AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Institutional Change in Indian Agriculture

Edited by

Suresh Pal
Mruthyunjaya
P K Joshi
Raka Saxena

भाकृअनुप
ICAR

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH

Institutional Change in Indian Agriculture

Editors

Suresh Pal

Mruthyunjaya

P K Joshi

Raka Saxena

भाकृअनुप
ICAR

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
NEW DELHI, INDIA

Institutional Change in Indian Agriculture

Edited by
Suresh Pal, Mruthyunjaya, P K Joshi and Raka Saxena

© NCAP 2003

Published by
Dr Mruthyunjaya
Director, NCAP

Printed at
Chandu Press
D-97, Shakarpur
Delhi - 110 092

Contents

Foreword

Agriculture will continue to play an important role in the economic development and poverty alleviation in India even in the era of economic liberalization and globalization. Generation of gainful employment and income for the rural poor, strengthening of household food and nutritional security and sustainable use of natural resources shall continue to be the main objectives of agricultural development in the country. However, there would be a paradigm shift in the development strategy. Market forces will now greatly guide agricultural production, and private sector would be a useful ally of public sector in the development process. Knowledge will be the key catalyst of growth, besides the traditional sources of growth like land and other resources. These developments will require significant changes in a majority of the existing institutions to keep them relevant in the present context. In some cases, obsolete institutions may have to be replaced with the new ones. This institutional change will be guided by expected impact in terms of increasing economic efficiency, strengthening incentives like protection of intellectual property, providing level-playing field to development agents, encouraging participation of stakeholders, enhancing accountability, etc.

The institutions for management of land, water and other common resources should involve their users and other stakeholders for efficient, sustainable and equitable use of these resources. The institutions dealing with agricultural marketing and credit should reach and protect the interests of small farmers, besides increasing economic efficiency. The most significant change will, however, be witnessed in the institutions dealing with creation, protection, exchange and application of new knowledge and technologies. This is because the governance, management and organizations of public research system will have to change to improve their effectiveness and efficiency. The public system will also be required to encourage private research through appropriate incentives and regulatory mechanisms. In particular, protection of intellectual property will be critical; it will determine the linkages between investment, technology and trade, which shall further reinforce the need for institutional change. A strong intellectual property regime will encourage private investment both domestic and foreign and improve access to internationally competitive technologies and

make an agricultural economy vibrant. The government may have to play a greater role to monitor such developments and respond accordingly.

The government has enacted a number of legislations and amended some others to facilitate development and use of technologies. The present volume discusses provisions in and appropriateness of these institutional reforms. It also covers the institutional changes needed for agricultural marketing, credit and management of natural resources. These institutions may not directly affect technology uptake, but facilitate technology adoption, and therefore, are indispensable for evolving knowledge-intensive agriculture in the country. I hope this volume would be immensely useful to policy makers, administrators, researchers and other readers alike.

Mangala Rai
Secretary
Department of Agricultural Research and Education, and
Director-General
Indian Council of Agricultural Research
Ministry of Agriculture
New Delhi

Preface

Technological advancements favoring better utilization of land and water resources fueled agricultural growth in India since the mid-1960s. Technologies were generally embedded in inputs (seed, fertilizer, pesticide, etc.), and therefore, were simple in the beginning to disseminate and adopt. However, in future, there will be a paradigm shift—productivity growth would be largely driven by technological advancements, which would be highly knowledge-based and information intensive. This shift requires new approaches to development, management and dissemination of technologies. The need for change is further heightened by evolving incentive system, ownership of intellectual property, restricted flow of research material, international treaties and conventions, globalization, challenges of the World Trade Organization, changing role of the state, etc. Thus, a new set of institutions should emerge to provide the growth impetus and synergy to optimally harness technological advances. In fact, benefits of technological change will be maximum when efficient and responsive institutions are in place.

In the wake of economic reforms, the institutional change should involve re-examination of the roles of the state, markets and collective actions in the management of natural resources and provision of goods and services to farmers. The challenging question is that the Indian agriculture has reached a stage where public sector may have to largely focus on the roles of facilitation, guided regulation and social welfare. Honestly put, the baggage of public organizations in their current form, functioning and accountability will be a big liability to the society in future. Thus, there is a need for phasing out, merging, remandating and may be establishing need-based new organizations. Further, active involvement of the private sector in national development has become a dire necessity. Therefore, strengthening public-private interface should engage our attention. This volume addresses some of these issues in the contributed papers and synthesis of the available evidence. In particular, efforts are made to analyze the role of hierarchy, incentives, laws and regulations in promoting relevance and efficiency of institutions.

There are a number of institutions dealing with various sub-sectors of agriculture and it is rather difficult to cover all of them in a moderate attempt

like this volume. Therefore, scope of this work is confined to the institutions affecting development, management, dissemination and impact of emerging knowledge-intensive technologies. Specifically, it covers institutions relating to agricultural research and extension, marketing and trade (including post-harvest processing), credit and agrarian reforms. Lessons from the institutions for sustainable management of natural resources are also drawn for dissemination of technologies needing collective actions. Besides the contributed papers, an attempt is also made to provide an exhaustive review of literature on theory and application of the institutional economics in agricultural development to outline the direction for institutional change.

Since the contributed papers of this volume were presented and discussed at a seminar "Institutional Change for Greater Agricultural Technology Impact" organized at National Centre for Agricultural Economics and Policy Research in March 2001, we were benefited from the comments of the discussants and participants. We are grateful to Dr A Vaidyanathan, Dr S S Johl, Dr S L Mehta, Dr Kiran Singh, Dr Dayanatha Jha and Dr P L Gautam for providing able guidance and invaluable insights. We are also grateful to all the chairpersons (Dr S S Johl, Dr S S Acharya, Dr Mohan Kanda, and Dr Kanchan Chopra) and discussants (Dr V M Rao, Dr D P Chaudhary, Dr R Maria Saleth, Dr M S Bhatia, Dr J P Mishra, Dr S Thorat, and Dr S Selvarajan) of various technical sessions for their significant contributions. Authors of the contributed papers deserve our special thanks for agreeing to contribute the papers, revising them on the lines of discussions held during the seminar, and responding to numerous editorial requests. The reports provided by all the rapporteurs (Dr B C Barah, Dr K K Datta, Dr P S Birthal, Dr M Sudha and Dr Anjani Kumar) were helpful in developing the synthesis chapter.

We have also benefited from invaluable guidance and input provided by Dr D K Marothia and Dr Robert Tripp in planning the seminar. Our colleagues at NCAP extended all help in organizing the seminar and bringing out this volume. We are indeed grateful to all of them. Financial support for this work was provided by the National Agricultural Technology Project of Indian Council of Agricultural Research and is gratefully acknowledged.

Editors

Acronyms

ADA	Aeronautical Development Agency
AgGDP	Agricultural gross domestic product
AICRP	All India Coordinated Research Project
APMC	Agricultural Produce Marketing Committee
APC	Agricultural Prices Commission
APEDA	Agricultural and Processed Food Export Development Agency
APL	Above the poverty line
ARS	Agricultural Research Service
ASRB	Agricultural Scientists Recruitment Board
ATIC	Agricultural Technology Information Centre
ATMA	Agricultural Technology Management Agency
BAIF	Bharatiya Agro Industries Foundation
BCR	Benefit-cost ratio
BOO	Build, own and operate
BOOT	Build, own, operate and transfer
BPL	Below the poverty line
BRAC	Bangladesh Rural Advancement Committee
CACP	Commission for Agricultural Costs and Prices
CADA	Command Area Development Authority
CAMPCO	Cocoa Marketing and Processing Cooperative
CCI	Cotton Corporation of India
CD	Community development
CGIAR	Consultative Group on International Agricultural Research
CII	Confederation of Indian Industry
CIMMYT	International Maize and Wheat Improvement Centre
CIRs	Community intellectual property rights
CMGs	Credit management groups
CMIE	Center for Monitoring Indian Economy
COs	Community organizers
CPLRs	Common property land resources
CPRs	Common pool resources
CWC	Central Warehousing Corporation
DAC	Department of Agriculture and Co-operation
DANIDA	Danish International Development Agency

DCCBs	District Cooperative Banks
DCP	Directed credit paradigm
DMI	Directorate of Marketing and Inspection
DoA	Department of Agriculture
EEC	European Economic Community
EOUs	Export-oriented units
EPZs	Export processing zones
ERC	Expenditure Reforms Commission
FAO	Food and Agricultural Organization
FCI	Food Corporation of India
FDS	Farmers drainage society
FFDA	Fish Farmers Development Agency
FIG	Farmers interest group
FMP	Financial market paradigm
FPO	Food product order
FPR&E	Farmer participatory research and extension
FPS	Fair price shop
FSSs	Farmer Service Societies
FYA	Five-yearly assessment
GB	Grameen Bank
GDP	Gross domestic product
GEM	Groundwater extracting mechanism
GEMS	Global environment monitoring system
GGP	Gram Gaurav Pratishthan
GMM	Gross marketing margins
GMOs	Genetically-modified organisms
GoI	Government of India
HACCP	Hazard analysis and critical control point
HAFED	Haryana State Agricultural Marketing Federation
HLL	Hindustan Liver Limited
HLRDC	Haryana Land Reclamation Development Corporation
HOPP	Haryana Operational Pilot Project
HPMC	Himachal Pradesh Processing and Marketing Corporation
HRD	Human resource development
HSMITC	Haryana State Minor Irrigation Tubewell Corporation
HYVs	High-yielding varieties

IADP	Intensive Agricultural Development Program
IARCs	International Agricultural Research Centres
ICAR	Indian Council of Agricultural Research
ICT	Information communication technology
IIHR	Indian Institute of Horticultural Research
IPRs	Intellectual property rights
IRR	Internal rate of return
IRRI	International Rice Research Institute
ISI	Indian Standards Institution
ISNAR	International Service for National Agricultural Research
ISO	International Standard Organization
IT	Information technology
IVLP	Institute Village Linkage Program
JCI	Jute Corporation of India
JKHPMC	Jammu and Kashmir Horticultural Produce Marketing Corporation
JVs	Joint ventures
KHDP	Kerala Horticultural Development Program
KVKs	Krishi Vigyan Kendras
LAMPS	Large Multipurpose Cooperative Societies
MANAGE	National Institute of Agricultural Extension Management
MFIs	Micro finance intermediaries
MINARAS	Monitoring of Indian national aquatic resources
MLA	Member of Legislative Assembly
MoFPI	Ministry of Food Processing Industry
MP	Member of Parliament
MSP	Minimum support price
MYRADA	Mysore Resettlement and Development Agency
NABARD	National Bank for Agriculture and Rural Development
NAFED	National Agricultural Co-operative Marketing Federation
NARS	National agricultural research system
NATP	National Agricultural Technology Project
NBFCs	Non-banking financial companies
NCDC	National Cooperative Development Council
NDDB	National Dairy Development Board
NES	National extension service

NGO	Non-governmental organization
NHB	National Horticultural Board
NIE	New institutional economics
NIRD	National Institute of Rural Development
NNP	Net national product
NPL	Natural Products Limited
NRAP	National river action plan
NSI	National systems of innovation
NSSO	National Sample Survey Organization
NTFPs	Non-timber forest products
NVA	Net value added
O&M	Organization and management
ODI	Overseas Development Institute
PACSs	Primary Agricultural Cooperative Societies
PAP	People action plan
PDS	Public Distribution System
PDV	Planning for development of villages
PHCs	Post-harvest contractors
PIDOW	Participatory Integrated Development of Watershed
PIM	Participatory irrigation management
PRA	Participatory rural appraisal
PRIS	Panchayati Raj Institutions
PSBs	Public sector banks
PTD	Participatory technology development
PWD	Public Works Department
QRs	Quantitative restrictions
R&D	Research and development
RCP	Rural credit project
RDP	Rural development program
RFIs	Rural financial institutions
RRBs	Regional rural banks
RVT	Rate of variable tariff
SAMB	State Agricultural Marketing Board
SAU	State Agricultural University
SMSs	Subject matter specialists
SFAC	Small Farmers Agri-business Consortium

SGs	Sacred groves
SHGs	Self-help groups
SREP	Strategic research and extension plan
SSD	Sub-surface drainage
SUGARFED	Sugarcane Marketing Federation
SWC	State Warehousing Corporation
SWDF	Sadguru Water and Development Foundation
T&V	Training and Visit (System)
TAPCMS	Taluka Agricultural Produce Co-operative Marketing
TAR	Technology assessment and refinement
TERI	Tata Energy Research Institute
TGCSs	Tree Growers Cooperative Societies
TNCs	Transnational companies
TQM	Total quality management
TRIFED	Tribal Cooperative Federation
TTC	Trainers Training Centers
UNICEF	United Nation's Children's Emergency Fund
UPDASP	Uttar Pradesh Diversified Agricultural Support Project
UPSLRP	Uttar Pradesh Sodic Land Reclamation Project
UVM	Ubeshwar Vikas Mandal
VAC	Value addition center
VDA	Village development assembly
VDC	Village development council
VEW	Village extension worker
VHT	Vapour heat treatment
VLW	Village-level worker
VPDOs	Village panchayat development officers
WTO	World Trade Organization
WUAs	Water user associations
WYTEP	Women/Youth Training Extension Project
ZARS	Zonal Agricultural Research Station

1

Keynote Address

A. Vaidyanathan

I have come to an age where giving keynote addresses becomes a bit of ritual which one cannot resist. But I am not apologetic for it, because the subject is very interesting. The subject is institutional environment necessary for making the results of technological research effective on the ground.

What does agricultural research do? Research contributes in two ways: (a) It pushes yield barriers up through development of varieties, and (b) it develops agronomic and resource management practices for the varieties to perform optimally. Both the technologies pay attention to the ways of economizing the costs. It is not simply reducing the cost of production but also reducing the cost of reaching the ground level. Both contribute to increasing profitability and that is the most important driving force for effective use of research results. Therefore, one of the major issues is of functioning of research stations. I will talk about that a little later.

Now, let us look at what happens on the ground. Firstly, there is lack of transmission of knowledge generated by the research system to the actual users of research. The second is the actual physical environment in which cultivation takes place; it is basically soil and water environment, which is highly variable and complex for various reasons. The performance of technologies crucially depends on soil moisture management. People speak with such excitement about the potentials of biotechnology; it may produce varieties in the lab with reduced research lag, but these varieties will not perform until soil-moisture environment is managed at optimal level. Due to constraints operating at farmers' fields, there exists a wide gap between the demonstration yield and the actual crop yield realized on farmers' fields, which thereby affects the costs and returns.

Another important dimension associated with the costs and returns is that farm sizes are very small, affecting the propagation and use of technology. In

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

principle there are no strong economies of scale. Numerous constraints like improperly managed irrigation systems, sub-optimal fertilizer use, etc. operate in the system. Small farmers have limited access to modern inputs and credit facilities, and poor bargaining power in the product market. The idea is of having a credit system, which is highly subsidized through the public system in our case, or with the help of genuine cooperatives. The message is that the smallest should not be disadvantaged in availing credit as well as the prices for his products. Now I shall discuss the important issues one by one.

Soil and Moisture Management

Rainfed lands have low moisture-retention capacity, degraded soil, and high rates of surface-water flow. It is perhaps the reason why watershed programs have been given emphasis and are effective for the purpose of institutionalization. You cannot control the seasonal distribution of moisture that depends purely on the distribution of rainfall. But, you can increase the control on amount of moisture available per unit of area and that will have effect on the production of different varieties. In the case of irrigation, we are bringing in extra water from outside. It increases both the amount of water available and its seasonal distribution—this is what our irrigation systems have done. It is not the quantity of moisture available but how effectively you are able to regulate its availability to the plants at the right time and in the right quantity. An optimal soil moisture regime consisting of all these elements is supposed to bring the best results out of any given technology. The more sophisticated is the technology, the more demanding it is in terms of better soil and moisture conditions.

Now, about surface irrigation system, most of it is in the public domain because it is of common pool nature, which, in principle, should be accessible on equitable basis. But for various reasons, it is not treated as a common pool resource; it is largely left for the exploitation by the private sector. The management of irrigation systems is notorious which has succeeded remarkably in providing more water for a longer duration of time, but has failed miserably in ensuring the control element. The question then arises why not to privatize the irrigation systems? As a result of privatization, markets will lead to optimal allocations of water, as markets are well-defined in time and space. Each common small network in the market is a part of a large network. Whatever

you do in one part of the network, it will affect the larger network. It is not only the water to be sold, but one should ensure that water reaches the right users in right quantity and at right time. When you have thousands of users, there are outright violations of the rules because of locational and other advantages. Then, the requirement of optimal management of moisture will not be met. Therefore, irrigation systems will continue to be in the public domain. This is also demanded by the nature of the resource, water. It is extremely important to improve the management of public water system. Since environment and technology are changing, we need flexibility in ways and means to allow changes in cropping systems. For this, we need efficient water management through creation of a system with well-defined rights which are acceptable to all, and effective mechanisms to control the encroachment. There should also be sufficient internal flexibility to adopt rules for the management. These are the challenges of institutional reforms needed in this area. The creation of users' associations at the outlet of canal command area is important for negotiation of rules and participatory management to make the system function better.

The same set of problems is being focussed in watershed programs. We talk about the Ralegaon program; it is not that it can be replicated but it has a very important lesson. The entire community is involved in what is being done, how it is being done, and who is expected to do what in this scheme for the collective group. Unless the basic deficiencies are corrected, bringing institutional reforms is a difficult task. Unless we are able to create mechanisms for incentives to individuals, it cannot simply work based on the bureaucratic rules.

Credit and Marketing

The vulnerable section here is of small farmers who can't go to the market because of their limited asset base. We have to overcome these limitations in the size of credit and marketing. Cooperatives failed to address this problem; they have become totally undemocratic, and everything is against the spirit and philosophy of cooperatives. Now the question is how to get politics out of cooperatives? They must be able to mobilize their resources. Credit is a very challenging area for insightful research. There exist some research studies, but we need to do a great deal of research in this area. We cannot talk in the air

about how institutions actively function. It is an area where entire institutional reforms are needed.

In markets, we have to ensure the bargaining power of small farmers and see that how do the markets function, especially in sharing of information, rules for grading, weighing, auctioning, etc. An effective marketing institution should facilitate more information, fairer trading, better prices and greater transparency in its functioning. Privatization and market-mediated solutions can work in this direction. Markets cannot work without public support. Between government and private sector, various institutions exist like non-governmental organizations (NGOs), cooperatives, etc. Expanding the scope of participatory, democratic, and transparent organizations for managing these common activities has a much wider role in empowering the disadvantaged and realizing the economies of scale. We also have to identify the areas in which private institutions can function more efficiently.

Research System

It is very important to see the functioning of agricultural research institutions—their focus, internal incentive system, etc. We have regional research stations where we are supposed to conduct the adaptive research. There are several issues that need to be critically examined for efficient functioning of the system. This is primarily because there is limited scope for private sector's participation in agricultural research, except seed, and bulk of research will continue to be in the public domain. We should improve functioning of the public research system. Our first job as a researcher is to unravel the existing deficiencies in the system; it is really being self-critical in the first step. Then, we have to look at how actively institutions function. A very few empirical studies have been done on how similar institutions work differently under different environments. This may give us an insight into the underlying conditions for functioning of research institutions and engineering the needed institutional reforms.

2

Institutional Change in Indian Agriculture: An Overview[1]

Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena

Introduction

Economic and technological systems are changing rapidly all over the globe. However, intensity and impact of these changes are more pronounced in developing countries. Although trade liberalization and integration of developing economies with rest of the world have opened new avenues for growth, these have also exposed the domestic systems to intense competition and a new regime of incentives and institutions is emerging. There is a greater reliance on market forces, and competition and incentives are largely going to be influenced by trends in the world markets. Under this emerging scenario, we need efficient organizations to link the domestic system with the world market, and a highly developed information system to monitor developments in the world markets and provide right signals for efficient organization of economic activities and allocation of resources. The main objective is that the domestic players in the developing countries should have easy access to global markets and resources, including technology, and the domestic institutions should improve the access to the markets.

On the scientific front, the recent advancements in molecular biology, information communication technology (ICT), space sciences, etc. have profound implications on economic development. These scientific developments, on the

[1] This chapter largely summarizes the main points raised in the contributed chapters and the discussions that took place during the seminar. An abridged version of this chapter has been published in the conference issue (Vol. 3, 2002) of the Indian Journal of Agricultural Economics.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

one hand, have enhanced the growth potential significantly and have increased the chances of harnessing this potential due to better precision in research methodologies and reduction in research and development (R&D) lag. On the other hand, with the advancements in ICT and space technology, it has become easier to have access to improved technologies and their attributes (characteristics, sources, potential benefits, etc.). What is needed is that appropriate policies and institutions are in place to promote and harness these scientific advancements for developing a knowledge-based society.

In India, although the reforms of economic liberalization and structural adjustments initiated in 1991 were not explicitly directed to agriculture, these are expected to impact agricultural sector significantly. The impact, however, will be more visible with the completion of second phase of the reforms, covering financial sector, public organizations, protection of intellectual property and labor regulations (Vyas 2001). This, coupled with harnessing technological revolutions, is expected to transform Indian agriculture significantly. It is now a fact that further growth in the agriculture could be achieved through increase in productivity, which is possible only through accelerated development and dissemination of improved technologies. Since most of the cutting-edge technologies are knowledge intensive, new institutions and organizations are needed for their development, management and use. In particular, the participation of private sector in agricultural R&D and the protection of intellectual property, including plant varieties, require reorientation of the existing R&D institutions. The experience of the Green Revolution has also shown that besides technological advancements, supporting institutions like credit, land reforms, etc., as well as incentives like prices, are of paramount importance for technology-led growth in agriculture. Therefore, the development of knowledge-based modern agriculture would require changes in all these institutions. The past experience has clearly shown that full potential of some of the technologies, e.g. hybrids, integrated crop management, watershed development, bio-inputs, etc., could not be realized due to lack of proper institutions (Pal et al. 1998; and Kolavalli and Kerr 2002). These were information-intensive technologies, while the existing institutions were tuned to transfer of input-based technologies like seeds of open pollinated crops and fertilizers.

The above facts grossly point towards the need and direction of institutional reforms in Indian agriculture. Though the main emphasis in this volume is on the institutions relating to agricultural R&D — technology development, management,

transfer and use, regulations, etc., other institutions, such as credit, agrarian and marketing and trade affecting adoption and impact of technologies, are also discussed. This chapter presents the concept and evolution of institutional economics and their applications in economic and agricultural development, followed by a synthesis of the issues by sub-themes in the context of Indian agriculture.

The Concept and Application

The new institutional economics

The burgeoning literature on institutional economics is being increasingly applied to understand and accelerate the process of economic development. Conceptually, institutions are different from organizations; the former refer to the 'rules of the game', while the latter refer to the group of individuals bounded by some common objectives. The institutions could be formal (e.g. laws) or informal (social norms, traditions, customs, etc.); these govern behavior of economic agents or individuals and determine incentives in political, social and economic relations (North 1990). However, these concepts are often used interchangeably in the literature and so is in this volume. But, the use of these terms against each other maintains the distinction between them.

The principles of neo-classical economics, usually applied to explain the behavior of economic agents, hold that individuals make rational choices and the market forces satisfying the marginal conditions ensure economic efficiency in the system. It considers the role of state in the event of market failure. However, market failures or imperfections due to real world intricacies, and opportunistic human behavior, do not always result into the Pareto-optimal solutions, envisaged in the neo-classical economics. This theory also failed to explain uneven performance of the economies over space and time. As a result, the focus shifted on the role of political and individual ideologies, institutions and incentives in explaining the economic performance. The basic premises of 'rationality' and 'competition' facilitating market equilibrium were questioned. It was argued that individuals are 'bounded rational' (rationality within information available) and the incentive structure determined by the institutions affect the behavior of economic agents. Therefore, institutions are as important as market forces in

determining economic performance (for detail discussion, see Williamson 1985).

The developments in the institutional economics draw on a number of disciplines, notably economics, sociology, anthropology, law and organization theory, and do not converge to a unified theory to study the institutions and their determinants. The early work in this area, commonly referred to as the 'old institutional economics', was successful in highlighting the importance of institutions and their development in specific contexts. The work, however, lacked theoretical foundation. The path-breaking work of Coase (1937 & 1960), North (1990) and Williamson (1975 & 1985) laid the foundations of what is popularly known as the 'new institutional economics (NIE)'. The NIE maintained that transaction, rather than market, is an appropriate unit of analysis, as economic agents try to minimize the transaction cost. The transaction cost was defined as 'the economic equivalent of friction in physical systems' by Williamson (1985), while others defined it as 'losses due to imperfect information' and further divided into 'search and information costs, bargaining and decision costs, and policing and enforcement costs' (Dahlman 1979). The concept has been increasingly used to explain how organizations evolve in market economies, or efficiency of hierarchy and markets. In case the cost of market transaction is higher than that of internal transaction, firms bring new but related economic activities under them, which is known as vertical integration. Conversely, a higher cost of internal transaction or hierarchy leads to greater dependence on market-based transactions. Further applications of this concept provided an understanding of the roles of state (hierarchy), private sector (markets) and voluntary agencies in economic development (Picciotto 1995).

Other important theoretical approaches followed in the NIE are: Political economy and public choice theory, property rights, path dependence, quantitative economic history, and principal-agent theory. All of these, though important contributions, sometimes compete amongst themselves and therefore, are difficult to put on the trajectory of conceptual developments. Williamson (2000) has tried to put them into a perspective by describing four levels of analysis in the NIE. The first level is embeddedness of informal institutions, which are often considered as given as they change over a very long period of time. Their analysis draws inputs from social theory. The second level of analysis is broad institutional environment or 'setting formal rules of the game', especially property rights. At this level, property rights and political theory are more useful. The third level is 'play of the game or aligning governance structure with transactions', and is

largely guided by the transaction cost economics. At this level, enforcement of the property rights and contract laws is critical. The governance process should ensure order to resolve conflict and realize mutual gains (Commons 1934). The extreme cases where assigning property rights is difficult, or transaction cost of the enforcement of property rights is high and distribution of the benefits is highly skewed, the theory of collective actions assumes significance (Olson 1965; and Ostrom 1990). The fourth and final level of analysis deals with resource allocation and incentive alignment, drawing on the principles of neo-classical economics and the agency theory. At this level, setting of the marginal conditions right, *ex ante* incentive alignment and efficient risk bearing are important, rather than *ex post* governance. This description of the economics of institutions, thus, clearly indicates that the NIE does not neglect or replace the neo-classical economics, but it broadens the scope of analysis by bringing additional useful insights into the process of understanding economic development.

Application in agriculture

The NIE is increasingly being applied to study economic and agricultural development. The evidences suggest link between quality of institutions and investment and growth (for review of evidence, see Aron 2000). Some notable examples of institutional failure or weak institutions are the breakup of former Soviet Union, economic crisis of east Asia, and low growth of African economies. Weak financial institutions are responsible for the east Asian crisis, while lack of incentives demolished the production system in the Soviet Union. The economic growth in African and other developing countries is poor because structure of institutions (property rights and other rules) and their enforcement do not provide incentives and encouragement to productive or wealth maximizing activities of individuals and organizations (North 1990). The investment level is low and the firms are small scale, using low capital-intensive technology (often inefficient). In other words, there are not enough incentives to innovate and invest.

Advancements in the NIE have also been applied to agricultural development and change. The most notable applications are in the field of agrarian structure, management of common pool resources, technology systems, including provision of improved seeds, marketing and trade, and micro-institutions for credit and poverty alleviation. The focus of analysis has been on describing the existing institutions, institutional change and impact on agricultural development with an

overall objective of indicating appropriate form of institutions (see Chapter 3). Another significant contribution of these studies has been that they successfully underscored the intimate interactions between institutions and technology to influence economic performance. For example, micro-level agrarian institutions, such as share-cropping, lower the cost of labor supervision in the field and reduce risk by spreading it among landlord and share-cropper (Bardhan 1989). At the same time, agrarian institutions like tenancy and labor contract change because of technological interventions and allow productivity gains of improved technologies (Hayami and Ruttan 1985). Some analysts maintain the key role of ideology in making the society receptive to technological change, in particular and agricultural development, in general. Furthermore, it is found that 'social capital' significantly influences the absorption of technology (David 1997). The study of technology systems (research and extension) also reveals that a pluralistic system with active partnerships between various actors emerges only when appropriate institutional framework (property rights and regulations) is in place. This coupled with nature of technology, incentives and information flow greatly affects the provision of the technologies embedded in inputs (e.g. seed) to farmers (Morris 1998; and Tripp 1997, 2001). It is thus evident that institutions are as important as technology for economic development, and they evolve together interactively during the development process. It is this link between institutions and technology which is getting increasing attention of researchers in recent years.

In the context of Indian agriculture, the recent studies on institutional change are mainly influenced by the change in economic policies, which, in turn, is the result of internal crisis of the balance of payment and external shock of the new trade regime. In the new policy regime, emphasis shifted to a greater role of markets in economic development, and a receding role of the state to facilitation and social welfare. Vaidyanathan (1996) visualized continued dominance of the state in irrigation, research and extension and infrastructure development, but he underlined the need for reforms in the public organizations for their financial viability and efficiency. On the other hand, some other researchers consider institutional reforms *sine qua non* for sustainable agricultural development and poverty alleviation (Gandhi 1998; and Saleth 2000). In particular, sustainable use of common pool resources and management of surface irrigation have received much greater attention, and the need for institutional reforms ensuring stakeholders' participation and equitable distribution of benefits is reiterated

time and again (Jodha 1992; Chopra et al. 1990; Kerr et al. 1997; and Marothia 2002). The issues highlighted in the context of technology systems are: (a) Reforms in the public sector organizations to ensure accountability; (b) aligning incentives with performance, and reducing transaction cost by decentralization; (c) enforcing property rights (such as IPR) and other regulations; and (d) improving information flow in the seed systems (Pal and Singh 1998; and Tripp and Pal 2001). All these studies have made important contributions in terms of their objectives and scope of the analysis, but the critical link between institutions and technology was however not accorded due importance. This volume revisits some of these works to search for the evidence of these interactions. Our assumption is that the role of technology in accelerating agricultural development through steady growth in productivity would be central in the years to come, paving the way for emergence of knowledge-intensive agriculture. Since most of the new technologies would be knowledge-intensive, the interplay between technology and institutions would be much stronger. Another related concern is that how best small holders can be served with the intensification of technology-institution links and increase in the capital and knowledge intensity of technologies. All these aspects need an in-depth analysis.

Institutional Change in Indian Agriculture

Institutions for management of common pool resources

Institutional aspects of management of common pool resources such as land, water, forest, irrigation tanks, etc. have perhaps received considerable attention of researchers in India. Here, we use the available evidence to draw lessons for the development and dissemination of technologies requiring collective actions, and not establishing link between institutions and technologies. Open access to the commons is the main problem, which is popularly known as the 'tragedy or crisis of commons'. Commercialization of the use of resources and conflicts arising due to the increasing scarcity have further complicated the management problem (Jodha 1992; and Kerr et al. 1997). Besides these problems, distorted policies, breakdown of the traditional social institutions and lack of alternative formal institutions are responsible for degradation of the commons (Singh 1994; and Marothia 2002). For example, lack of property rights and

subsidized electricity supply have led to unabated mining of groundwater. Similarly, breakdown of village-level social institutions has led to degradation of common lands, irrigation tanks, village forests, etc.

The main problem with sustainable use of common pool resources is lack of institutions to resolve conflict, and ensure equitable distribution of benefits and ordering of contract. Assigning property rights to individuals or groups is difficult, and privatization, as often advocated, provides incentives for management but does not ensure equitable distribution of benefits. The experience of cooperative management of the commons has shown mixed results — cooperatives are mostly dominated by the government nominees, and lack resources and people's participation (Singh and Ballabh 1996). Another option is the participatory management or governance of the commons with clarity of rights and responsibilities of stakeholders (Chopra et al. 1990). This concept has been implemented in the forest management through enactment of the Joint Forest Management Act, and also being tried for the management of surface irrigation, both canal and tank in some states. For the success of such institutional arrangements, it is essential that there are effective links between various agents such as government, user organizations, voluntary groups, individuals, etc. Further, the problems encountered with these arrangements are: (a) Larger institutions sometimes create conflicts with the macro-institutions and political system, and (b) time, space and resource specificity of institutions make generalization and replication difficult. Nevertheless, it is widely accepted that there must be adequate incentive for people to ensure their participation in the management of the commons. Transparency of rules, credibility of enforcement and conflict resolution mechanism further add to the success of the participatory management.

The management of groundwater and fishery resources is much more difficult as these are confronted with a number of conflicts in the absence of suitable property rights. The property rights, in fact, are linked with land rights, which are highly skewed, and the power relations govern access to these resources. Moreover, enforcement of pollution laws to check resource degradation is extremely weak. As a result, these resources are depleting in terms of both quantity and quality. Harmonization of relations between the state, people and community would perhaps provide solution to promote sustainable use of these resources (Chapter 7).

Some important lessons can be learnt from the experience of common pool resources and can be applied to development and dissemination of technologies

requiring collective actions such as watershed development and integrated pest management. Economic benefits (higher income or risk reduction) have been much higher in the case of people's participation, particularly in low productivity regions. This has been clearly shown in the case of watershed development programs (Chapter 5). Therefore, to ensure people's participation, adequacy of incentives, demand-driven program development and decentralized decision-making are essential. In the context of R&D, this implies that research agenda must be demand-driven and clients should be involved in the on-farm technology development and evaluation. Technological intervention should benefit all social classes in the target domain, and necessary information, training and other support should be extended, at least during the initial phase of the intervention. Farmers' organizations and voluntary groups could be useful allies of public research and extension systems in this task.

Institutions for agricultural R&D

Nature of emerging technologies. Before we discuss technology-institution links, it would be useful to take a look at the nature of emerging technologies in the field of agriculture during the next twenty years or so and their implications on R&D strategy. Broadly speaking, emerging technologies could be framed into four typologies. *First* and the most discussed are the products of biotechnology, including genetically modified organisms (GMOs) or transgenic products. The major research products or technologies in this category are plant varieties with gene for resistance to biotic (e.g. Bt cotton, Bt corn, herbicide tolerant seed) and abiotic (salt tolerance varieties) stresses, varieties with gene for better product quality (e.g. 'golden rice'), planting material developed by tissue culture technique, animal health vaccines, etc.[2] It is difficult to distinguish these technologies from the traditional ones in terms of their physical characteristics. But, these are significantly different in their biological characteristics, application management, market differentiation for farm produce, biosafety issues, etc. For example, in

[2] Genetically modified varieties for biotic stresses are, in fact, in the field or advance stage of field testing or experimentation. However, the varieties for better quality or tolerance to abiotic stresses such as water stress, are yet to make a significant advancement in India (for details, see Chopra 2000).

the case of GM seeds, farmers need to know attributes of the seed, care in its use (e.g. planting of 'refugia' in the field), sale of GM product in market, etc. These technologies are knowledge intensive and offer scope for appropriation of the benefits by the private sector. *Second* type of technologies are related to open-pollinated varieties and hybrids developed using conventional breeding methods. These will continue to be important vehicles for increasing and sustaining crop productivity on a vast proportion of agricultural lands in the country. The significant deviation more likely is that hybrid technology would be available for even more crops, including rice and wheat. Hybrid rice is now a reality in India also. Besides hybrids, better plant types, e.g. 'super rice' also have potential for yield advantages. These technologies may attract the participation of the private sector. *Third* type of technologies relate to improved crop and resource management methods based on system approach. There is a considerable scope for realizing potential of technologies such as watershed development, integrated crop management, precision and protected farming, micro-irrigation, etc. Most of these technologies require greater skill for their adoption. *Fourth* category of technologies includes improved and value-added inputs (such as biofertilizers, treated seed for tolerance to biotic stresses or nutrient supply), better products for plant and animal health, post-harvest processing and value addition, etc. The private sector would find delivery of these technologies attractive, and some of them can even be imported.

The technologies discussed above have certain distinct features, having implications for the institutions governing them. Most of these technologies provide scope for participation of the private sector in their development and dissemination. This requires that there should not only be adequate incentives for the private sector to participate, but also protection of farmers against monopolistic behavior of large companies, and thereby ensuring access of small farmers to these improved technologies. In other words, institutional issues relating to management and use of technologies, particularly of the proprietary products become critical. Further, most of the future technologies will be knowledge intensive, and therefore, specific efforts should be made to disseminate information about the attributes of these technologies to farmers. This is particularly important when information flow in the technology system and commercial input market is inadequate (Tripp and Pal 2001). The farmers need information about technology attributes and quality of inputs (seeds, pesticides, fertilizers, etc.) available in the market. Lastly, there must be an effective mechanism to protect consumer-farmers from the

supply of spurious inputs like seeds and pesticides, causing substantial losses to them.

Institutional imperatives. The Indian agricultural R&D system is slowly moving towards a pluralistic system drawing strengths from the public, private and voluntary sectors. This coupled with significant presence of international agricultural research centers (IARCs) has raised the issues of their appropriate roles and need to develop synergies through partnerships. These organizational developments have implications on the institutions governing them and management of technologies. The most significant is the protection of intellectual property. The private sector not only wants facilitating regulations, but also sufficient incentives in the form of protection of intellectual property. To this effect, the government has liberalized entry of the private companies, including multinationals, in agricultural R&D, and also passed recently acts like the Plant Varieties Protection and Farmers' Rights Act (2001), and the Patents (Amendment) Act (1999). These Acts primarily aim to provide incentives to the private sector by bringing the domestic IPR regime at par with the international regime envisaged under the World Trade Organization (WTO). These developments are not in isolation with technological developments. As noted above, the emerging technologies provide considerable scope for appropriation of research benefits and therefore may attract lot of private investment in agricultural R&D. Thus, agricultural R&D organizations, institutions governing them and technologies are simultaneously evolving or undergoing a drastic change in India. Appropriate policy interventions and enforcement of the institutions can shape this healthy trend for catering to R&D needs of the country.

In this context, three issues deserve special attention. First is the clarity on the roles of various actors in the R&D system based on their comparative advantage, and providing enabling policies and macro-environment to undertake their respective roles. The public research organizations, particularly ICAR, have now much larger responsibility of coordinating research and catering to the needs of other providers of R&D (e.g. basic research support to the private sector). This function could be best performed on the pattern of the All India Coordinated Research Project (AICRP) and the Centre-State Coordination Committee, which help establish direct link with all the stakeholders. This is also essential to overcome institutional and disciplinary rigidities. On the other hand, the public research organizations need to undergo a number of reforms. Decentralization and devolution of power, autonomy with accountability,

enhancing funding and linking it with performance, improving management and information system, capacity including human capital development in frontier areas of science, introducing performance-based incentive system, etc. deserve immediate attention (Mruthyunjaya and Ranjitha 1998; and Pal and Byerlee 2002). The extension system also needs to be reformed on the similar lines; it should be made demand-driven and accountable to farmers and also should be strengthened in terms of financial and manpower resources. Some researchers even suggest that agricultural extension should be farmer-driven and controlled (for detail discussion, see Part 2 of this volume). All these reforms cannot be implemented in one go; realization of the need for change (by research managers and policy makers), developing a road map for reforms, and learning from the experiences would be desirable. The on-going reforms particularly under the National Technology Project provide a good starting point.

The second issue relates to the credibility of the regulatory mechanisms—this includes both appropriateness of the regulations and degree and cost of their enforcement. A number of laws are enacted to regulate the technology systems; the most important are the Seed Act (1966), the Plant Varieties Protection and Farmers' Rights Act (2001), the Patent (Amendment) Act (1999), the proposed bill on conservation of biodiversity, rules regulating GMOs, the Insecticide Act (1968), etc. Some of these have been in existence since long and some are enacted very recently. It is likely that more than one regulations govern a technology; for example, new seeds are governed by the seed act, plant variety protection act, and regulations relating to biodiversity[3] . And if the seed is genetically modified, regulations for GMOs also control this. All these may add to the cost as well as effectiveness of the regulations. High cost of implementation, delay in release of technology and weak enforcement may defeat the basic purpose of the regulation and also may cause enormous economic losses. Therefore, regulations should be simple, transparent and easy to implement. There is no simple rule to develop such regulations, but these evolve over a period of time with learning from the past experiences, as well as from others.

The third point relates to protection of farmers' interests. This concern is gaining importance with the increase in participation of private sector in the

[3] The Seed Act is under review to harmonize all the functions (testing and registration of varieties, quality control, point-of-sale seed inspection, etc.), as well as provisions in other regulations for seed.

development and delivery of technology, particularly those embedded in inputs (e.g. seed). This could be addressed at two levels: (a) Providing information to farmers about technologies and their attributes. This will help farmers to make a rational choice and also protect them from the unscrupulous trade activities. Since information has attributes of 'public good', the public sector should take a lead role in provision of the information. Of course, the private sector could be a useful ally, and there could be cases of private delivery of public information. (b) Grass-root-level mechanism to ensure quality of inputs (e.g. point-of-sale inspection of seed) and legal system to protect consumer-farmers (e.g. Consumer Forums) should be made more effective and easy to approach (Pal and Tripp 2002). In the absence of such protection mechanisms, greater reliance on the private sector in the provision of agricultural R&D and technology-related inputs is bound to exploit the farmers.

Agrarian and credit institutions

The basic objective of this sub-theme was to know how agrarian and credit institutions, including those linking production with processing, affect impact of technologies. The main issues covered are ceiling on land holdings, consolidation of holdings, tenancy, and contract farming. The issues relating to agricultural financing touched upon are: performance of rural credit institutions and institutions for micro-credit. In the wake of economic liberalization, agrarian reforms have been denied their due importance, in spite of their significant impact on agricultural development in the past. Consolidation of holdings and tenancy reforms in West Bengal ('Operation *barga*') and Karnataka (Land Reform Act 1974 and Amendment 1979) have contributed significantly to agricultural development.[4] The tenancy reforms not only changed the rural power structure, but also provided powerful incentives to raise land productivity. The reforms also improved tenants' access to new technology, modern inputs and institutional credit (Haque 2001). Thus, tenancy reforms have accelerated adoption of new technologies, but it is not clear whether further legalization of tenancy, particularly in the high productivity regions, would benefit small and marginal farmers. The same holds true for abolition of ceiling on land holdings. In the high productivity regions like

[4] In West Bengal, land ownership rights were given to the tenants, whereas Karnataka offered the occupancy rights to the tenants, subject to some ceiling limit.

Punjab, the 'reverse tenancy' is common. This coupled with abolition of land ceiling will promote concentration of land with large farmers. Further, with the lack of non-farm employment opportunities, the misery of small farmers and landless laborers would worsen (Chapter 14). Therefore, it is suggested that region-specific land reforms would help accelerate the rate of technology adoption and thereby agricultural development in the country.

Contract and corporate farmings are important institutional arrangements to realize economies of scale, accelerate speed of technology adoption and ensure supply of raw material to agro-industry. However, corporate farming is not preferred because of high asset and location specificity, desisting firms to make huge investments in land, and adverse equity implications. Contract farming, on the other hand, does not have asset specificity and can promote rapid adoption of technologies and increase productivity and farm income (Haque 2001). However, it is observed that the transaction cost in dealing with a large number of small farmers is high and therefore, the processing units try to reduce the transaction cost by working with well-resource endowed, large farmers. Thus, institutional arrangements to integrate small farmers with market economy are yet to emerge. This was addressed in the seed production to some extent, where seed companies work through the organizers who link farmers (by mobilizing them) with seed companies (Pal et al. 2000).[5] The experience of Japan and China may be useful in linking small farmers with domestic as well as international markets.

Abolition of priority lending to agriculture and liberalization of commercial financial institutions have raised doubts on the availability of institutional credit to agriculture. On the recommendation of the expert committees, several reforms were introduced in the public sector banks (PSBs)—the main banking organizations in the country. These include allowing the PSBs to raise capital up to 49 per cent from the public, increased autonomy and office automation, half-yearly review of performance, etc. These reforms have made some impact, but real issue of reducing the non-performing assets by simplifying legal procedure for recovery of over dues is yet to be addressed (GoI 1998; and Reddy 1999). Any effort to privatize the PSBs in the absence of effective regulatory mechanism

[5] Small farmers are linked with market in milk and sugar cooperatives. But this is because of homogeneity of the product (milk and sugar) and not because of institutional arrangement. The same degree of homogeneity may not be possible in other agricultural crops.

would not only restrict credit flow to agriculture but also would be vulnerable to financial crisis (Mathur 2002). Therefore, efforts should be targeted to improve efficiency and competitiveness of financial institutions. In the context of agriculture and rural development, micro-finance, high-tech agriculture, and information technology are expected to make impact on the institutional credit (delivery mechanism and extent of lending), and institutional change must respond to these developments. Efficiency and effectiveness of rural financial institutions through quantitative and qualitative parameters, and their ability to make impact on sustainable rural development should form the basis for performance assessment. Also, focus must shift from the supply side to the demand-side management of credit (Chapter 15).

One of the major limitations of formal credit institutions was the high transaction cost. The credit institutions find it costly to reach a large number of people spread over a region. On the other hand, the cost of following cumbersome lending procedures of the commercial institutions was also high for the borrower. This serious constraint was addressed by the micro-finance approach, which was patronized by the apex rural banking institution, i.e. the National Bank for Agriculture and Rural Development. Linking of self-help groups (SHGs) with commercial financial institutions through NGOs has reduced the transaction cost of both the lending institutions and borrowers. At the same time, SHGs encouraged people's participation and demand-driven approach. This institutional innovation has made significant impact in terms of improving income level and standard of living of beneficiaries, and empowered the rural poor, particularly the women. In fact, suffering from poverty is the main binding force to form and stay with SHG. This helped NGOs to mobilize the rural poor and facilitate delivery of about three-fourths of the total micro-credit in the country. However, the success is confined to the southern region of the country, where infrastructure development is comparatively better (Chapter 16). Further work is required to draw lessons for replicating this institutional innovation in other parts of the country for meeting credit needs for agricultural purposes.

Agricultural marketing and trade

Traditionally, India followed an administered price policy to protect both producers and consumers, and to enforce this policy, the government made a number of direct and indirect interventions in input and output markets. This

resulted into creation of a number of institutions (the Commission for Agricultural Costs and Prices (CACP), commodity boards, agricultural marketing boards, Agricultural and Processed Food Products Export Development Authority, etc.), para-statal organizations (the Food Corporation of India (FCI), seed corporations, state trading corporations, marketing cooperatives, etc.). Besides, a number of regulations were enacted to control agricultural marketing, particularly for foodgrains. These include the Prevention of Food Adulteration Act (1954), the Essential Commodity Act (1955), the Future Contracts (Regulation) Act (1952), the regulated market acts (of different states), the Prevention of Blackmarketing and Maintenance of Supplies of Essential Commodities Act (1980), restrictions on interstate movements of foodgrains, regulations on input markets, particularly seed and pesticide (see section on R&D), quantitative restrictions on imports and exports, etc (for details see Acharya 1997; and Gulati and Sharma 1991). These regulations were successful in managing the food security during the periods of shortage (Pal et al. 1993; and Tyagi 1990). But, these are said to have eroded incentives for the participation of private sector (World Bank 1999). Now in the wake of the economic liberalization under the WTO, and complacency on the food security front, a number of regulations like interstate movement of foodgrains, quantitative restriction on exports, and canalization of exports have been removed. Also, there is pressure to reduce the scale of direct interventions in foodgrain markets, and to reduce subsidy on inputs, so as to bring the incentives at par with the international level. The question now is whether agricultural market institutions would be efficient in providing right information and incentives to producers, and especially allow small producers to participate in trade-led growth opportunities.

Given the rapidly expanding volume of marketed surplus in Indian agriculture, it would be unrealistic to assume that the para-statal agencies can handle majority of the produce. Therefore, the private sector should be encouraged to take increasing responsibility of grain marketing, and the public sector agencies should take a facilitating and welfare (food security) role. This may even involve transfer or sharing of facilities created by the public sector, or private execution of the public functions (e.g. storage and transportation). Professional bodies like CACP may assume additional role to guide on the privatization of agricultural marketing and trade, and strategy to meet challenges of international competitiveness. Secondly, there is a need for improving efficiency and effectiveness of the para-statal agencies, particularly FCI, state trading

corporations, seed corporations, etc., by making them decentralized and accountable. Inefficient organizations should either be closed or privatized. However, direct interventions like procurement or some other form of protection should be extended to the farmers in the new growth areas with high risk.

Regulated markets and cooperative marketing have by and large failed to meet the expectations (Chapter 18). Only cooperative marketing with value-addition activities has been successful in those cases where management is purely professional, such as AMUL (Chapter 20). Agricultural foodgrain markets in India are considered to be efficient and integrated, but much can be done to improve their functioning. Deliberate attempts are required to improve marketing efficiency of perishable commodities (like fruits and vegetables) and livestock markets. This requires reconsideration of market regulations and phasing out of outdated controls (Acharya and Chaudhri 2001). The guiding principle is that domestic market reforms are pre-requisite for integrating with the world markets. Also, it is quite likely that trade liberalization may destabilize domestic markets, as international prices are highly unstable in comparison to the domestic prices (Pal et al. 1993). Therefore, in order to avoid this and protect the poor, due care is required in monitoring the international prices and trade.

Agro-processing with value addition is another area which needs immediate attention. In this sector, there would be a shift from small-scale, employment-intensive industry to large-scale, capital-intensive industry for improving efficiency and product quality. Several models of organization of agro-processing linking production with processing are in operation in the country; these include government, cooperative, corporate with contract farming, etc. It is found that farmers' participation is low in the government and cooperative models. The cooperative models are in fact government-administered organizations. The success of the model depends on the availability of capital for investment, strength of backward and forward linkages, professional management and availability of processing technology (Chapter 20). Contract farming is successful only when there are adequate incentives for both industry and farmers, which are also influenced by technological support for yield enhancement and better product quality. Contract covering a very long period, as in the case of horticultural products, is bound to fail unless supported with strong legal framework. This is mainly because of loss of contact between the farmers and industry and new opportunities emerging for either party, which were not anticipated earlier (Chapter 21). Therefore, there is a need for developing appropriate legal

framework for contract farming. In addition, efforts are required to study organizational models of agro-processing industry, their contracting arrangements and behavior of individuals (farmers). Appropriate technological support, both at the production and processing level, could further help develop this sector. Lastly, efforts are needed to cater to the needs of small farmers for their integration into this high growth sector.

Conclusions

The foregoing discussion brings out that if technological change of varied nature have to accelerate the pace of agricultural development in India, new efficient institutions would be required. Since the development approach, incentives and nature of technologies are changing rapidly, institutional change is bound to occur in all sectors of Indian agriculture, which will be further hastened by the new trade regime. It is likely that the formal institutions to facilitate functioning of markets, enforce contractual arrangements, and protect property rights and other incentives would be more stronger and dominant in future. However, traditional institutions involving people's participation, particularly small holders, to manage natural resources and to provide livelihood security to the rural poor should also be strengthened. Resource scarcity would also induce institutional change, which should be encouraged by providing appropriate policy environment. The state would continue to play a facilitating and welfare role, but with much greater efficiency, transparency and accountability. With regard to technology, intensification of R&D efforts, efficiency of public R&D organizations, management of intellectual property, incentives, and dissemination of information about technology would be critical. Given the public good nature of knowledge and even some technologies, preponderance of small holders, dominance of marginal production environments, and centrality of equity and environmental concerns, there would always be need for government interventions in agricultural R&D, both in terms of investment and provision of R&D services.

The discussion has provided some insights into the direction of institutional change for knowledge-intensive agriculture. However, there are still some gray areas requiring our attention. For instance, much could be achieved by improving performance of the public sector organizations. This is particularly important for

those areas (e.g. R&D, surface irrigation) where the public sector would continue to play a dominant role. Information on improving their efficiency and accountability through decentralization and other measures will be extremely useful. Another related aspect is the forging linkages (horizontal and vertical) among various institutions, particularly between macro and micro institutions, formal and informal institutions, and public and private organizations. The issue is how effective linkages among the institutions can be forged and sustained over time. A better understanding of this issue would help reduce transaction cost in economic systems and generate synergies through effective utilization of resources. More importantly, this will help understand policy and other interventions required to protect and empower small holders and poor consumers during the process of globalization. Finally, concerns are raised about enforcement of laws, regulations and conflict resolution mechanisms in India. How this weakness could be addressed? The problem could be with the formulation of laws (provisions contained therein) or with the design of the implementation agency. Important regulations governing the agricultural sector could be studied for making them effective. We must also look at the possibility and conditions for private enforcement (outside court of law) of contracts and resolution of conflicts.

Besides this overview part containing the synthesis and literature survey, the book is organized into four parts. Part 2 deals with the lessons to be learnt from the institutions for management of natural resources. Part 3 discusses the institutions for agricultural research and extension. Agrarian and credit institutions are covered in Part 4. Finally, Part 5 presents the institutions of agricultural marketing and trade.

References

Acharya, S. S. 1997. Agricultural price policy and development: some facts and emerging issues. *Indian Journal of Agricultural Economics* 52(1): 1-47.

Acharya, S. S. and D. P. Chaudhri. 2001. *Indian agricultural policy at the crossroads*. Jaipur & New Delhi: Rawat Publications.

Aron, J. 2000. Growth and institutions : a review of the evidence. *The World Bank Research Observer* 15(1): 99-135.

Bardhan, P. (ed.). 1989. *The economic theory of agrarian institutions.* Oxford: Oxford University Press.

Chopra, K., G. K. Kadekodi and M. N. Murthy. 1990. *Participatory development: people and common property resources*. Delhi: Sage Publication.

Chopra, V. L. 2000. Biotechnology and its impact on Asian agriculture production structure, Keynote address delivered at 3rd conference of Asian Society of Agricultural Economics held at IDS, Jaipur, Oct. 18-20,2000.

Coase, R. 1937. The nature of the firm. *Economica* 4: 386-405.

Coase, R. 1960. The problem of social cost. *Journal of Law and Economics* 3: 1-33

Commons, J. R. 1934. *Institutional economics*. New York: Macmillan.

Dahlman, C. 1979. The problem of externality. *Journal of Law and Economics* 2: 141-162.

David, P. 1997. Rethinking technology transfers: incentives, institutions and knowledge-base industrial development. In *Chinese technology transfer in the 1990s: current experience, historical problems and international perspectives*, C. Feinstein and C. Howe (eds.). Cheltenham: Edward Elgar.

Gandhi, V. P. 1998. Institutional framework for agricultural development. *Indian Journal of Agricultural Development* 53(3): 552-564.

GoI (Government of India). 1998. Report of the committee on banking sector reforms. New Delhi: Ministry of Finance.

Gulati, A. and P. K. Sharma. 1991. Government interventions in agricultural markets: nature, impact and implications. *Journal of Indian School of Political Economy* 3(2): 205-237.

Haque, T. 2001. *Impact of tenancy reforms on productivity improvement and socio-economic status of poor tenants*. Policy Paper 13. Delhi: National Centre for Agricultural Economics and Policy Research.

Hyami, Y. and V. W. Ruttan. 1985. *Agricultural development: an international perspective*. Baltimore: John Hopkins University Press.

Jodha, N. S. 1992. *Rural common property resources: the missing dimension of development strategies*. Discussion paper No. 169. Washington, D.C.: The World Bank.

Kollavalli, S. L. and J. Kerr. 2002. Mainstreaming participatory development. *Economic and Political Weekly* 37(3): 225-242.

Kerr, J. M., D. K. Marothia, K. Singh, C. Ramasamy and W. R. Bentley (eds.). 1997. *Natural resource economics- theory and application in India*. Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.

Marothia, D. K. 2002. *Institutionalizing common pool resources.* Delhi: Concept Publication.

Mathur, K. B. L. 2002. Public sector banks in India: should they be privatized? *Economic and Political Weekly* 37(23): 2245-2256.

Morris, M. L. 1998. *Maize seed industries in developing countries.* Colorado: Lynne Rienner Publishers.

Mruthyunjaya and P. Ranjitha. 1998. The Indian agricultural research system: structure, current policy issues, and future orientation. *World Development* 26(6): 1089-1101.

North, D. C. 1990. *Institutions, institutional change and economic performance*. Cambridge: Cambridge University Press.

Olson, M. 1965. *The logic of collective action.* Cambridge: Cambridge University Press.

Ostrom, E. 1990. *Governing the commons.* Cambridge: Cambridge University Press.

Pal, S. and A. Singh. 1998. Strengthening the Indian agricultural research and extension systems: funding and institutional imperatives. *Indian Journal of Agricultural Economics* 53(3): 488-503.

Pal, S. and D. Byerlee. 2002. The funding and organization of agricultural research in India: evolution and emerging policy issues. In *Agricultural R&D policy in developing countries*, J. M. Alston, P. G. Pardey and R. R. Piggott (eds.). John Hopkins Press (forthcoming).

Pal, S., D. K. Bahl and Mruthyunjaya. 1993. Government interventions in foodgrain markets: the case of India. *Food Policy* 18(5): 414-427.

Pal, S., R. P. Singh and M. L. Morris. 1998. Case Study-India. *In Maize seed industries in developing countries,* M. L. Morris (ed.), Colorado: Lynne Rienner Publishers, pp. 251-267.

Pal, S. and R. Tripp. 2002. India's seed industry reforms: prospects and issues. *Indian Journal of Agricultural Economics* 57(3): 443-458.

Pal, S., R. Tripp and A. Janaiah. 2000. *Public-private interface and information flow in the rice seed system in Andhra Pradesh (India).* Policy Paper 12. Delhi: National Centre for Agricultural Economics and Policy Research.

Picciotto, R. 1995. *Putting institutional economics to work: from participation to governance.* Discussion Paper No. 304. Washington, D.C.: The World Bank.

Reddy, Y. V. 1999. Financial sector reform: review and prospects. *RBI Bulletin* January 1999.

Saleth, R. M. 2000. *Institutional issues in Indian agriculture.* Delhi: Institute of Economic Growth/Institute for Social and Economic Change (mimeo).

Singh, K. 1994. *Managing common pool resources: principles and case studies.* Delhi: Oxford University Press.

Singh, K. and V. Ballabh. 1996. *Cooperative management of natural resources.* Delhi: Sage Publications.

Tripp, R. (ed.). 1997. *New seed and old laws: regulatory reforms and the diversification of national seed system.* London: Intermediate Technology Publications.

Tripp, R. 2001. *Seed provision and agricultural development*. London: Overseas Development Institute.

Tripp, R. and S. Pal. 2001. The private delivery of public crop varieties: rice in Andhra Pradesh. *World Development* 29(1): 103-117.

Tyagi, D.S. 1990. *Managing India's food economy*. New Delhi: Sage Publications.

Vaidyanathan, A. 1996. Agricultural development: imperatives of institutional reform. *Economic and Political Weekly* 31(35-37): 2452-2458.

Vyas, V. S. 2001. Agriculture: second round of economic reforms. *Economic and Political Weekly* 36(10): 829-836.

Williamson, O. E. 1975. *Markets and hierarchies: analysis and antitrust implications*. New York: Free Press.

Williamson, O. E. 1985. *The economic institutions of capitalism*. New York: Free Press.

Williamson, O. E. 2000. The new institutional economics: taking stock, looking ahead. *Journal of Economic Literature* 38:595-613.

World Bank. 1999. *India's foodgrain marketing policies: reforming to meet food security needs.* Report No. 18329-IN. Delhi.

3

Institutional Economics : A Review of Theories and Practices in Agricultural Development

P. A. Lakshmi Prasanna[1]

Introduction

In the recent years, there has been a rise in interest in the study of the institutions in economics. This is because of the inadequacy of the neoclassical theory in dealing with a set of issues like uneven performance of economies in space and time, persistence of inefficient institutions, role of ideology in choice determination of individuals, and rationale and effect of the rule observing behavior, etc (North 1997). These inadequacies were attributed to both conceptual and methodological frameworks used in the neoclassical theory. Further, the neoclassical economics does not deal with the incentives and behavior of political actors, or the influence of political process on target for growth, stability, pollution abatement regulation in agriculture or the division of public investment among sectors and enterprizes (Eggertsson 1997). The neoclassical economics completely ignores "power" dimension in policy-making (Schmid 1978). The framework is also being criticized for its isolated nature in that it does not encompass the reality and efficacy of transaction costs (Williamson 1990). This is due to greater focus on a few key variables like price, quantity, etc. Further, the framework offered no scope to

[1] The author is highly indebted to Dr Dayanatha Jha, former Director, NCAP, for stimulating her interest in this area and providing necessary guidance to start and proceed. She is equally indebted to Dr Mruthyunjaya, Director, NCAP, for giving his valuable time, patiently for going through several drafts of this paper and providing useful suggestions. She is also thankful to Dr Suresh Pal for his guidance in revising the paper. However, the usual disclaimer applies and the author is alone responsible for oversights, if any.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

integrate politics into economics to capture the real time phenomenon of economic outcome as influenced by political institutions. Institutions are taken for granted for observing the social rules, conventions and other elements of the structural framework of social interaction in the mainstream economics. They are often pushed so much into the background that many of their central propositions are sometimes stated with false notion of institutional neutrality (Bardhan 1989). These inadequacies led economists to look for an alternative framework for analyzing economic phenomena with explicitly studying interaction of institutions with these phenomena.

A study of literature indicates that markets are not ideal mechanisms for coordinating transactions among actors when either the quality of product is uncertain, increasing returns to scale prevail, and future contingencies are uncertain, or there is multitude of repetitive transactions within a truly decentralized monetary economy. Evidences also indicate that the markets do not always lead to the best economic performance in the industries with complex and rapidly changing technologies (Hollingsworth and Boyer 1997). On the other hand, as disillusionment with the capacity of the state to control the "commanding heights" of development economies sets in, the role of private and voluntary sectors increases (Picciotto 1995). Thus, accumulating literature, both against, and for on various coordinating agencies like markets, state and voluntary agencies in economic growth of nations led to increasing interest in institutions and reasons behind varied performance of these institutions under different contexts. If there is a clear evidence that weak political and economic institutions significantly hamper economic growth, policy makers might take measures that may strengthen institutions in particular ways or encourage more appropriate political structures (Arnon 1996).

Types of Institutionalism

Institutional economics in the minimal sense is economics with institutions in the role of either explaining entities or explained entities or both. Consequently, different versions of institutionalism result from different specifications of how institutions are conceptualized and explained, which aspects of institutions are explained, how institutions are invoked in explaining something else, and what this something else consists of, etc. (Maki 1993).

Old institutional economics vs neoclassical economics

The old institutionalists believe that institutions are more "as settled habits of thought common to the generality of man" and less instrumental (Veblen 1919). This concept rejects much of the neoclassical tradition with its emphasis on rational maximizing atomistic agents (Stein 1994) and thus, this version of institutionalism of Veblen and others emerged largely out of critique of orthodox assumptions (Hodgson 1989). In the neoclassical economics, institutions are treated as exogenous fixed entities and no attempt is made to explain their evolution. In old institutional economics, the role of institutions and their evolution over time under particular circumstances is the central part (Grabowski 1988). The old institutionalist approaches are classified into three categories (Gruchy 1990):

- Miscellaneous or topical approach which draws attention to economic problems that are ignored by orthodox economics but lacks theoretical cohesiveness.
- Thematic approach which focuses on various well-established basic themes but still lacks an overall framework of interpretation into which the basic themes can be fitted in a general unity, and
- The paradigmatic approach which seeks an overall analytical framework of analysis.

Gruchy (1982) admits that old institutionalists have become engrossed in the analysis of limited issues rather than in an exposition of the theoretical foundations of their economics. The general view is that the old institutional economics lacks a theoretical framework (North 1997; and Maki 1993).

New institutional economics vs neoclassical economics

Although the new institutionalists are concerned with issues not often considered central to the mainstream of economics, they still begin with an appreciation of the neoclassical theory as a powerful tool for predicting many, but not all, economic outcomes in the real world. The new institutional economics does not fundamentally challenge the percepts of the neoclassical economics, but criticizes it for failing to explain the nature of institutions and the role they play in supporting the existence and operation of markets (Stein 1994). The new

institutional economics has grown not through re-emergence of traditional institutionalism, but mainly through developments in the heart of modern orthodox theory itself (Hodgson 1989). The new institutional economists have begun to broaden the scope of economic inquiry without overturning established methodologies.

North did not discard the neoclassical theory, but modified it. He retained the fundamental assumption of scarcity and hence competition, and the analytical tools of micro-economic theory. He modified the rationality assumption and added the dimension of time (Fogel 1997). The new institutional economics draws upon mainline micro-theory, economic history, economics of property rights, comparative systems, labor economics and industrial organization, and all these are complementary to each other, rather than a substitute for conventional analysis (Williamson 1975).

Old institutional economics vs new institutional economics

The role of institutions and their evolution over time under particular circumstances is a central part of traditional institutional economics (Grabowski 1988) and hence is context-specific. The old institutional economics is non-theoretical, while the new institutionalism is theoretical, i.e. neoclassically non-adhoc. Representatives of the new institutional economics are committed methodological individualists, while the members of the old institutional economics subscribe to holism, often of a functionalist kind (Maki 1993). In the new institutional economics, there is a greater willingness to explore the boundaries of existing models and to focus on relaxing different sets of assumptions. Hence, it attempts to move towards "realism" and "realistic" philosophy without violating the paradigm of having "a unified theoretical framework", independent of particulars of space and time. It can be used as a tool for designing institutions (Toye 1993).

Institutional Economics

Subject matter of institutional economics

Broadly, the subject matter of institutional economics falls under two heads, viz. genesis or the persistence of existing institutions, institutional change and impact

Table 1. Basic differences between mainstream economics and institutional economics

Item	Mainstream economics	Institutional economics
Approach	Materialistic	Idealistic
Unit of observation	Commodities and prices	Transaction
Objective of individual	Self-interest	Self and others
Relation to other social sciences	Narrowly economic	Considers all
Concept of value	Value in exchange	Value in use
Concept of economics	Akin to physical sciences	A cultural approach
Social deportment	Belief in free will	Behaviorist
Postulate	Equilibrium	Disequilibrium
Focus	Particularism	Holism
Scientific method	Allegedly positive	Mostly normative
Data	Mostly quantitative	Mostly qualitative
System	Closed	Open
Econometrics	Well-adapted	Ill-adapted
View of economics	Essentially static	Essentially dynamic
Role	Usually offer choice	Often prescribe
Attitude towards collective action	Against it	Considered unavoidable
Patron scientists	Smith, Marshall	Veblen, Commons

Source: Paalberg (1993)

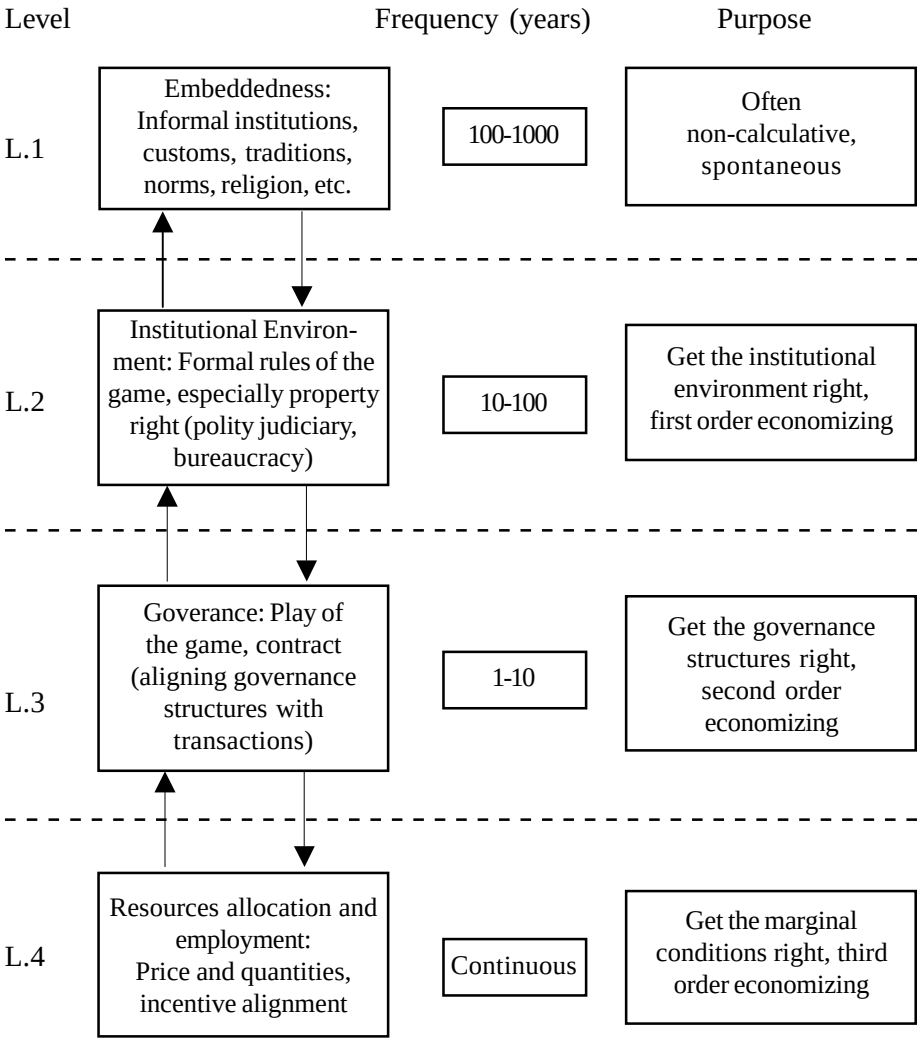
of institutions (i.e. accounting for different outcomes as behavioral consequences of different institutional regimes). The new institutionalists generally focus on the following four areas of research: (i) Transaction costs and property rights, (ii) political economy and public choice, (iii) quantitative economic history, and

(iv) cognition, ideology and the role of path dependence. The new institutionalism cuts across many disciplines such as political science, law, business, anthropology, sociology and economic history. It professes that institutions provide mechanisms to enable individuals to escape the tension between individual and social rationality created by the perverse incentives that lead to the failure of markets. It builds on and modifies the neoclassical economics in order to resolve the problems of market failures through allocative mechanisms, such as property arrangements, private contracts, community arrangements and collective provision (Roy 1995). There are four broad kinds of institutions, viz. contracts, property rights, conventions and authority (Mathews 1986). The last three constitute "prevailing institutions". Contracts respond to market conditions either assisted by prevailing institutions where these are supportive, or hindered where they are incomplete and/or hostile to the transaction concerned (Hubbard 1997). This leads to two central propositions of the new institutional economics: (i) The nature of business contract is determined by the uncertainties and assurances arising out of the transactions involved and from the prevailing institutions, and (ii) prevailing institutions are altered by social action responding to changes in relative prices. In other words, the institutional economics emerges from the theories of firm (transaction cost), market (imperfect information), politics (institutions used to favor interest groups) and history (institutional change) (Hubbard 1997). Divergent literature on institutions in economics highlights three conceptual issues, viz. social choice, economics of institutions, and information problem (Eggertsson 1997).

Levels of analysis in institutional economics

According to Williamson (2000), there are four levels in the analysis of institutions, which are distinguished based on the origin of institutions, rapidity (frequency) of change in institutions, causal force behind change, and how institutions are treated (exogenous or endogenous) in economics. These levels and inter-linkages are depicted in Figure 1 wherein downward arrows indicate constraints posed by higher level on lower level institutions, and upward arrows indicate feedback from lower level to upper level institutions, thereby clearly bringing about the fact of embedded nature of institutions. Some salient features of this embedded system are:

Figure 1. Economics of institutions



L.1: Social theory
L.2: Economics of property rights/positive political theory
L.3: Transaction cost economics
L.4: Neoclassical economics/agency theory
Note: Downward arrows indicate feedback from upper level to lower level, and upward arrows indicate feedback from lower level to upper level.
Source: Williamson (2000)

Level 1. Mostly institutions are treated as "given" and expected to change very slowly and many of the institutions are of spontaneous origin.

Level 2. The structures observed here are partly the products of evolutionary processes but design opportunities are also posed.

Level 3. Any issue that arises or can be reformulated as a contracting issue can be examined to advantage in transaction cost economizing terms. Moving beyond the agency theory tradition of *ex-ante* incentive alignment, transaction cost economics turns its attention additionally and predominantly to the *ex-post* stage of control.

Towards Institutional Economics

Definitions of institutions

- Schultz (1968): Institutions are *behavioral rules*. These rules pertain to social, political and economic behavior.
- Powelson (1972): Institution is a set of relationships between individuals, that are designed to resolve conflicts.
- Bromley (1974): Institutions comprise the working rules wherein conflicting social demands are reconciled.
- Runge (1981): Institutions increase the value of a stream of benefits associated with economic activity by coordinating behavior and reducing uncertainty in the realm of human interaction.
- North (1993): Institutions consist of a set of constraints on behavior in the form of the rules and regulations, a set of procedures to detect deviations from the rules and regulations and finally, a set of moral, ethical behavioral norms which define the contours that constrain the way in which the rules and regulations are specified and enforced.
- Hayami and Ruttan (1985): Institutions channel the behavior of people with respect to each other and their belongings, possessions and property, providing assurance by setting the "rules of the game".
- Eggertsson (1997): Institutions are the enforceable rules that affect the expected payoff of actors. Institutions directly or indirectly assign to actors the control over scarce resources. Institutional change, therefore, involves a new structure of control in the economic and political domains.

Theories of institutions

According to Maki (1993), theorizing institutions is dependent on rejecting the extreme form of the rationality assumption which involves the idea of perfect knowledge on the part of economic actors. A typology of institutional theories based on different concepts of "rationality" and unit of analysis is given by Knudsen (1993).

Table 2. Typology of neo-institutionalist contributions

Perspective/unit of analysis, type of explanation and concept of rationality	Contractual focus 'transaction'	Technological focus 'decision maker'
Equilibrium models and maximization rationality	Principal-agency theory	Neoclassical theory/ game theory
Functionalist explanation and bounded rationality	Property rights theory; Williamson transaction cost theory	Information economics; Institutional game theory
Models of economic change and procedural rationality	North's transaction cost theory	Austrian institutionalism; Path-dependency theory; Evolutionary economics

Source: Knudsen (1993)

(i) Equilibrium models

In formal equilibrium analysis, "individual" is modelled as a perfect rational agent who is able to find the optimal strategy under each situation without any learning process. In these models, at the single decision maker's level, "maximization rationality "is the hardcore and at the system level "equilibrium" concept forms the hardcore. As a result, the program commits itself to an analysis of only those systems that display rather stable and well-coordinated behavior,

while dismissing systems with no or several equilibria as anomalous and uninteresting cases. 'How a state of equilibrium was emerged in the first place from the causal interaction between agents' is, however, not explainable by orthodox programs. By postulating an adjustment mechanism, without a foundation in individual behavior, the orthodox program has been restricted to make rather extreme and unsophisticated assumptions (Knudsen 1993). The principal agency model seeks to address the issue of how a so-called 'incentive compatible contract' can be drawn up, i.e. a contract in which it is in the agent's own interests to act in accordance with the interests of the principal.

(ii) Functionalist theories

In this, institutionalists focus from the start on the systems in which there are either no or several equilibria, or on systems with different kinds of coordination failures, such as market failures, organizational failures, etc .The rationale behind this strategy is that it is for providing solutions to these kinds of problems that institutions, including norms, conventions, standards, etc., have evolved to either supplement the market or replace it. In functional explanation, the functions served by the phenomenon we wish to explain which are meant to explain its existence. However criticisms have been raised against this reversed order of cause and effect.

According to Elster (1983), a social researcher must specify the causal mechanism through which an institution is reproduced and not merely indicate it. More specifically, Elster recommends both a natural selection mechanism and a reinforcement mechanism as two possible examples of feedback loops which can justify the use of functionalist explanations. While this selection mechanism takes place at the population or industry level, the reinforcement mechanism takes place at the level of single decision maker. It appears reasonable to think the use of functionalist's explanation of institutions together with the concept of satisfying or bounded rationality (Knudsen 1993).

(a) Property rights theory. Property rights develop to internalize externalities when the gains of internalization become larger than the cost of internalization. Increased internalization results from the changes in economic values, changes which stem from the development of new technology, opening of new markets, changes to which old property rights are poorly attuned (Demsetz 1967). Although the thesis of the property rights school has been that market failures mostly lead

to a redefinition of property rights. Arrow (1963) went a step further. He maintained that in certain circumstances market failures would also produce institutions as a substitute for and not merely as a support for the market institution. It is under situations marked by 'structural uncertainty' and where it becomes impossible to formulate contingent contracts that the market is replaced with internal organization as a more suitable allocation mechanism. The choice of property rights affect the distribution of transaction costs on different groups (Schmid 1978).

(b) Williamson's transaction cost theory. Transaction costs include the costs of the land, labor, capital and entrepreneurial skills required to transfer property rights from one person to another (North and Wallis 1994). The costs of determining, capturing and retaining the attributes of an asset constitute transaction cost (Barzel 1989). The central idea behind this program is that there are different ways of organizing transactions and these differ in cost. Transactions are assigned to and organized within governance structures in a discriminating way. The key behavioral assumptions of Williamson's program are: bounded rationality and opportunism. The protective belt constituting dimensions of a transaction are, degree of uncertainty, the frequency with which transaction reoccurs and the degree to which asset–specific investments are involved in the transaction. Williamson's main focus is on economic organizations and their contracting relations. According to him, the main purpose of contract is to reduce transaction cost (Poulton et al. 1998). However, the transaction cost school, i.e. implication that firm's governance structure must improve efficiency, is being criticized because firms not only have incentives to reduce transaction costs (which is efficiency enhancing), but they also have incentives to cartelize markets (efficiency-reducing) (Schneiberg and Hollingsworth 1988; and Eden and Hamson 1997).

(iii) Neo-institutionalist theories (explanatory models focusing on social change)

Traditional equilibrium analysis and programs with a functionalist mode of explanation share a common characteristic, i.e. they give priority to the study of stable states at the expense of the processes which are meant to produce these conditions. The researchers who focus on social processes are not satisfied with theories, which do not explicitly account for the conceivable origins of a

state of equilibrium or a relatively enduring social pattern. Those who focus on processes and explanations of social change, therefore, require that the dynamic analysis be integrated into the actual model on a non-*ad hoc* basis. This necessitates the broadening of the behavioral foundations of economic theory, i.e. replacement of concepts of both unbounded and bounded rationality with procedural rationality (Knudsen 1993). Based on this perception, theories of path dependence and evolutionary economics are formulated.

(a) North's transaction cost theory. According to this theory, the costliness of information is the key to the cost of transaction. If transaction costs are too high, trade will not take place and economies will stagnate. The challenge of economic development, therefore, is to reduce the transaction costs of increasingly complex forms of trade. This is achieved through development of institutions that support trade, provide available information, protect property rights and develop effective mechanisms for enforcing agreement.

The above theory besides being used for analyzing economic contracts, is used for explaining behavior of state with regard to its control over its subjects (Nye 1997) and inefficiency of political institutions (North 1981). Nye (1997) concludes that when the choice of production methods (of citizens) increases the potential rent to be extracted, the capacity of the ruler to extract rent is reduced, and the ruler will choose to weigh the trade-offs between control and income in a manner to maximize the expected gains. The higher the transaction cost of monitoring alternate mechanisms of production, the more is the revenue extraction and control tied to specific activities on the part of subjects, and smaller is the potential gains from the peoples use of "optimal" production technology, the more likely is the ruler going to force the people to work and produce in a fashion that is not the first best for them and that does not maximize their surplus, although it allows for easy control. According to North, the inefficiency of existing political institutions develop primarily from three problems, imperfect information, transaction costs of various sorts, and the consequence of additional actors, such as the roles of the state agents in enforcement or non-enforcement of property rights. Thus, he argues that institutions are devised, first and foremost, to serve the needs of those who devise them and that they may or may not facilitate exchange, whereas the main purpose of contracts is to reduce transaction costs (Poulton et al. 1998).

(b) Path dependency theory. This theory insists that it is of decisive importance to explicitly model the process from which an institution emerges. The theory

states that some unimportant events can arise early in such a process and start a 'snowball effect', leading the system towards a particular institutional solution from which it is no longer possible to escape (Knudsen 1993). In other words, the theory says that 'history' matters in the emergence of an institution. Path-dependency is a cumulative process where random events in the opening phase of the process determine the outcome in the long-term. It is therefore with good reason that these processes are termed ' historical' (David 1988). It is also felt that this theory can be useful in explaining (a) the existence of inefficient institutions, and (b) the phenomenon like a social system becomes 'locked into' a technical standard.

(c) Evolutionary theories. Recently, it has been argued that the new institutionalism is an effort to promote a methodological shift in economic research from physics and mechanics to biology and law. Development of evolutionary theories is a step in this direction. The evolutionary research program has to analyze long-term process of change using the analogy of biological genetics. Nelson and Winter (1982) developed an evolutionary theory of 'firm' taking 'firm' as a collection of routines which need to be continuously reproduced. In this way, it differs from neoclassical theory wherein a firm is seen as a production function. It is conceptualized in this theory that routines or 'acquired features' can be inherited and transmitted through imitation, social learning, etc. Just like, 'mutations' in biology, 'innovations' explain changes in behavioral pattern and technical routines. In biology, the concept of 'natural selection' exists, and on the same analogy, 'natural selection' mechanism is conceptualized in economics, but the rapidity with which the selection becomes effective differs. Winter (1964, 1975) has argued that the economic environments change too quickly to eliminate all inefficient firms or firms with inadequate routines. In this way, this theory also explains the simultaneous existence of both efficient and inefficient institutions.

In the context of explaining successful collective action, contrary to zero contribution, thesis of Hardin and the problems anticipated by collective action theory of Olson, Ostrom (2000) explains the need for considering existence of multiple types of players in a society. In addition to the rational egoists, a society also consists of "norm-users, conditional cooperators and willing punishers." Ostrom takes the help of evolutionary theories in modeling the emergence and survival of multiple players in a population. According to this, individuals inherit strategies and those carrying more successful strategies for an

environment, reproduce at a higher rate. He also outlines an indirect evolutionary approach wherein players receive objective payoffs, but make decisions on the transformation of these material rewards into intrinsic preferences.

Institutions: Functions, Changes and Performance

Functions

1. Institutions are conflict resolution mechanisms
2. Institutions are mechanisms to address externality
3. Institutions are a response to missing markets
4. Institutions are a response to overcome demosclerosis (political inertia to change outdated programs due to prevalence of a number of interest groups)
5. Institutions are transaction cost minimizing mechanisms
6. Institutions are a response to uncertainty

Institutional change

According to Eggertsson (1997), institutional change involves a new structure of control in the economic and political domains. The process of growth alters the demand for institutions (for their economic functions). This, in turn, brings about disequilibrium between demand and supply of (economic functions performed by) institutions, and hence, institutional change occurs (Schultz 1968). According to Hollingsworth and Boyer (1997), there are four levels of society at which there may be variation in the dominant forms of economic coordination, viz. the regional level within a country, the level of nation-state, the level of transnational regions, and the global level. The choice of coordination mechanisms (institutions) at these levels is constrained by the social context within which they are embedded. Depending on the nature of that embeddedness, there is variation in the collective forms of governance. According to Evenson and Putnam (1987), intellectual property rights in the USA changed relatively rapidly in response to shifts in economic and technical factors within the national system, but this is not true for the international system. Legislators respond to the changing demand for the institutional changes by balancing the perceived societal benefit

and expected individual benefit to successful investors (Fan 1987), but at the same time, to design laws to balance individual national benefit versus global benefit is a very difficult task. Each type of institution (coordination mechanism) has various positive features, or else it would be strongly opposed by various economic actors. Nevertheless, each mechanism does have particular failures. It is the contest between those who support and those who oppose these coordinating mechanisms that tends to lead to transformations in coordinating mechanisms over time (Campbell et al.1991).

Theory of induced institutional innovation. Changes in market prices and technological opportunities introduce disequilibrium in the existing institutional arrangements by creating new profitable opportunities for the institutional innovations (Hayami and Ruttan 1985; Shaffer 1969; and Gary 1978). Changes in market conditions and technologies bring about changes in relative resource scarcities, which, in turn, induce changes in social systems and institutions (Hayami and Kikuchi 1982). According to North and Thomas (1970), the potential benefits that have historically induced institutional innovations have resulted from economies of scale and reduction in transaction costs. This theory views institutional change as a response or joint-product with technology. Pereira (1974) and Gary (1978) infer that causal relationship between *technological and institutional change can work in both the directions,* and the major institutional changes in agriculture are dictated by socio-political factors and not merely by economic ones.

However, criticism has been raised against this theory. Field (1984) asserts that it is impossible to make all institutions endogenous within a model of individual choice based upon individual maximization. It was argued that when interpersonal relationships assume the characteristics of game of assurance, the theory of induced innovation can be used to explain institutional change. In situations of prisoners' dilemma, the induced innovation theory can not be used (Grabowski 1988).

The theory of induced institutional innovation from a public choice perspective states that specific demands for institutional change arise from a set of constraints which limit the accomplishment of a shared objective. The constraints may include factor endowment, technology and population growth, as well as the existing barriers (Runge and Witzke 1987). The supply of institutions is a response to the demand based on institutional alternatives that redirect and reorganize these activities in response to constraints and opportunities. This process is

endogenous when it arises within the reference group rather than being imposed from outside.

Institutional changes are response to address income distribution. The demand for institutional change is increased if the income stream of a social group gets decreased absolutely or relatively. The theory is emphasizing that when new opportunities of resource use arise and the resultant outcome presents opportunity for alternative distributional pattern of income among stakeholders, institutional change/innovations occur. The demand for institutions is derived from the demand for assured income streams and the efficient coordination of economic activity. The demand for institutional innovation is derived not only from the demand for more efficient allocation of resources but from the perceived fairness and social acceptability with which current institutions can be expected to channel these allocations now and in the future (Runge 1984).

Response to conflict between national and local objectives. Conflict between national objectives and administration of property rights at the local level sets the stage for redefinition of division of power. The market for rights and property are influenced greatly by public policies that have multiple objectives as well as by demand and supply for the resource itself (Castle 1978).

Response to changes in ideology. Institutional change is a response to changes in ideology. Dominant ideologies change over time as intellectual entrepreneurs espouse and face contrasting views of the world and are ultimately able to convince about the merits of their stand (North 1981). Ideological shifts (ex democracy, socialism, etc) redirect government action, which is primarily the outcome of interdependence between civil and economic rights. Changes in private property rights flow from the social changes in concept of justice and changes in value (Tideman 1988; Macpherson 1978; Bromley 1991; and Powelson 1972). Ideological consensus is the characteristic of more developed countries, so conversely, ideological conflict is attributable to less developed countries. Economic and political ideologies are the basis for institutional ideology, and the consensus on all the three ideologies is essential to institutional effectiveness (Powelson 1972). In the long run, an institution need not conform exactly to existing values. Its changing functions and structure over time may whittle them away.

Institutional innovations are response to overcome budget constraints. At the local government level, budget constraints induce innovation in institutions

(Otto and Edleman 1990). In a similar paradigm, the emergence of open access is viewed as a consequence of decision not to invest in management of certain resources (Swanson 1996). North (1990) argues that institutional arrangements tend to be self-perpetuating until trends of change in relative prices (so increased costs of maintaining existing institutions) are such that pressure for reallocation of resources become irresistible.

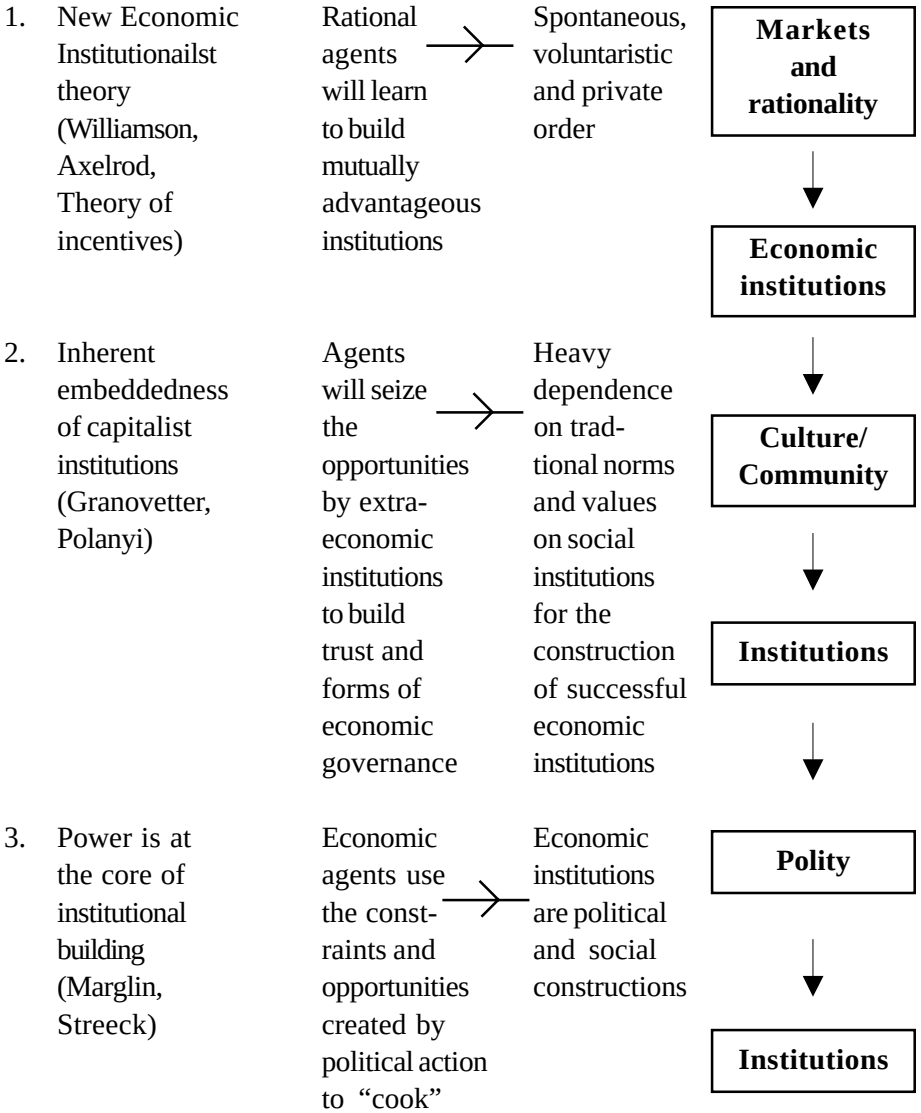
Institutional innovations seek to reduce transaction costs. Institutional innovations in this paradigm are viewed as an attempt to search for institutional alternatives having lower transaction cost just as technological innovations aid in reducing production costs (Kydd et al. 1997; and Matyas 1998).

Demand for one institution is actually a displaced demand for another institutional change. Feder et al. (1991) on land rights in Thailand observed that the demand for and value of secure property rights is an important measure of a displaced demand for credit by producers who can gain access to capital markets when they have collateral land rights. Zimmerman and Carter (1999) by using dynamic simulation analysis of the option value of marketable land rights, reported that collapse of traditional institutions for risk management is a vital part of the demand for marketable rights.

Macro theory of institution building. Economic growth requires increasing social differentiation (Powelson 1972). Division of labor is limited by size of the market and mistrust. In this backdrop, institutions serve as an entity in which contestants acquire confidence. Once mutual confidence is achieved, the original institution may be modified or abandoned if a more efficient form emerges. In the context of economic growth, new conflicts arise due to changes in values. Thus, new institutions emerge which will be in conformity with the new values.

Syncretic approach. Working in the context of capitalistic economies, Boyer and Hollingsworth (1997) proposed a syncretic approach combining three major interpretations with their strengths and weaknesses. The weaknesses of rationality-based institutional change are sunk costs invested in existing institutions, which provide them with a high degree of legitimacy. Even when actors may have good sense of what a superior institutional arrangement may be at any one moment in time, it may be blocked by the habit and inertia of social interaction (Boyer and Orlean1992; and David 1988). In both, the first and second models, the missing component is 'power' and it is the core of institution building in the third model.

Figure 2. Three visions of institutional change



Source: Boyer and Hollingsworth (1997).

Institutional performance

Hollingworth and Boyer (1997) used the term "social system of production" referring to the way that institutions or structures of a country or a region are integrated into a social configuration. They also inferred that different coordinating mechanisms (institutions) were associated with different social systems of production, and that different coordinating mechanisms and different social systems of production resulted in different types of economic performance. Hence, they emphasized the importance of embeddedness of institutions in determining its impact on economic performance. Ensminger (1997) and North and Thomas (1973) also made similar observations, i.e. the fit between formal and informal institutions is the key for success of formal institutions. When formal systems are imposed upon a society with which they are out of accord, self-enforcement may erode and externally engineered incentives may fail to yield the predicted results. These observations also imply that no institutional configuration can simply be borrowed and implemented in any given social setting (Hollingsworth and Boyer 1997). The same implications were drawn by Powelson (1972) in terms of "transplanted institution".

Traditionally, institutions have been conceived as media through which tasks are accomplished, and therefore, institutional efficiency was the performance variable. But in the context of institutions being viewed as recurrent conflict resolving mechanisms, the performance variable is institutional effectiveness. This consists of capacity to identify conflicts, establish and enforce rules of universal applicability and acceptability of institutions to all persons using them. National consensus on economic and political ideology is a *sine qua non* for institutional effectiveness (Powelson 1972). These observations on the whole imply that institutional selection for good performance must be "context based " and "objective specific."

Determinants of feasibility of institutional change/design

According to Libcap (1990), the likelihood of institutional change is related directly to the magnitude of expected gains, and inversely to the number of competing interests, heterogeneity of the groups involved in negotiation, degree of asymmetric information across groups, and initial and the projected inequality in the distribution of wealth. Feeny (1987) has stated that incentive compatibility, enforceability and informational efficiency are important determinants of the

feasibility in institutional design. Institutional innovations which satisfy certain demands at lower marginal cost are generally preferred, because they provide some assurance that the benefits of change will be distributed fairly. The institutional changes that will occur at some future date, can never be exactly foreseen. However, some conjectures can be made by analyzing alternative proposals in the light of the source of demand. These conjectures on future outcome are not value free because both the demand for and supply of new institutions are driven by normative criteria (Runge and Witzke 1987).

When social capital endowment is very high, a society can largely dispense with collective regulation and rely on the emergence of a decentralized equilibrium of cooperative behavior. In order to avoid significant reshuffling of individual status, institutional inertia may occur which may result in resource degradation (Baland and Platteau 1998).

Institutions in Rural and Agricultural Development

Economic institutions are conceptualized as social systems providing decision rules for the use of resources and the distribution of income from such use. However, social, legal, political and economic institutions together determine the actual resource use and distribution of income. Environmental issues, agricultural development and commodity programs range across the various social disciplines and so are institutional inherently (Paalberg 1993). Hence, agricultural development is dependent on institutions in several ways. Emergence of new institutions in agricultural production is attributable to the firms' interest to assure timely delivery and compliance with quality and safety standards for agro-exports together with policy, market and factor distribution context (Escobal et al. 2000). In this section, an attempt is made to review application of institutional theories in selected areas of agricultural development, viz. marketing and trade, technology development and adoption, sustainable resource use, poverty alleviation and growth in rural areas.

Institutions in marketing and trade

As noted in the introduction section, when uncertainty and scale economy prevail together with asset specificity in production, processing and handling,

market is not the ideal coordinating mechanism. The qualities of agricultural commodities, viz. (i) perishability, (ii) quality standards required for raw material or commodity, (iii) seasonal variability of raw material supply, (iv) technical sophistication and equipment specialization in post-harvest activities, and (v) level of fixed costs and scope for economies of scale in post-harvest activities, suggest the relevance of non-market institutions in handling them. Jaffee and Morton (1995) have applied the transaction cost analysis to marketing of certain high-value crops in sub-Saharan Africa. They have hypothesized that the range of feasible institutional arrangements for commodities which pose inherent problems for quality control and vertical coordination and which are associated with economies of scale in production and/or processing, will be limited to vertically integrated systems or contract–based systems. For commodities with less demanding techno-economic characteristics and lower investment requirements, decentralized, small-scale trading and processing operations could well be the institutional norms. This concept has been used in a number of studies on agricultural marketing, e.g. on potato in Egypt (Loader 1996), cashew in southern Tanzania (Poulton 1998), cotton in northern Ghana (Poulton 1998a) and cotton and wheat in Sindh province of Pakistan (Stockbridge et al. 1998). Gow et al. (2000) using a case study on an agri-business in a transition economy, have shown that in the absence or ineffectiveness of public institutions in contract enforcement, use of "internal" private mechanism can have a significant positive effect on output and efficiency of both the partners in the transaction.

Technology and institutions

Transaction costs change relative prices of technology and thus influence technology adoption. North's (1968) recognition of the fact that the same stimulus did not always have the same effect led him to focus on the role of economic institutions in shaping the capacity of economies to exploit the opportunities. His emphasis on extreme sensitivity of the cost of transactions to institutional arrangements, greater role of transaction sector in inducing technological change, and role of ideology in creating a society receptive to technological change needs greater attention in the context of technology development and spread in agriculture. Institutions are devised to prevent transactions from being too costly and thus, to allow the productivity gains of large scale and improved technology to be realized (Bardhan 1989).

The quality of institutions can affect technological progress. David (1997) has discussed how take up of technology is constrained by "social capital". Analyzing technology adoption in industries where network externalities are significant, Katz and Shapiro have (1986) observed that the pattern of adoption depends on whether technologies are sponsored or not. As sponsored technology has a strategic advantage and may be adopted even if it is inferior. The path dependency theory advanced by Arthur (1989) and elaborated in the historical context by North (1981) and David (1985), is concerned with the problems of technological lock in which inferior products become established by virtue of historical serendipidity.

According to Mokyr (2001), it is possible for an economy to be "struck" at low level of income because the institutions are inappropriate for technological progress. Existing institutions are filtering the emergence and diffusion of new technologies. In the long run, some radical technological innovations seem to call for epochal changes in institutions, but the success of those changes may not always be guaranteed (Freeman (1986). Some specific characteristics associated with a particular technology might be the causal force leading to evolution of specific institutions. Markets as mechanisms of coordination do not lead to the best economic performance in industries whose products have technologies that are very complex and change very rapidly (Hollingsworth and Boyer 1997). *All these observations on interaction between technology and institutions emphasize that the relations between technology and institutions are bidirectional and not unidirectional, and this interaction needs due attention in technology development and spread policies*. Evidences confirming this conclusion are available in agricultural sector also. Helmberger (1966) found that cooperatives were in jeopardy given the trends in technological change and the structure of agriculture. Conforming this observation in the context of industrialized agriculture, Fulton (1995) has stated that agricultural production has become less unpredictable (quality-wise) because of technological change (development of varieties). The result is a predicted decline in both family-oriented agricultural production and cooperatives. Based on this observation he has suggested that certain co-operatives are more likely to be formed than others, example being cooperatives in fruits and vegetables, where the input provided by members is subject to unpredictable variability.

Sustainable resource use

In recent years, budget constraints brought into light the limits on the ability of the state to address the negative externalities. Hence, more emphasis is being laid now on collective management of resources. But in history, evidences are there for both success and failure of collective actions. This is due to the fact that communities themselves are dynamic, inducing dynamism in institutions through which they gain access and control over resources. Changed institutional settings offer changed choice sets to members of community and thus determine ultimately the resource utilization pattern. Further, most of the natural resources are subjected to ecological dynamism also. These realities call for attention to institutions in sustainable management of resources by addressing (i) asymmetry in perceptions (of different stakeholders), (ii) transaction costs issue (by means of property rights), (iii) shaping and stabilizing expectations (i.e. reduction in uncertainty) to influence investment in (conservation and improvement of resources) long-term growth, (iv) poverty and low income issues, (v) interregional and intergenerational externalities, (vi) imperfections in other markets, and finally, (vii) catching up with dynamism in ecology and demography. Evolving institutions of watershed management, participatory irrigation management, and joint forest management, etc. are some examples of application of the theories of institutional economics in sustainable resource management. Further interventions in other related institutions like introduction of crop insurance (Junjie 1999) and suggestion for regulating market power (Gopinath and Junjie 1999) are documented in the literature to reduce use of chemicals in agriculture.

Poverty alleviation and growth

The debate on the effects of inequality on economic growth has sharpened in recent years. One of the mechanisms through which inequality affects the growth is that the productive opportunities might vary along the wealth distribution with capital market imperfections (Ferreira 1999). The two prominent capital markets with imperfections encountered in this mechanism are credit and insurance markets. Barro (1999) reports that the negative effect of inequality on growth is significant for poorer countries, but vanishes above a certain per capita income threshold. These observations highlight the need for overcoming these market imperfections not only from equity point of view but also for higher

growth and poverty alleviation. The imperfections in these markets are due to high transaction cost of lending and monitoring in the context of incomplete information and moral hazards. To overcome these imperfections, institutional innovations like micro-finance under group lending is being suggested, as it implies lower transaction cost to lender and better targeting of clientele (Puhazhendhi 2000; Khandker et al. 1995; and Zeller 1998). However, applicability of this concept in agricultural financing (in the context of high risk and seasonality associated with the sector) is being debated and tested. Some evidences of the successful operation are found in properly designed financing programs.

Effective formal property rights are needed for rapid economic development. But as cautioned by North, efficient policies that are perceived to be inequitable can stall or reverse effective reforms due to political considerations. This underlines the need for institutional reforms which are efficiency oriented, socially equitable and political sustainable (Brockmeier 1998). For example, interventions in the form of creation of institutions, like management of common property resources, can check even distress population migration (Chopra and Gulati 1998).

How to choose from institutional alternatives? The nature of goods and services and development objectives help choose from institutional alternatives. In the context of social services, Blank (2000) has provided some guidelines in choosing institutional alternatives (Table 3). For example, under the situation of

Table 3. Models of public-private interaction by types of market failures

Institutional alternatives	Externalities	Distributional concerns	Agency problems	Unobservable output quality
Public sector owns and manages	Yes	Yes	Yes	Yes
Private sector owns and manages with regulation	Yes	Yes	Yes	Yes
Private sector owns and manages with regulation and vouchers	Yes	Yes	Yes	Yes
Public sector owns and private sector manages	Yes	Yes	Yes	Yes

Source: Blank (2000)

externalities, distributional concerns and unobservable output quality, public sector agencies have dominant role. On the other hand, in the absence of agency problems and unobservable output quality, externalities of the private sector can be managed with regulations. In between these two extremes, there is a lot of space for public-private interactions.

Conclusions

The important conclusions that emerge from the foregoing discussion are:

1. Institutions though broadly categorized as formal and informal based on the enforcement mechanism, are really multi-dimensional and embedded.
2. An appropriate institution is context-specific and sensitive to the aimed objectives (i.e. its expected functions).
3. Markets are not the sole institutions to be relied upon under all situations.
4. Complementarity, compatibility or perfect fit between the prevailing and new institutions is an important parameter to be considered in institutional reforms/design.
5. Multi-dimentional nature of goods and services is to be considered while looking for proper institutional design.
6. Technology and institutions are linked by two-way relations, contrary to the traditional belief of institutions as fixed entities.
7. Sustainability in agriculture is determined by the dynamics of evolution of ecology and institutions.
8. Interplay of economic and socio-political institutions determines the economic performance.

References

Arnon, Janine. 1996. The institutional foundations of growth. In *Africa now: people, policies, and institutions*, Stephen Ellis (ed). London: James Currey/Heinemann; Paris: Karhala.

Arrow, K. 1963. Uncertainty and the welfare economics of medical care. *American Economic Review* 53: 941-73.

Arthur, B. 1989. Competing technologies, increasing returns and lock in by historical events. *Economic Journal* 99: 116-31.

Baland, Jean Marie and Platteau Jean–Philippe. 1998. Division of the commons: a partial assessment of the new institutional economics of land rights. *American Journal of Agricultural Economics* 80: 644-650.

Bardhan, P. 1989. *The economic theory of agrarian institutions.* Oxford: Oxford University Press.

Barro, R. 1999. *Inequality, growth and investment*. Working Paper 7038. Cambridge: National Bureau of Economic Research.

Barzel, Y. 1989. *Economic analysis of property rights*. New York: Cambridge University Press.

Blank, Rebecca M. 2000. When can public policy makers rely on private markets? The effective provision of social services. *The Economic Journal* 110: c34-49.

Boyer, Robert and R. J. Hollingsworth. 1997a. The variety of institutional arrangements and their complementarity in modern economies. In *Contemporary capitalism, the embeddedness of institutions*, R. J. Hollingsworh and Robert Boyer (eds). New York: Cambridge University Press.

Boyer, Robert and R. J. Hollingsworth. 1997b. How and why do social systems of production change? In *Contemporary capitalism, the embeddedness of institutions*, R. J. Hollingsworth and Robert Boyer (eds). New York: Cambridge University Press.

Boyer, Robert. 1997. The variety and unequal performance of really existing markets: farewell to Doctor Pangloss? In *Contemporary capitalism, the embeddedness of institutions*, R. J. Hollingsworth and Robert Boyer (eds). New York: Cambridge University Press.

Boyer, Robert and Andre'Orlean. 1992. How do conventions evolve? *Journal of Evolutionary Economics* 2:165-177.

Brockmeier, Thomas. 1998. Legal order and economic (under) development: a contribution to the theory of property rights. *Economics* 58: 7-46.

Bromley, D. 1991. *Environment and economy: property rights and public choice*. Cambridge: Basil Blackwell.

Campbell, John L, R. J. Hollingsworth and Leon Lindberg. 1991. *The governance of the American economy.* New York: Cambridge University Press.

Castle, Emery N. 1978. Property rights and the political economy of resource scarcity. *American Journal of Agricultural Economics* 60: 1-9.

Chopra, Kanchan and S. C. Gulati. 1998. Environmental degradation, property rights and population movements: hypotheses and evidence from Rajasthan (India). *Environment and Development Economics* 3: 33-57

David, Paul. 1988. Path-dependence: putting the past in the future of economics. IMSS technical Report No.533, Stanford University.

David, Paul. 1997. Rethinking technology transfers: incentives, institutions and knowledge-based industrial development. In *Chinese technology transfer in the 1990s: Current experience, historical problems and international perspectives,* Feinstein Charles and Chrisroper Howe (eds). Cheltenham: U.K: Edward Elgar.

Demsetz, H. 1967. Towards a theory of property rights. *American Economic Review* 57(2): 347-359.

Eden, Lorraine and Fen Olser Hamson. 1997. Clubs are trump: the formation of international regimes in the absence of a hegemon. In *Contemporary capitalism , the embeddedness of institutions*, R.J. Hollingsworh and Robert Boyer. New York: Cambridge University Press.

Eggertsson, T. 1997. The old theory of economic policy and the new institutionalism. *World Development* 25 (8):1187-1203.

Elster, J. 1983. *Explaining technical change: a case study in the philosophy of science*. New York: Cambridge University Press.

Ensminger, Jean. 1997. Changing property rights: reconciling formal and informal rights to land in Africa. In *The frontiers of the new institutional economics.* J. N. Drobak and V. C. Nye (eds). New York: Academic Press.

Escobal, Javier, Agreda Victor and Reardon Thomas. 2000. Endogenous institutional innovation and agro-industrialization on the Peruvian coast. *Agricultural Economics* 23: 267-277.

Evenson, R. E. and Jonathan D. Putnam. 1987. Institutional change in intellectual property. *American Journal of Agricultural Economics* 69: 403-409.

Fan, Liang. 1987. Institutional design and innovation discussion. *American Journal of Agricultural Economics* 69: 418-419.

Feder, G. and D. Feeny. 1991. Land tenure and property rights: theory and implications for development policy. *World Bank Economic Review* 5: 135-153.

Feeny, David. 1987. Institutional design and innovation: discussion. *American Journal of Agricultural Economics* 69: 416-417.

Ferreira, Francisco H. G. 1999. Inequality and economic performance: a brief overview to theories of growth and distribution. World Bank website on inequality, poverty, and socio-economic performance. http://www.worldbank.org/ poverty/inequal/index.htm

Field, Alexander J. 1984. Microeconomics, norms, and rationality. *Economic Development and Cultural Change* 32: 683-711.

Fogel, Robert William. 1997. Douglass C. North and economic theory. In *The frontiers of new institutional economics*, J. N. Drobak and V. C. Nye. New York: Academic Press.

Freeman, Christopher. 1986. *Design, innovation and long cycles in economic development.* New York: St.Martin's Press.

Fulton, Murray. 1995. The future of Canadian agricultural cooperatives: a property rights approach. *American Journal of Agricultural Economics* 77: 1144-1152.

Gary, Storey.1978. Institutional economics and political economy revisited: implications for agricultural economics. *American Journal of Agricultural Economics* 60: 749-758.

Gopinath, Munisamy and Junjie Wu. 1999. Environmental externalities and the optimal level of market power. *American Journal of Agricultural Economics* 81: 825-833.

Gow, Hamish R., D. H. Steeter and F. M. Swinnen John. 2000. How private contract enforcement mechanisms can succeed where public institutions fail: the case of Juhocukor. *Agricultural Economics* 23: 253-265.

Graboswski, Richard. 1988. The theory of induced institutional innovation: a critique. *World Development* 16(3): 385-394.

Gruchy, A. G. 1982. The current state of institutional economics. *American Journal of Economics and Sociology* 41: 225-242.

Gruchy, A. G. 1990. Three different approaches to institutional economics: an evaluation, *Journal of Economic Issues* 24: 361-369.

Hayami, Y. and Kikuchi Masao. 1982. *Asian village economy at the cross road: an economic approach to institutional change*. Baltimore: Johns Hopkins University Press.

Hayami, Y. and V. W. Ruttan. 1985. *Agricultural development: an international perspective.* Baltimore: John Hopkins University press.

Helmberger, P. 1966. Future roles for agricultural cooperatives. *American Journal of Agricultural Economics* 48: 1427-1435.

Hodgson, G. 1989. Institutional economic theory: the old versus the new. *Review of Political Economy* 1: 249-269.

Hollingsworth, J. R and R. Boyer. 1997. Coordination of economic actors and social system of production. In *Contemporary capitalism, the embeddedness of institutions,* J. R. Hollingsworth and Robert Boyer (eds). New York: Cambridge University Press.

Hubbard, Michael. 1997. The new institutional economics in agricultural development: insights and challenges. *Journal of Agricultural Economics* 48(2): 239-249.

Jaffee, S. and J. Morton. 1995. *Marketing Africa's high value foods*. Iowa: Kendal Hunt.

Junjie, W. U. 1999. Crop insurance, acreage decisions and non-point source pollution. *American Journal of Agricultural Economics* 81: 305-320.

Katz, Michael L. and Carl Shapiro. 1986. Technology adoption in the presence of network externalities. *Journal of Political Economy* 94(4): 822-841.

Khandker, S. R., B. Khalily and Z. Khan. 1995. Grameen bank: performance and sustainability. World Bank Discussion paper 306. Washington, D. C.

Knudsen, Christian. 1993. Equilibrium, perfect rationality and the problem of self-reference. In *Rationality, institutions and economic methodology,* Uskali Maki, Bo Gustaffon and Christian Knudsen (eds). London: Routledge.

Knudsen, Christian. 1993. Modelling rationality, institutions and processes in economic theory. In *Rationality, institutions and economic methodology,* Uskali Maki, Bo Gustaffon and Christian Knudsen (eds). London: Routledge.

Kydd, J., R. Pearce and M. Stockbridge. 1997. The economic analysis of commodity systems, extending the policy analysis matrix to account for environmental effects and transaction costs. *Agricultural Systems* 55(2): 323-345.

Libcap, G. 1990. *Contracting for property rights*. New York: Cambridge University Press.

Loader, R. 1996. Transaction costs and vertical relationships in agri-food system. Paper presented at the conference of the Agricultural Economics Society, New Castle.

Macpherson, C. B. 1978. *Property: main stream and critical positions*. University of Toranto Press.

Maki, Uskali. 1993. Economics with institutions: agenda for methodological enquiry. In *Rationality, institutions and economic methodology,* Uskali Maki, Bo Gustaffon and Christian Knudsen (eds). London: Routledge .

Maki, Uskali, Bo Gustaffon and Christian Knudsen (eds). 1993. *Rationality, institutions and economic methodology.* London: Routledge .

Matthews, R. C. O. 1986. The economics of institutions and the sources of growth. *Economic Journal* 96(4): 903-918.

Matyas, Antal. 1998. Critique and expansion of the scope of investigation of traditional economics by the representatives of the new institutional school. *International Journal of Development Planning Literature* 13(2) : 161-176.

Mokyr, Joel. 2001. Innovation and its enemies: the economic and political roots of technological inertia. In *A new institutional approach to economic development,* Satu Kahkonen and Mancur Olson (eds). New Delhi: Vistar Publications.

Nelson, R, and S. Winter. 1982. *An evolutionary theory of economic change.* Cambridge Mass, Harvard University Press.

North, D. C. 1981. *Structure and change in economic history,* New York.

North, D. C. and J. J. Wallis. 1994. Integrating institutional change and technical change in economic history: a transaction cost approach. *Journal of Institutional and Theoretical Economics* 150(4): 609-24.

North, D. C. 1968. Sources of productivity change in ocean shipping, 1600-1850. *Journal of Political Economy* 76: 953-970.

North, D. C. and Robert Paul Thomas. 1970. An economic theory of growth of the western world. *The Economic History Review* 23: 1-17.

North, D. C and R. Thomas 1973. *The rise of the western world: a new economic history.* Cambridge U.K: Cambridge University Press.

North, D. C. 1990. *Institutions, institutional change and economic performance*. Cambridge, U.K. : Cambridge University Press.

North. D. C. 1993. Institutions and economic performance. In *Rationality, institutions and economic methodology,* Uskali Maki, Bo Gustaffon and Christian Knudsen (eds). London: Routledge.

North, D. C. 1997. Prologue in the *frontiers of new institutional economics*. John N. Drobak and V. C. John Nye (eds). New York: Academic Press.

Nye, John V. C. 1997. Thinking about the state: property rights, trade and changing contractual arrangements in a world with coercion. In *The frontiers of new institutional economics,* John N. Drobak and John V. C. Nye (eds). New York: Academic Press.

Ostrom, E. 2000. Collective action and the evolution of social norms. *Journal of Economic Perspectives* 14(3):137-158.

Otto Daniel, M. and Edelman Mark A. 1990. Innovation in structural change of local government. *American Journal of Agricultural Economics* 72(4): 1074-1080.

Paalberg, Don. 1993. The case for institutional economics. *American Journal of Agricultural Economics* 75: 823-827.

Paul, David. 1985. Cloi and the economics of qwerty. *American Economic Review* 75(2): 332-337.

Pereira, Mario. 1974. *Induced technical and institutional change and future of agriculture technology, policies and adjustment*. Oxford: Alden Press.

Picciotto, Robert. 1995. *Putting institutional economics to work, from participation to governance*. World Bank Discussion Paper No. 304. Washington, D.C.

Poulton, C., A. Dorward, J. Kydd, N. Poole and L. Smith. 1998. A new institutional economics perspective on current policy debate. In *Smallholder cash crop production under market liberalization: a new institutional economics perspective*, A. Dorward, J. Kydd. and C. Poulton (eds). Wallingford: CAB International .

Poulton, C. 1998a. Cotton production and marketing in Northern Ghana: the dynamics of competition in a system of interlocking transaction. In *Smallholder cash crop production under market liberalization: a new institutional economics perspective,* A. Dorward, J. Kydd. and C. Poulton (eds). Wallingford: CAB International .

Poulton. C .1998b. The cashew sector in southern Tanzania: overcoming problems of input supply. In *Smallholder cash crop production under market liberalization, a new institutional economics perspective*, A. Dorward, J. Kydd. and C. Poulton eds). Wallingford: CAB International .

Powelson, John. P. 1972. *Institutions of economic growth* : *a theory of conflict management in developing countries.* Princeton University Press.

Puhazhendhi. 2000. *Evaluation study of self-help groups in Tamil Nadu*. Mumbai: National Bank for Agriculture and Rural Development.

Rauch, J. 1994. *Demosclerosis*. New York: Random house.

Robert Boyer and J. Rogers Hollingsworth. 1997. From national embeddedness to spatial and institutional nestedness. In *Contemporary capitalism, the embeddedness of institutions*, J. Rogers Hollingsworth and Robert Boyer (eds). Cambridge: Cambridge University Press.

Roy, Sumit. 1995. New institutional economics, state and development: some conceptual and empirical issues. *Economic and Political Weekly* 30:65-72.

Runge, C. F. and Harald von Witzke. 1987. Institutional change in the common agricultural policy of the European community. *American Journal of Agricultural Economics* 69: 213-222.

Runge, C. F. 1984. Strategic interdependence in models of property rights. *American Journal of Agricultural Economics* 66: 807-813.

Runge, C. F. 1981. Common property externalities: isolation, assurance and resource depletion in a traditional grazing context. *American Journal of Agricultural Economics* 63: 595-606.

Runge, C. F. and D. W. Bromley. 1979. Property rights and the first economic revolution: the origins of agriculture reconsidered. Center for Resource Policy Studies, Working Paper No. 13. Madison: University of Wisconsin.

Schmid, A. A. 1978. *Property, power and public choice: an equity into the law and economics*. New York: Prager special studies.

Schneiberg, Marc and J. Rogers Hollingsworth. 1988. Can transaction cost economics explain trade associations? Paper presented at the Swedish colloquim for advanced study of the social science conference on "The Firm as a Nexus of Treaties", Sweden, June 6-8.

Schultz, T. W. 1968. Institutions and rising economic value of man. *American Journal of Agricultural Economics* 50(5): 1113-1122.

Shaffer, James Duncan. 1969 . On institutional obsolescence and innovation-background for professional dialogue on public policy. *American Journal of Agricultural Economics* 51(2): 245-267.

Stein, Howard. 1994. Theories of institutions and economic reform in Africa. *World Development* 22(12): 1833-1849.

Stockbridge, M., L. Smith and H. R. Lohano. 1998. Cotton and wheat marketing and the provision of pre-harvest services in Sindh Province, Pakisthan. In *Smallholder cash crop production under market liberalization: a new institutional economics perspective,* A. Dorward, J. Kydd. and C. Poulton. Wallingford: CAB International .

Swanson, T. M. 1996. The economics of environmental degradation: an institutional appraoch. In *The economics of environmental degradation: Tragedy for the commons*?, Swanson Timothy M. (ed). Cheltenham: Edward Elgar Publishing Limited.

Tideman, T. N. 1988. The jurisprudence of taking. *Columbia Law Review* 88: 1714-54.

Toye, John. 1993. The new institutional economics and its implications for development theory. Paper presented at the conference on "Public Choice Theories and Third World Experience" held at the London School of Economics.

Veblen, Thorstein. 1919. *The place of science in modern civilization and other essays*. New York: B. W. Huebsh.

Williamson, O. E. 1975. *Markets and hierarchies: analysis and antitrust implications*. New York: Free Press.

Williamson, O. E. 1985. *The economic institutions of capitalism*. New York: Free Press.

Williamson, O. E. 1990. A comparison of alternative approaches to economic organization. *Journal of Institutional and Theoretical Economics* 146(1): 61-71.

Williamson, O. E. 2000. The new institutional economics: taking stock, looking ahead. *Journal of Economic Literature* 38: 595-613.

Winter, S. 1975. Optimization and evolution in the theory of the firm. In *Adaptive economic models,* R. H. Day and T. Groves (eds). New York: Academic Press.

Winter, S. 1964. Economics, natural selection and the theory of the firm. *Yale Economic Essays* 4: 225-72.

Zeller Manfred. 1998. Determinants of repayment performance in credit groups: the role of program design, intragroup risk pooling, and social cohesion. *Economic Development and Cultural Change* 46(3): 599-620.

Zimmerman, F. J. and M. R. Carter. 1999. A dynamic option value for institutional change: marketable property rights in the Sahel. *American Journal of Agricultural Economics* 81:467-478.

4

Institutions for Common Pool Resources*

Dinesh K. Marothia

Introduction

Common pool resources (CPRs) of land, water, forest, fisheries, wildlife and agriculture constitute an important component of community assets in India, and they significantly contribute to livelihood of people, despite their rapid depletion and decline in the physical productivity (Singh 1994; and Arnold and Stewart 1991). All natural resources, including CPRs, are amendable to management under various property regions, viz. state, private and collective community, etc. Even a particular resource may be held under more than one property regimes, or can be managed under distributed/shared management system (Townsend and Polley 1995; Cox 1985; and Marothia 2002). There is nothing inherent in a resource itself to determine the nature and type of the property right, but it is determined by social and institutional arrangements evolved and enforced by the community to protect the resource (Bromley 1992; Jodha 2002; and Marothia 1993 & 2002).

Institutional arrangements play an important role in the management of natural resources, in general and CPRs in particular, under any property right regime. In the context of CPRs, institutions are defined as "collective action in control, liberation and expansion of individual action" (Commons 1931). Thus, institutions express the value system of a society and enforce it in the form of working rules. In other words, institutions are 'working rules' to order relationship among individuals within a society, and structure incentives in human exchange, whether social, economic or political (North 1990; Weimer 1995; Williamson 1994; and Dasgupta and Maler 1994). The property rights or institutions are part of the `cultural capital' by which resource user communities convert the

* This article has been heavily drawn from Marothia (2002).

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

`natural capital' (resources and ecological services) into `human-made capital' or inputs of production. The cultural capital comprising social and institutional capital (Coleman 1988; and Ostrom 1992) indicates how people in any society view the use of natural resources and associated values and ethics, including customs, norms, religion and culturally transmitted knowledge (Folke and Berkes 1995). The principles of working rules are critical to form social relationships, choice of alternative policies, and governance in managing natural resources in general, and CPRs in particular.

A number of scholars from different disciplines have documented the extent, size, usages and contributions of CPRs to the livelihood system of the rural poor. They have also identified the factors responsible for the degradation and depletion of CPRs, and analyzed efficiency of alternative approaches for the governance of CPRs. However, only recently, the focus shifted towards understanding the role of institutions in the management of CPRs under property right regimes or some combinations thereof (e.g. distributed governance) under different agro-ecological and socio-cultural environments. Mainly, the Oakerson (1992) model and its derivative forms are applied for analyzing CPRs in various parts of the world. These studies, by and large, indicate that physical, technological, social and institutional attributes affect the outcome directly or through shaping the collective actions, which, in turn, can ensure efficient, equitable and sustainable use of CPRs (Bromley 1992; Ostrom 1992; Tang 1992; and Marothia 1993).

This article reviews the problems of CPRs management from an institutional perspective. Specifically, the article describes the connections between institutions and collective outcomes in the context of degraded lands, water resources, land-use and irrigation systems, fisheries, biodiversity and community knowledge. The consequences of changing institutions on sustainable use of CPRs are also discussed.

Erosion of Institutions and Decline of Common Pool Resources

During the last two decades, scholars from various fields have documented the factors leading to the decline of CPRs in India in terms of area, physical degradation and ineffective management systems. The important factors responsible for the decline are demographic changes, encroachments, fragmented

land holdings, land holdings in the vicinity of forests, tiny farm size, acquisition of common lands by developmental agencies, increased pressure of outsiders on common lands, and disintegration of social and institutional arrangements evolved and enforced by rural communities to protect and manage CPRs. Economic development with greater reliance on market forces and commercial interests, commoditization of CPRs and unfavorable public policies have also resulted into the decline of CPRs (for case studies, see Marothia 2002).

A number of studies conducted in different parts of the country clearly indicate that erosion or collapse of the 'social capital' leads to decline of CPRs. Once the 'social capital' depletes, CPRs become an open access resources and the process of their depletion begins (Jodha 2002). Local social groups and their customs have played an important role in designing informal institutional arrangements for managing CPRs collectively. Over time, however, these informal binders seem to loose their effectiveness, and as a result, voluntary participation in resource management is declining. Also, due to the introduction of elected village councils (*panchayats*) and derecognization of traditional social arrangements and customs (social capital), the community lost collective stake and control over the CPRs, and the culture of group action got replaced by individualistic tendencies. All these led to disintegration of village community and depletion of social capital (Gupta 1987; Jodha 2002; and Negi 2002). Further, most of the development programs undertaken by the government to restore and conserve CPRs largely focused on financial and technical support without recognition of local perceptions and traditional knowledge systems (Jodha 2002). Understanding of the traditional institutional arrangements may serve as an important step towards rehabilitation of CPRs as well as rebuilding of social capital.

Changing Structure of the Institutions and Their Consequences

Common lands

Apart from performing several useful ecological functions, common property land resources (CPLRs) provide livelihood support to the rural poor. Rapid and significant reduction in the extent of CPLRs, largely due to breaking down of

institutional arrangements, has brought down the ratio of uncultivated to cultivated land. The problems and prospects of restoring the environmental health of the degraded lands have been examined by several researchers. The results have indicated that under the traditional institutional arrangements, use of CPLR was regulated through the measures like grazing tax, livestock lives payable during ceremonies, and penalties for unauthorized use. The tragedy of commons could be avoided in the contemporary societies also through organization of social groups and effective enforcement of social norms.

The efforts being made to regenerate the degraded CPLRs in the country suggest that entire planning mechanism of the forest department may have to be altered by putting the resources under community's control, reducing the role of forest department to provide technical and scientific support, and enforcement of the formal institutions. The productivity of CPLRs has improved in several parts of the country through innovative experiments undertaken by the non-governmental organizations (NGOs), Tree Growers Cooperative Societies (TGCS) and other organizations (Singh 1994). However, with the improvement in the productivity of CPLRs, the members of the development group themselves press for privatization of CPLRs for value-addition activities. It is desirable for sustainable management of CPLRs that the privatization or design of the new institutional arrangements should be built around ethical codes of the traditional institutions. For example, regulated access to the fodder and fuel biomass under the joint management of CPLR in the Aravallies has significantly improved the distribution of benefits, which, in turn, has led to better standard of living. The joint management of CPLRs has successfully created participatory management institutions, facilitating equitable distribution of permanent assets and more activities for women to enhance their socio-economic status. Furthermore, the joint management has also increased enrollments in schools, promoted growth of biodiversity and ensured sustainability of CPLR projects after withdrawal of external support (Marothia 2002).

However, similar results in the joint management of revenue lands and forests could not be achieved due to bio-physical, socio-economic and technological constraints, and failures due to non-functioning of markets, weak institutions and inadequate policy support. In order to mitigate fuel wood, fodder and small timber scarcity and to achieve visible success in implementation of the joint forest/land management, several reforms for enhancing the capacity of the forest department are required. These reforms should respond to local

institutions, restructure rights and privileges over forest, streamline policies and laws pertaining to non-timber forest products (NTFPs) and design appropriate agro-forestry models (Saxena 2002).

The TGCS experience of reintroducing a decentralized system of management of village common lands indicates that people have potential to resolve land related disputes at the local level, and appreciate the value of regenerating and utilizing the common lands in a sustainable manner. However, politically motivated privatization of common lands and village level politics affect this process adversely (Singh and Ballabh 1996). Formulation and effective implementation of a judicious land-use policy, periodic survey for land-capability classification, simple procedures for land lease to grassroot institutions and interdepartmental coordination are important for afforestation of wastelands.

Water resources

This section reviews the role of community institutions in harvesting and use of rainwater, participatory water management in canal and tank command areas, and technological, policy and institutional options to overcome the management problems. Strategies for the replication of the community-based water management models are also discussed.

Rainwater harvesting and community institutions. Rainwater harvesting can meet people's basic water needs as well as improve food and livelihood security. Two comprehensive studies reported in Marothia (2002) indicate that community participation is essential for the transformation process from a state of ecological poverty to a state of sustainable economic growth. In all the three successful cases of Sukhomajiri, Ralegaon Siddhi and Tarun Bharat Sangh, village-level organizations played a crucial role in developing institutional arrangements and enforcing them for equitable distribution and sustainable use of water resources. A multi-layered institutional structure was created in the villages for decision-making and implementing the applied program with participatory democracy rather than representative democracy (Agrawal and Narain 2002). In another study of Shankerpura village in Gujarat state, interventions by Sadguru Water and Development Foundation (SWDF) in designing institutions to evolve rules and norms for sharing resources and reducing conflicts, organizing people, building capacity, and bearing the transaction costs associated with uncertainty of technology, and negotiation with government helped

out restoring livelihood system of the people (Ballabh and Thomas 2002). In both the studies, it was suggested that to understand poverty-environment interface in the management of CPRs, it was imperative to design integrated village ecosystem with high order of democracy in decision making, create appropriate community-based property rights, provide financial grants to village institutions, and induce village institutions to raise fund by organizing their CPRs.

Canal irrigation and institutions. Many success stories of irrigators cooperative societies and water user associations (WUAs) working in the command area of river basins have been documented during the last three decades. Shared resource management has been the key to success of irrigation cooperatives/WUAs. For example, the state Department of Irrigation facilitated the formation of cooperatives and still maintaining the main water courses in the command areas of the rivers of Tapi, Vkaikakrapur, Mala, Thindal and Partiganj distributories of Tamil Nadu and Bihar, and Mahandi carved areas. However, designing and enforcing the internal institutional arrangements by the members of the societies for equitable and efficient water distribution, recovery of irrigation fee and maintenance and repairs are pre-requisites for successful management of canal irrigation system beyond outlets (Mahapatra and Rajput 2002; and Marothia 2002). In some cases, WUAs also promoted group farming to enhance the productivity of tiny farm holdings.

Irrigation tank. For several centuries, tanks have been central to irrigated agriculture in the states of Andhra Pradesh, Karnataka, Tamil Nadu and Chhatisgarh. Tanks are, however, disappearing fast because of decades of siltation, poor organization and management, decline of compulsory labor contribution (*Kudimaramat*) for the maintenance work, inadequate operation and maintenance budget from government, meager revenue from tank-based activities (social forestry, fisheries, duck and goat rearing, grazing leases), poor collection of irrigation fee and growth of wells in tank command area. Most of the tanks in Tamil Nadu and elsewhere have degraded into open access due to weak institutional arrangements, property rights and breakdown of local authority system (Vaidyanathan 1997; and Palanisami and Ramasamy 1997). The government and international donors have devised programs to rehabilitate large tanks. The experience shows that three strategic elements are essential for rehabilitation of irrigation tanks. Firstly, creation of a WUA at the tank level with strong common property interests in the conservation of irrigation tank with clarity of management rights, responsibilities and rewards. Secondly, creation

of new sources of resource generation for sustained investment in maintenance and repair of the tank complex through giving the rights to WUA over plantations in water-spread area and tank bunds. And third, creation of upper tier organization as co-ordinating structure which can lobby with government agencies for resources and favorable policies. In order to produce significant impact, the tank rehabilitation program will need to search for ways to enhance relevance of farmers organizations or WUAs and to discover an appropriate nay, creative-response to the rise of well-irrigation which has emerged as the prime cause of decline of tanks in much of south India (Shah 1993). Similar strategies may be designed to rehabilitate tanks in other parts of the country, and special attention should be paid to numerous small tanks.

Technical and institutional arrangements for groundwater. Groundwater accounts for over half of the total irrigated area in India. The expansion of groundwater irrigation was largely due to improved drilling and lifting technologies, lower per unit cost of water pumping, massive rural electricity program, liberal credit for exploring groundwater and subsidized supply of electricity. The productivity of irrigation in conjunction with chemical fertilizers and high-yielding varieties (HYVs) is much higher for groundwater as compared to canal, mainly due to less wastage of water and flexibility to adjust the timeliness and quantity of water distribution to crops. Until recently, the government policies of supporting and promoting private groundwater development were widely acclaimed time and again. However, there is now a growing concern that the existing policies, if continued, may lead to over-exploitation of groundwater, particularly in the arid, semi-arid and hardrock regions of peninsular India. Further, under the private property regime, water markets have emerged in many parts of the country (Shah 1993). The individual farmers are more concerned with their private gains and costs, while completely ignoring the social cost of over-exploitation of ground water resource (Joshi and Tyagi 1991; Dhawan 1995; and Vaidyanathan 1996). Efficient, equitable and sustainable use of groundwater can be achieved through providing appropriate technological support for regulation of spacing of tubewells, identification of aquifers, size of pumps, and control on the overall rate of exploitation. This should be accompanied by the institutional arrangements like rights over water, land tenure, users' relationship, financial incentives, etc. Ownership of groundwater is tied with the ownership of land, and the landowners have right to extract groundwater beyond any limit until it is available. This traditional dominance of private property regime needs serious rethinking for

judicious use of groundwater. Property rights for groundwater are complicated because of nature and size of aquifers and capability of more than one user to tap the same aquifer. Groundwater is thus neither a true open access resource because the ability to extract groundwater is limited by well ownership, nor common property resource because it lacks an identifiable group of users having co-equal use rights (Ciriacy-Wantrup and Bishop 1975). Research and administrative efforts are required to study various aspects of property regime for groundwater and their adaptability in different agro-climatic regions. The ecological, economic and equity gains of the property right systems could be much higher than the investment needed for institutionalizing the system (Saleth 1994). Legislative measures are also equally important to manage groundwater and minimize environmental and equity problems in the long run. But, these could be more effective if enforced with the support of appropriate local organizations (Moench 1994). In order to develop new technical and institutional arrangements, financial incentives currently provided for power, diesel and credit need to be critically analyzed (Shah 1993; Dhawan 1995; Vaidyanathan 1996). For example, groundwater can be efficiently managed through drip and sprinkler irrigation technologies under common property regime. These technologies are being adopted on a large scale by private landowners. It is important to expand the manufacturing capacities for sprinkler and drip irrigation systems to meet their growing demand, as well as to keep the prices under check, so that the financial incentives could also be availed by small farmers.

Fishery resources

Inland water fishery is managed under different property and management regimes having direct bearing on socio-economic conditions of fishermen. The property rights over river water rest with the state, despite the fact that it flows through more than one states and is managed by different departments. This causes multiple conflicts in exploitation and management of riverine fisheries in terms of resource investment in fish stock and fishing rights. Privatization of riverine fisheries has created social and economic inequalities in many states, and therefore, some kind of a central authority should be constituted for development of fisheries in major rivers of the country flowing through two or more states. Also, the Fish Farmers Development Agency (FFDA) needs structural changes in its approach with respect to preferential allotment of pond

water, and provide credit and technical support to fish cooperatives and fisher groups (see also Marothia 1997). Similarly, new institutional arrangements are required to regulate the efforts and limit the fish harvesting to maximum sustainable level in the estuarine fisheries, which are presently under an open access regime. The same holds true for the fisheries in floodplain wetlands, which are under either cooperative or private management regime. These arrangements should be strengthened through re-examination of the lease policy and revitalization of the cooperatives.

The need for innovative institutional arrangements is felt for shrimp farming, which has spatial and temporal environmental externalities, as well as adverse socio-economic impact within coastal ecosystem. Pumping of brackish water and indiscriminate use of sub-terranean fresh water for hatcheries of shrimp farms cause salinity, making fresh water unfit for irrigation and human consumption. Coastal mangrove forests are also depleting fast due to shrimp farming (Saleth 1997). To internalize the externalities in shrimp farming and promote efficient use of coastal resources, policy for coastal CPRs, market interventions and institutional structures are called for.

Biodiversity

Sacred groves. The institution of sacred groves (SGs) to conserve biodiversity dates back to pre-agrarian hunting stage. The SGs are widely distributed in various parts of India and provide a variety of cultural, social, economic, ecological, health, psychological, religious and political functions to individuals, clan and communities. The SGs encompass a variety of systems ranging from truly private to community owned and managed groves. Unlike many CPRs, SGs do not necessarily provide tangible economic benefits to the community but instead provide a common socio-religious space which the community uses to establish cohesiveness, identity, solidarity and well-being of inhabitants, including crop and animals (Malhotra 2002). However, many groves are threatened because of the weakening of traditional beliefs and cultural and biological integration. We need to understand the process of and the factors responsible for the shift in the traditional values and beliefs. To understand the changes that are taking place in the institution of SGs, we need to develop approaches and models which should help us in analyzing the nature of threats, both internal and external, that are likely to destabilize the institutions of SGs rather than economic models.

Table 1. Examples of institutional innovations for sustainable management of common pool resources in India

Sl. No.	Common pool resources	Institutions for collective actions and governance
1.	Common pool land resources	
(a)	Grazing, p*anchayat*, revenue, waste or porromboke land	Several innovative institutional initiatives have been undertaken by NGOs, cooperatives and user groups to institutionalize degraded CPLRs. Among the most successful ones are: The Gambhira Cooperative Farming Society (Gujarat), AKRSP (Gujarat), National Tree Growers Cooperative Federation (working successfully in several states), Ubeshwar Vikas Mandal (UVM) in Rajasthan, Chakriya Vikas Pranali (CVP) in Bihar, Indian Farm Forestry Development Cooperative (in several arid and semi-arid regions), village councils of Andhra Pradesh, committees of Mukhias (Rajasthan), Fodder Farms (Gujarat), Gram Vikas Mandals (Gujarat), Participatory Watershed Development Program, Collective action in salt-affected and waterlogged soils.
(b)	Protected and reserved degraded forest land	Joint Forest Management (in most of the Indian States), forest protection committees (West Bengal), *Van Panchayat* model of UP hills (now in Uttranchal), Village development committees (Himachal Pradesh), hill resource management societies (Haryana), tribal hamlet committees/Gram Vikas (Orissa), Village Woodlots, Social Security Plantation and Forest Farming for Rural Poor Programs of State Department of Forest (working in several states of India).

Table 1. Contd.

Sl. No.	Common pool resources	Institutions for collective actions and governance
2.	Integrated management of land and water resources	Experiences of Sukhomajri, Ralegaon Siddhi, Tarun Bharat Sangh, NM Sadguru Water and Development Foundation, PRADAN, Rajiv Gandhi Watershed Development Mission and other NGOs working in tribal regions (Rajasthan, Gujarat, Madhya Pradesh, Chhattisgarh, Jharkhand, Maharashtra, Orissa and West Bengal) have been successfully replicated with some adjustments suited to local agro-climatic conditions.
3.	Canal / lift irrigation for surface irrigation	Participatory Irrigation Management (Madhya Pradesh and Chhattisgarh), Irrigation Cooperatives (Mohini Water Cooperative Society, Gujarat Shri Datta Cooperative Water Management Society, and Amrutvahini Life Irrigation Cooperative Society Maharashtra), Water Users Associations (Andhra Pradesh, Tamil Nadu, Kerala, Bihar, Maharashtra), NM Sadguru Water and Development Foundation (life irrigation network in Gujarat, Madhya Pradesh, Rajasthan), on-farm water management research pilot project of ICAR/water and land management institutes. Traditional Kuhls irrigation management system still functioning as effective institution for collective action in some parts of Himachal Pradesh.
4.	Irrigation tanks	PRADAN and other NGOs have been working for tank rehabilitation through collective action in Tamil Nadu, Karnataka, Andhra Pradesh, Madhya Pradesh, Rajasthan, Orissa, West Bengal and Chhattisgarh.
5.	Groundwater	Pani Panchayats (Gram Gaurav Pratishthan, Maharashtra), Tube well Cooperatives and irrigation companies of Kheda and Mahsana of Gujarat.

Table 1. Contd.

Sl. No.	Common pool resources	Institutions for collective actions and governance
6.	Multi-purpose village ponds (domestic use of water for village population livestock, fresh water aquaculture)	A few community institutions have mobilized local participation for de-silting and sustainable management. These village ponds are in a large number in the states of Chhattisgarh, Orissa, Jharkhand, and West Bengal. However intensive efforts are required for collective institutional innovations. Local NGOs can play important role in institutionalizing these water bodies in coordination with *Panchayat* (for example Tagore Society for Rural Development).
7.	Non-timber forest products	NTFPs: Madhya Pradesh Minor Forest Products Cooperative Society Model.
8.	Inland and marine fisheries	The Pong Dam Reservoir Cooperative Management Society in Himachal Pradesh, Captain Bhery Fishermen's Cooperative Society in West Bengal, The Marine Fishermen's Cooperative Societies in Kerala, Marine Fisheries Cooperative Societies Karnataka, and The Marine Fishermen's Cooperative Societies of West Bengal. Traditional institution of fisherfolk groups is still functioning under collective governance in marine and inland fisheries in coastal and non coastal areas of the country.
9.	Coastal CPRs	A few examples of people's movement/collective protest and legislative interventions are available for arresting the degradation of coastal CPRs (i.e. Ministry of Environment and Forest, The Supreme Court of India Intervention to internalized the negative externalities due to shrimp farming on coastal CPRs). In terms of institutional initiative, this is a gray area.

Table 1. Contd.

Sl. No.	Common pool resources	Institutions for collective actions and governance
10.	Traditional ecological common knowledge and biodiversity conservation	Shared management/ participatory conservation of protected areas (experiences of Keoladeo National Park, Bharatpur; Dalma Sanctuary, Bihar; Kailadevi Wildlife Sanctuary, Rajasthan; Rajaji National Park, Uttranchal). Very effective community-based institutions for management of sacred groves are functioning in Rajasthan, Maharashtra, Karnataka, Kerala, Tamil Nadu, West Bengal, Bihar, Jharkand, Madhya Pradesh, Chhattisgarh, Andhra Pradesh, Orissa, Uttranchal, Uttar Pradesh, Meghalaya, Sikkim and other north eastern state. For medicinal and aromatic plants, village- level institutions for traditional medicinal system, and Ayurvedic institutions still effectively working in tribal areas. Traditional/ indigenous knowledge of tribal and local communities are being incorporated currently in the National Biodiversity Strategy and Action Plan at state level. The traditional knowledge is being synthesized with scientific knowledge to recover biological and intellectual commons in several states through NGOs working in tribal dominated areas.

Note: The table is primarily based on the case studies reported in Marothia (2002), Singh (1994), Singh and Ballabh (1996), and Arnold and Stewart (1991).

Medicinal plants. Conservation of medicinal plants has not been accorded due attention by researchers and policy makers while addressing the land-based CPRs. In the context of the new economic policy and the regime of World Trade Organization (WTO), conservation and sustainable use of medicinal flora will be directed and enforced by the interplay of property and patent regimes (Ved 1997). Analysis of the magnitude and dimension of the trade and trade-related benefits and costs is difficult, unless frantic efforts are made to unearth

them. The approach for conservation and sustainable use of medicinal plants should be location-based and context-specific. It must consider the synergistic relations among economic, institutional and technological factors which determine the conservation and propagation strategies of medicinal plants in forest and non-forest CPRs and on cultivated lands.

Protected areas. The protected areas are affected by the continued existence of conventional rights of local people, such as livestock grazing, harvesting of timber, collection of non-timber forest products (NTFPs), etc. Tourists also use the protected areas for recreation and education, while scientists use them for research. Each of these uses creates a set of stakeholders with limited rights over the protected areas. Kothari (2002) suggests that only a partnership among conservationists, communities and social activists, and the empowerment of ecosystem-dependent communities can withstand destruction of wildlife and habitats. Changes are, therefore, needed in the conservation policy, law and administration to allow for a much more participatory system, which is respectful of both the needs of wildlife and the rights of humans. Such changes will have to integrate relevant community knowledge and practices, customary laws and local institutional structures, government agencies, etc. However, such a conservation strategy requires empowerment of local people, trust between authority and local people, and political will to overcome socio-economic and cultural constraints. There are several examples of people and resource communities addressing such hurdles and creating opportunities for shared resource management. For example, the Sikkim Biodiversity and Ecotourism Project has shown that collaboration between public and private sectors, as well as local communities in a participatory design can conserve biodiversity assets of global significance.

Intellectual Property Rights and CPRs

With the provision of patents and intellectual property rights (IPRs) into the domain of biodiversity under the WTO, a potential threat has been posed to the biological and intellectual heritage of our diverse communities by appropriating and privatizing their knowledge. Shiva (2002) argues that a pluralistic IPR regime with strong legal framework should be evolved which makes it possible to recognize and respect indigenous knowledge system and protects the livelihoods

based on it through the prevention of biopiracy. Entitlements, equity, sustainability and justice are built into usufruct rights since ownership is based on concepts of return on labor. Whereas IPRs on plant genetic resources or products derived from them convert the survival resource held in common by the poor into the monopoly of the rich and powerful. Often this appropriation is done under the projects for 'bioprospecting', which, in fact, leads to the enclosure of the biological and intellectual commons. In the context of IPRs, it is necessary to evolve community intellectual property rights (CIRs) related to biodiversity to balance and set limits for IPRs and on the monopolies of transnational companies (TNCs) (Gupta 1999; Gadgil and Utkarsh 1999; and Mishra 1999). Community's control over the common resources is the only real mechanism for ensuring sovereign control over the natural resources. The legal precedence of biodiversity as commons has already been established by the provisions of the *Panchayat* (extension to the Scheduled Areas) Act. This implies that any IPR regime that relates to biodiversity has to have a mechanism of institutionalizing CPRs for respecting indigenous knowledge of people, protecting biodiversity and preventing biopiracy.

The importance of community property rights and reconciling the system of common knowledge of indigenous communities with modern approaches to the management of natural resources are gaining importance. Development of the documents such as the People's Biodiversity Register, that takes advantage of the crucial methodological advances of the modern fast track science to confer dignity on and enhance the utility of the slow track indigenous knowledge could serve as a useful tool in such an endeavor. Full benefits of such an integration would, of course, flow only when supported by the systems of open, public participation in the management of natural resources and a just sharing of benefits flowing from relevant commercial applications (Gupta 1999; and Gadgil and Utkarsh 1999).

Conclusions and Policy Implications

This article has discussed the role and effectiveness of institutions in sustainable management of CPRs. The discussion has also flagged the prospects for redesigning or creating new institutions. It is now conclusively established that the process of CPRs depletion begins with the collapse or erosion of the

social capital or informal institutions. Development program for CPRs largely failed due to lack of understanding of the social capital, which is critical for the management system of CPRs. In addition to the existence of appropriate institutions, which facilitate the effective functioning of the management system, willingness of the community to reform the existing institutions in the changing socio-cultural, economic and political environment, and collective enforcement of new rules by customary authority are also important.

Community mobilizes and NGOs play a catalytic role in designing multi-layered technical and institutional innovations intended to solve or alleviate ecological poverty through community participation in the management of CPRs. The community-based experiences have been adopted by many government organizations, and institutional mechanism developed by the communities and NGOs have been successfully replicated. Change in the mindset of politicians, bureaucrats, resource management agencies and village-level institutions are the common features of successful replication of the community-based institutional innovations. The property right regimes, particularly their structures, enforcement and linkages with social and ecological systems, have a central role in the management of CPRs. Without well-defined property rights system and its effective enforcement, the management systems of CPRs have failed in the past. Further, it is also important that no single type of property rights regime can ensure the rehabilitation and sustainable management of CPRs. Relative merits of a range of institutions in conjunction with alternative property rights regimes and CPR under consideration guide the management system. General consensus is, however, in favor of joint or decentralized system of CPRs management, which requires clear understanding of the distribution of the rights and responsibilities among and within the states, resource industry, private owners and local communities.

References

Agrawal, A. and S. Narain. 2002. Community and household water management: the key to environmental regeneration and poverty alleviation. In *Institutionalizing common pool resources,* D.K. Marothia (ed.). New Delhi: Concept Publishing Company.

Arnold, J. E. M. and W. C. Stewart. 1991. *Common property resource management in India.* Tropical Forestry Paper No. 24, Department of Plant Sciences, Oxford Forestry Institute. Oxford, U.K: University of Oxford.

Ballabh, V. and P. Thomas. 2002. Integrated management of water and land for sustainable development in semi-arid areas. In *Institutionalizing common pool resources*, D.K. Marothia (ed.). New Delhi: Concept Publishing Company.

Bromley, Daniel W. (ed.). 1992. *Making the commons work.* San Francisco: ICS Press.

Ciriacy-Wantrup, S. V. and R. C. Bishop. 1975. Common property as a concept in natural resources policy. *Natural Resources Journal* 15(4): 713-728.

Coleman, James.1988. Social capital in the creation of human capital. *American Journal of Sociology* 94 (Supplement): S95-S120.

Commons, J.R. 1931. Institutional Economics. *American Economic Review* 21: 649-57.

Cox, S. J. B.1985. No tragedy on the commons. *Environmental Ethics* 7: 49-61.

Dasgupta, P. and K. G. Maler. 1994. *Poverty, institutions, and the environmental resource base.* Environmental Paper No.9. Washington, D.C: World Bank.

Dhawan, B. D. 1995. *Groundwater depletion, land degradation and irrigated agriculture in India.* New Delhi: Commonwealth Publishers.

Folke, C. and F. Berkes. 1995. Mechanism that link property rights to ecological system. In *Property rights and the environment - social and ecological issues*, Susan Hanna and Mohan Munasinghe (eds). Washington, D.C: The Beijer International Institute of Ecological Economics and World Bank.

Gadgil, M. and G. Utkarsh 1999. Intellectual property rights and agricultural technology: linking the micro and the macro scale. *Indian Journal of Agricultural Economics* 54(3): 327-341.

Gupta, A. K. 1987. Why poor people do not cooperate? A study of traditional forms of cooperation with implications for modern organizations. In *Politics and practices of social research*. G. C. Wanger (ed.). London: George Allen and Unwin.

Gupta, A. K. 1999. Making Indian agriculture more knowledge intensive and competitive: the case of intellectual property rights. *Indian Journal of Agricultural Economics* 54(3): 342-369.

Jodha, N. S. 2002. Decline of rural commons: role of population growth and public policies. In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Joshi, P. K. and N. K.Tyagi. 1991. Sustainability of existing farming system in Punjab and Haryana – some issues on groundwater use. *Indian Journal of Agricultural Economics* 46(3): 412-421.

Kothari, A. 2002. Nature conservation areas: who will protect them? In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Mahapatra, I. C. and R. K. Rajput. 2002. Improved water management through farmers' participation. In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Malhotra, K. C. 2002. Sacred groves as common property resources: an exploratory study. In *Institutionalizing common pool resources*. D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Marothia, D. K. 1993. Property regimes and institutional arrangements: concepts and their relevance in managing the village commons. *Indian Journal of Agricultural Economics* 48(3): 557-65.

Marothia, D. K. 1997. Institutional arrangements in common fish ponds. In *Natural resource economics: theory and application in India.* J. M. Kerr, D. K. Marothia, K. Singh, C. Ramasamy and W. R. Bentley (eds.), New Delhi: Oxford & IBH Pub. Co.

Marothia, D. K. (ed.) 2002. *Institutionalizing common pool resources.* New Delhi: Concept Publishing Company.

Mishra, J. P. 1999. Rapporteur's report on intellectual property rights and agricultural technology. *Indian Journal of Agricultural Economics* 54(3): 447-458.

Moench, Marcus. 1994. Approaches to groundwater management to control or enable?. *Economic and Political Weekly* 29(39): A135-A146.

Negi, Y. S. 2002. Common property resource management in Himachal Himalayas. In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

North, Douglas C. 1990. *Institutions, institutional change and economic performance.* Cambridge: Cambridge University Press.

Oakerson, R.J. 1992. Analyzing the commons: a framework. In *Making the commons work.* D.W.Bromley (ed.), San Francisco, U.S.A: ICS Press.

Ostrom, E. 1992. *Crafting institutions for self-governing irrigation systems*. San Francisco: ICS Press.

Palanisami, K. and C. Ramasamy. 1997. Conjunctive use of tank and well irrigation. In *Natural resource economics: theory and application in India*. In J. M. Kerr, D. K. Marothia, K. Singh, C. Ramasamy and W. R. Bentley (eds.), New Delhi: Oxford & IBH Pub. Co.

Saleth, R. M. 1994. Towards a new water institution: economics, law and policy, *Economic and Political Weekly* 29(39): A147-A155.

Saleth, R. M. 1997. Sustainable management of mangrove resources in India: strategies and option. In *The challenges of the balance*. Anil Agrawal (ed.). New Delhi: CSE.

Saxena, N. C. 2002. Fuelwood production through wasteland development: some policy issues. In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Shah, Tushaar. 1993. *Groundwater markets and irrigation development: political economy and practical policy.* Mumbai: Oxford University Press.

Shiva, V. 2002. The enclosure and recovery of the biological and intellectual commons. In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Singh, K. 1994. *Managing common pool resources: principles and case studies.* Delhi: Oxford University Press.

Singh, K. 2002. Integrating common pool resources management with rural development programs. In *Institutionalizing common pool resources.* D. K. Marothia (ed.), New Delhi: Concept Publishing Company.

Singh, K. and V. Ballabh. 1996. *Cooperative management of natural resources.* New Delhi: Sage Publications.

Tang, Shui Yan. 1992. *Institutions and collective action: self-governance in irrigation*, San Francisso, U.S.A.: ICS Press.

Townsend, R. E. and S. G. Polley. 1995. Distributed governance in fisheries. In *Property rights and the environment – social and ecological issues*. Susan Hanna and Mohan Munasinghe (eds.), Washington, D.C: The Beijer International Institute of Ecological Economics and the World Bank.

Vaidyanathan, A. 1996. Depletion of groundwater: some issues. *Indian Journal of Agricultural Economics* 51(1&2): 184-192.

Vaidyanathan, A. 1997. Tanks and tanks irrigation. In *The challenges of the balance.* Anil Agrawal (ed.), New Delhi: CSE.

Ved, D.K. 1997. Trade in medicinal plants: the state of our ignorance. *Amruth* 1(10): 2-8.

Weimer, David L. 1995. Institutional design: overview. In *Institutional design.* David L. Weimer.(ed.). Boston: Kluwer Academic Publishers.

Williamson, O.E. 1994. The institutions of governance of economic development and reform. In *Proceedings of annual conference on development economics*. Washington, D.C.: The World Bank.

5

Impact of Watershed Program and Peoples' Participation

P. K. Joshi, Laxmi Tewari, A. K. Jha and R. L. Shiyani

Background

Watershed program is reckoned as the engine of agricultural development in the fragile and marginal rainfed areas. Since the Seventh Five Year Plan, the Government of India has been according high priority to the rainfed areas, after realizing that the impact of green revolution in the irrigated areas was gradually fading away. The serious drought of 1987 further justified investment needs in the rainfed areas. As high as 65 per cent of the total agricultural land in the country is rainfed. Watershed program was viewed as the only program which could face the emerging and complex challenges of rainfed areas — high poverty, huge unemployment and acute degradation of natural resources. Until 1987, several pilot projects on watershed were implemented in different agro-ecoregions of the country. Over different plan periods, the nature and scope of watershed program was modified and these were tuned to encourage more of peoples' participation.

In the past, several useful studies have been conducted to assess the impact of watershed programs, and examine the extent of peoples' participation (for seminal reviews, refer Chopra et al. 1990; Marothia 1997; Deshpande and Thimmaiah 1999; Hanumantha Rao 2000; and Ratna Reddy 2000). The available watershed evaluation studies have provided useful insight on the performance of numerous watersheds but have not attempted to assess the patterns of multiple benefits from watershed programs across regions, sizes and types, and extent of peoples' participation.

This paper attempts to analyze the earlier studies, and provides some logical conclusions on the performance of watershed programs and peoples' participation

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

at aggregate level. It also identifies conditions for larger participation of the stakeholders in the watershed activities. More specifically, the objectives of this study are: (i) To document the benefits of watershed program in different regions of the country, (ii) to assess the role of peoples' participation in the success of the watershed programs, and (iii) to identify conditions for increasing peoples' participation.

Methodology

Approach

The study is based on the meta-analysis. It is the analysis of analyses. The meta-analysis is relatively a new methodology. The purpose is to collate research findings from previous studies, and distil them for broad conclusions. Meta-analysis can be helpful to policymakers, who may be confronted by a number of conflicting findings (Alston et al. 2000). The meta-analysis has earlier been applied to assess the returns on investments in education (Lockheed et al. 1980; and Phillips 1994), and to understand the implications of certain medical treatments on offspring (Mann 1996). Recently, it was diligently applied to measure the returns on research investments at the global level (Alston et al. 2000). In the present study, an attempt has been made to amass the available micro-level studies, which evaluated the watershed programs and assessed peoples' participation. These micro-level studies have been critically reviewed and analyzed for upscaling the conclusions to stipulate the macro-level picture of the watershed benefits and peoples' participation.

Watershed programs were launched with three principal objectives of improving efficiency, equity and sustainability in the rainfed areas. To document these benefits, a few proxy indicators were chosen and analyzed. The benefit-cost ratio and the internal rate of return (IRR) were used as proxy for efficiency gains from watershed programs. Additional employment generation in agriculture as a consequence of watershed activities was assessed for equity benefits. Four important indicators were identified to demonstrate the sustainability benefits. These were: (i) Increased water storage capacity, which augmented the irrigated area, (ii) increased cropping intensity, (iii) reduced run-off, which enhanced groundwater recharge, and (iv) subsided soil loss.

Watershed programs have a unique characteristic of collective action of all the beneficiaries and the stakeholders. Therefore, peoples' participation becomes very critical to determine the performance of any watershed program. In the present study, peoples' participation has been documented as high, medium and low with respect to various activities at different stages of the watershed programs. Intensity of peoples' participation was related with the multiple benefits derived from the watershed programs. This exercise also drew lessons for institutionalization of collective action.

Data

Numerous studies have been conducted to evaluate the performance of watershed programs, covering the entire country. These, therefore, represent a wide range of environment according to their agro-ecological location, size and type of watershed, source of funding, rainfall, regional prosperity/backwardness, etc. Under the present study, an exhaustive bibliography was prepared of the studies which evaluated watershed programs, and thus could scan 311 case studies. Complete bibliography is available with the authors and may be obtained, if desired. These studies were published as either research articles or research reports. There are, however, many more studies, which could not be traced. The meta-analysis calls for a large number of studies; more the studies, higher the reliability of results.

Results and Discussion

Benefits of watershed programs

Watershed programs have been specifically launched in the rainfed areas with the sole objective of improving the livelihood of the poor rural households, who encounter disproportionate uncertainties in agriculture. Their income levels are meagre and their plight is further compounded by acute degradation of soil and water. The Government of India has aggressively intensified watershed program in fragile and high-risk ecosystems, where the farm incomes have markedly descended due to excessive soil erosion and moisture stress. It was viewed that the watershed programs would bring 'second generation green

revolution' in the rainfed areas by providing appropriate technological and financial support.

The watershed programs were located across different agro-ecoregions. These were planned, developed and implemented by various agencies. The available literature repletes that the past investments in watershed programs have yielded the desired results of raising income levels, generating employment opportunities and conserving soil and water resources. A summary of the multiple benefits reported in the numerous studies is illustrated in Table 1. It can be seen that the mean benefit-cost ratio of watershed program was quite modest at 2.14. This revealed that investment in the watershed programs under fragile and uncertain rainfed environments yielded more than double. There were about 15 per cent watersheds having benefit-cost ratio more than 3 (Figure 1). Only less than 3 per cent of the watersheds were reported to have benefit-cost ratio less than 1. The mean internal rate of return on watershed investment was about 22 per cent, with a maximum of 94 per cent. This rate is quite comparable with any of the successful government programs. It was interesting to note that there were 35 per cent watersheds, which yielded more than 30 per cent internal rate of return (Figure 2). There were about 5 per cent watersheds which

Figure 1. Percentage share of watershed studies according to BCR

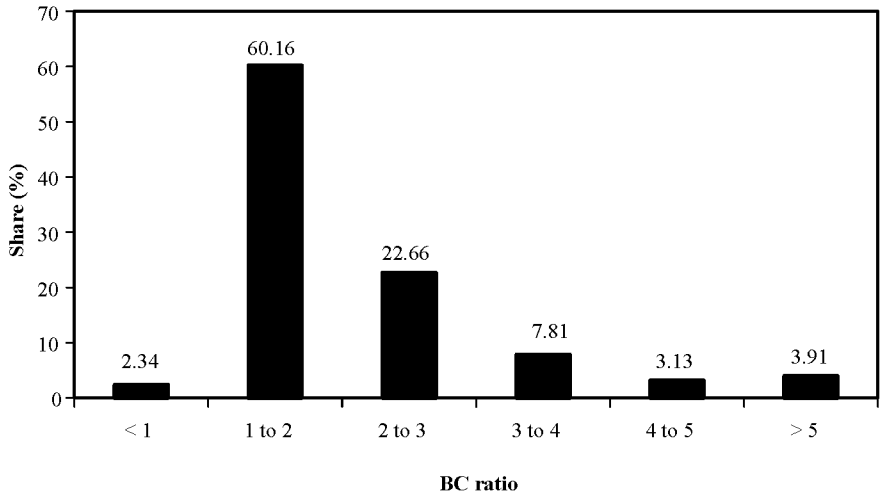


Table 1. Summary of benefits from the sample watershed studies

Indicator	Particulars	Unit	No. of studies	Mean	Mode	Median	Minimum	Maximum	t-value
Efficiency	B/C ratio	Ratio	128	2.14	1.70	1.81	0.82	7.06	21.25
	IRR	Per cent	40	22.04	19.00	16.90	1.68	94.00	6.54
Equity	Employment	Man-days/ha/yr	39	181.50	75.00	127.00	11.00	900.00	6.74
Sustainability	Irrigated area	Per cent	97	33.56	52.00	26.00	1.37	156.03	11.77
	Cropping intensity	Per cent	115	63.51	80.00	41.00	10.00	200.00	12.65
	Rate of runoff	Per cent	36	-13.00	-33.00	-11.00	-1.30	-50.00	6.78
	Soil loss	Tonnes/ha/yr	51	-0.82	-0.91	-0.88	-0.11	-0.99	39.29

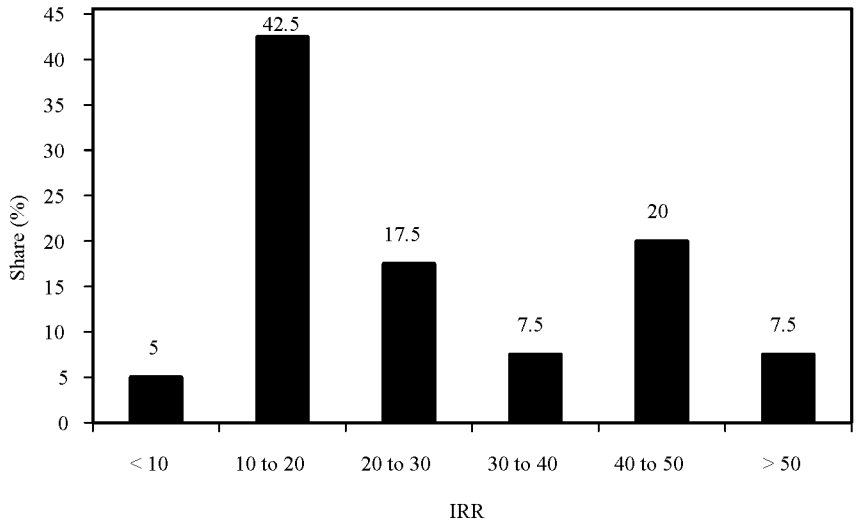
Source: Derived from various studies

performed very poor; the internal rate of return being less than 10 per cent. These evidences suggested that the watershed programs performed reasonably well in the fragile and uncertain environments. The investment was logically justified, as it significantly raised the income levels of the beneficiaries in the target domains.

Another important purpose of the watershed programs was to generate employment opportunities and through that alleviate rural poverty and reduce disparities among rural households. The mean additional annual employment generation in the watershed areas on various activities and operations was about 181 man-days per hectare. It was as high as 900 man-days per ha in the watersheds with multiple activities. Generating employment opportunities for the rural poor means raising their purchasing power, and in turn, alleviating rural poverty. Based on these observations, the watershed investment may be characterized as a poverty alleviation program in the fragile areas.

Rainfed areas are confronted with acute problem of land degradation through soil erosion, and high risk in agriculture. Technological interventions through soil and water conservation can largely overcome these eventualities. The watershed programs are mainly aimed to conserve soil and water to raise farm productivity.

Figure 2. Percentage share of watershed studies according to IRR



The available evidences revealed that both these objectives were accomplished in the watershed areas. Soil loss of about 0.82 tonnes per ha per year was saved due to interventions in the watershed framework. Conserving soil means raising farm productivity and transferring good soils to the next generation. On water conservation, it was noted that on an average about 38 ha m additional water storage capacity was created as a result of watershed program. Augmenting water storage capacity contributed to (i) reducing the rate of runoff, and (ii) increasing the groundwater recharge. These have direct impact on expanding the irrigated area and increasing the cropping intensity. On an average, the former has increased by about 34 per cent, while the latter, by 64 per cent. Such an impressive increase in the cropping intensity was not realized in many surface irrigated areas in the country. These benefits confirm that the watershed programs performed as a viable strategy to overcome several externalities arising due to soil and water degradation.

The above evidences suggested that the watershed programs have successfully fulfilled the three principal objectives, viz. (i) raising income level, (ii) generating employment, and (iii) conserving soil and water resources. These benefits will have far reaching implications on the rural masses in the rainfed environment. The results of meta-analysis further showed that the benefits vary depending upon the location, size, type, rainfall, implementing agency, and peoples' participation, among others.

Peoples' participation and benefits from watersheds

Peoples' participation in planning, developing and executing the watershed activities is indispensable. It calls for community participation and collective action. It is necessary because individual choices have collective consequences in the watershed framework. Action of one group of farmers at one location affects adversely (or favorably) the other group of farmers at different location. Often the different groups and locations have conflicting objectives with respect to their investment priorities and enterprize choices. These needs are to be converted into opportunities. The action of all the farmers in the watershed should converge in such a way that the positive externalities are maximized, and the negative ones are minimized. To achieve this, the community or stakeholders have to develop their own rules, which resolve their conflicting objectives. It is believed that a better organized and an effective peoples' participation would

yield higher benefits. A summary of the results on peoples' participation and benefits from watersheds are given in Table 2. The available evidences have confirmed that there existed a positive relationship between peoples' participation and benefits from watershed programs. The benefit-cost ratio was much more (2.4) in watersheds where peoples' participation was high in comparison to those watersheds which had low participation (1.24). The other impact indicators were also far ahead in watersheds having a greater peoples' participation.

It was interesting to find that the benefits from watershed programs were conspicuously more in the low-income regions than in the high-income regions (Table 3). The benefit-cost ratio was 2.46 in low-income regions and 1.98 in high-income regions. The corresponding figures for annual employment generation were 175 and 132 man-days per ha. The low-income regions call for such investments to enhance income levels of the rural poor. This suggests that watershed program should receive a higher priority by the government in the low-income regions. Such investments will not only raise income and employment opportunities in the low-income regions but also contribute to conserving soil and water. In a recent study, Fan and Hazell (1997) have demonstrated that the returns on investment in inputs as well as research at the margin were higher for the dryland areas than for the irrigated areas. Farmers in these regions could not invest due to low income and limited opportunities. Government intervention through watershed programs would benefit the rural poor in the low-income regions. Ironically, the participation of beneficiaries in planning and execution of the watershed was observed to be less in the low-income regions than in the higher income regions. This implied that poor rural households were less involved in planning and decision-making processes in the watersheds. However, these rural poor have been offering their services in various activities launched in the watershed. In fact, for the small farmers and the landless laborers in the watershed, there is often little prospect for development from the watershed works beyond the employment gain during the project period (Farrington et al. 1999). Perhaps a greater involvement of the beneficiaries would yield higher dividends from the investments in watershed-related activities.

These evidences revealed that peoples' participation was the key determinant in the success of the watershed development programs. Peoples' participation is not only critical during the implementation phase of watersheds but also beyond the actual investment phase. In the absence of active involvement of the stakeholders, the watershed programs would not be sustained.

Table 2. Summary of benefits from the sample watershed studies according to peoples' participation

Indicator	Particular	Unit	Peoples' participation		
			High	Medium	Low
Efficiency	B/C ratio	Ratio	2.37	1.79	2.06
			(12.41)	(24.10)	(14.93)
	IRR	Per cent	30.80	38.43	32.43
			(7.72)	(2.07)	(4.87)
Equity	Employment	Mandays/ha/yr	201.75	183.26	176.72
			(3.13)	(2.42)	(6.39)
Sustainability	Irrigated area	Per cent	28.87	41.08	34.03
			(6.52)	(5.58)	(8.32)
	Cropping intensity	Per cent	90.84	63.88	53.39
			(6.53)	(8.00)	(10.45)
	Rate of runoff	Percent	-12.98	-8.51	-15.62
			(4.02)	(2.56)	(4.84)
	Soil loss	Tonnes/ha/yr	-0.85	-0.80	-0.81
			(50.60)	(15.24)	(17.53)

Note: Figures in parentheses are the t-values
Source: Derived from various studies

Table 3. Summary of benefits from the sample watershed studies according to economic status of the region

Indicator	Particular	Unit	Per capita income of the region		
			High	Medium	Low
Efficiency	B/C ratio	Ratio	1.98	2.21	2.46
			(16.86)	(12.28)	(7.73)
Equity	Employment	Mandays/ha/yr	132.01	161.44	175.00
			(4.14)	(5.29)	(4.66)
Sustainability	Irrigated area	Per cent	40.34	23.01	36.88
			(9.73)	(6.24)	(4.19)
	Cropping intensity	Per cent	77.91	36.92	86.11
			(8.67)	(11.99)	(7.64)
	Rate of runoff	Per cent	-12.38	-15.82	-15.43
			(5.31)	(3.39)	(6.01)
	Soil loss	Tonnes/ha/yr	-0.82	-0.88	-0.69
			(40.32)	(37.55)	(4.60)
Extent of peoples' participation			High	High	Low

Note: Figures in parentheses are the t-values
Source: Derived from various studies

Conditions for Peoples' Participation

Traditionally, the watershed programs in the country have been supply-driven. The Central and State governments have been allocating resources for watershed development. Subsequently, the officials used to identify locations for these programs and prioritize various activities for implementation. Such an approach did not match the needs of stakeholders in the watershed. In the absence of peoples' participation, the potential benefits of the watershed programs could not be realized. Recognizing this, the concept of the Participatory Integrated Development of Watershed (PIDOW) was initiated in the 1980s. This qualified partial success. Overtime, the peoples' institutions, like *Zila Parishads*, self-help groups, and watershed implementing committees were gradually involved in the project management system. With allocation of more funds for watershed development, several non-governmental organizations came forward to aggressively participate in implementing this program, and demonstrated the importance of peoples' involvement in the success of the watersheds. Most of these arrangements were informal and varied across watersheds and implementing agencies. To make it formal, the 1994-watershed guidelines specifically included peoples' involvement as one of the conditions in the watershed development. More important was the observation how peoples' participation come forward voluntarily. And in reality, it is only the voluntary participation (not forced one) that would sustain the watershed program. It is, therefore, important to identify the conditions under which the watershed beneficiaries would involve themselves in its implementation, both during the project tenure and later in maintaining it when the project is formally over.

Demand-driven watershed approach

Demand-driven watershed activities will attract peoples' participation more. Once the watershed is identified, the needs of the stakeholders must be assessed jointly by the implementing agency and the stakeholders. Since there are diverse groups of beneficiaries in the watershed, their needs should not be overlooked. There are often reports that only influential and large farmers were involved, neglecting small and marginal farmers. Besides, there have been evidences that most of the watershed programs were not sensitive to the needs of women and landless laborers. Most often, these groups were silently left out of watershed

related decision-making processes. Attempts to integrate small and marginal farmers, women and landless laborers into the process require conscious efforts right from the beginning. It is, therefore, necessary that the need assessment of the stakeholders should be a precondition in designing and developing the watershed activities.

Self-help groups

The second stage of peoples' participation comes when various interventions are made. At this stage, a regular monitoring is required. The success of a watershed depends on how effectively the stakeholders monitor the progress. There are reports from some of the successful watersheds that informal groups were constituted there to regularly monitor the watersheds' activities. These groups were of different forms. In some watersheds, for example, the formal users' associations were formed. These associations have been found to be economically viable, and contributed significantly in managing the common pool resources in the watershed areas. A new concept of '*Mitra Kisan*' or '*Gopal*' has shown mixed results across different watersheds in different states (Deshpande and Thimmaiah 1999). Similarly, in a few watersheds, the participating farmers formed the 'thrift groups'.

Success of the watershed program will rely on not only the institutions, but also the effectiveness of credit and input delivery systems, output markets, and technology transfer mechanisms. A strong linkage of watershed program with various institutions would yield the desired outputs. Effective linkages between self-help groups or users' associations and various institutions would outlast the watershed program.

Decentralize the decision-making process

Decentralization of decision-making processes can also contribute to the success of the watershed program. This, however, is possible only if there is flexibility in the process. Often it is noted that the rigid norms do not allow decentralization of decision-making. To some extent, involvement of elected representatives of the people (MLAs and MPs) in the development process may ease the process. There are reports that in Madhya Pradesh, a conscious effort is being made since 1995 to involve the elected representatives of people.

Greater involvement of local MLAs, MPs and representatives of the *Panchayati Raj* institutions may assume significant role in project planning and execution, since they are the ones, who would like to take political mileage from the success of developmental programs, like watershed. In this process, they become party to the watershed and can be voted-out in the event of tardy progress.

Target poor regions

The poorer regions should receive higher priority in getting watershed programs. In these regions also, the relatively backward villages should be given higher attention in the watershed program. Overall, the prioritization of stakeholders in poor regions was not sought effectively. It should be ensured that the stakeholders must be involved during planning and execution of the watershed. The observation from a few watersheds in low-income regions was that the households generously participated in the program to increase the farm productivity and income levels. The landless laborers have incentives in the form of more jobs in the rural areas, and the women folk, for fetching water and fuelwood from the watershed area. There are reports that a well-knitted participatory approach even checked the migration of rural youth.

Commensurate benefits and costs

As stated earlier, the actions of individuals have collective consequences. There are many conflicting objectives among the stakeholders. In a watershed framework, the benefits do not commensurate with the cost incurred and the labor put in the watershed activities. Sharing of benefits in accordance with the cost will go a long way in sustaining the watershed program. For example, in the watershed framework, the farmers located at the upper reaches have to invest more but gains of this action are more to farmers at middle or lower reaches (Joshi et al. 1996).

Training of stakeholders

Training of beneficiaries is another key element for the success of the watershed program. The stakeholders must be aware about the importance of various activities in the watershed, as well as their benefits in terms of economic,

social and environmental impacts. Many actions by the stakeholders in the watershed are being accepted out of ignorance; these adversely affect the income and environment of other stakeholders and locations. Educating all the stakeholders would minimize such actions and maximize benefits from the watershed. Both, the Hanumantha Rao Committee and Sri Eshwaran Committee have strongly recommended the need for training of all stakeholders in the watershed. These recommendations must be adhered for making the program more participatory and successful.

Summary and Conclusions

The paper has documented the benefits from the watershed programs by collating information from micro-level studies and providing a macro dimension. The benefits have been assessed in terms of efficiency, employment and sustainability. It has been noted that the watershed programs have been raising income, generating employment and conserving soil and water resources. The analysis has further shown that the benefits of the program have been more in the poor income regions than in higher income regions. It has been suggested that the watershed program could be a vehicle of development to alleviate poverty by raising farm productivity and generating employment opportunities in marginal and fragile environments.

The benefits of watershed programs have been more where peoples' participation was higher. It has been found that peoples' participation is important not only during the phase of implementation of watershed development activities but also beyond the actual investment phase. In the absence of users' involvement, the watershed programs are likely are likely to fail. The important conditions of peoples' participation have been related to (i) demand-driven watershed programs rather than the supply-driven, (ii) involvement of all stakeholders (including women and landless laborers) in program implementation and monitoring, (iii) decentralization of decision-making processes, (iv) involvement of elected representatives and *Panchayati Raj Institutions*, (v) commensuration of benefits of all stakeholders with cost, and (vi) establishing effective linkages between watershed with other institutions, like credit institutions, input delivery system, and technology transfer mechanism.

Watershed program has been reported as one of the most important strategies to bring socio-economic change in the rainfed system. In some of the regions, it has silently revolutionized the agriculture and allied sector through various technological interventions, particularly soil and water conservation, and crop diversification. It is reported that for watershed program, location-specific technologies are available. There is an overwhelming policy and political support. It is postulated that the only problem is lack of appropriate institutional arrangement. This has been a major obstacle in attaining the potential benefits of watershed programs. It has been argued that earnest efforts to enthuse stakeholders for their voluntary participation would sustain watershed development and bring prosperity in the rainfed areas.

References

Alston, J. M., C. Chan-Kang, M. C. Marra, P. G. Pardey, and Wyatt. 2000. *A meta-analysis of rates of returns to agricultural R&D: ex pede herculem?* Washington, D.C. USA: International Food Policy Research Institute.

Chopra, K., G. K. Kadekodi and M. N. Murthy. 1990. *Participatory development, people and common property resources.* New Delhi: Sage Publication.

Deshpande, R. S. and G. Thimmaiah. 1999. Watershed development approach and experience of national watershed development program in the country. *Journal of Rural Development* 18(3): 453-469.

Fan, S. and P. Hazell. 1997. *Should India invest more in less-favored area*s? Environment and Production Technology Division, Discussion Paper No. 25, Washington, D.C.: International Food Policy Research Institute.

Farrington, J., C. Turton and A. J. James (eds.). 1999. *Participatory watershed development: challenges for the 21st century.* New Delhi: Oxford University Press.

Hanumantha Rao, C. H. 2000. Watershed development in India: recent experience and emerging issues. *Economic and Political Weekly* 35(45): 3943-3947.

Joshi, P. K., S. P. Wani, V. K. Chopde and J. Foster. 1996. Farmers' perception of land degradation: a case study. *Economic and Political Weekly* 31(26): A 89-92.

Lockheed, M. E., D. T. Jamison and L. J. Lau. 1980. Farmer education and farm efficiency: a survey. *Economic Development and Cultural Change* 29(1): 37-56.

Mann, C. 1996. Meta-analysis in the breech. *Science* 249(3): 476-480.

Marothia, D. K. 1997. Agricultural technology and environmental quality: an institutional perspective. *Indian Journal of Agricultural Economics* 52(3): 473-487.

Phillips, J. M. 1994. Farmer education and farm efficiency: a meta-analysis. *Economic Development and Cultural Change* 43(1): 149-165.

Ratna Reddy, V. 2000. Sustainable watershed management: institutional perspective. *Economic and Political Weekly* 35(40): 3435-3444.

6

Management of Irrigation: A View of Institutional Arrangements

R. S. Deshpande and G. Mini

Introduction

The technological changes in the mid-1960s brought forth the importance of irrigation along with seeds, fertilizers, pesticides, and improved cultivation practices. During the last two decades, the role of subsidies and expenditure on irrigation has become an important issue in the academic debate and led to the thinking of transfer of irrigation management to the users. The transfer of irrigation management has to be seen as a means to reduce pressure on the State finances and address environmental sustainability. The issue of management of irrigation has become prominent from two important point of views. The first view is that the irrigation sector continues to consume a large amount of budgetary resources and has remained far from self-supporting. The net returns to investments have not been commensurate with the efforts made. In addition, the pricing of resource has also remained sub-optimal for quite some time, and this has led to compounding inefficiencies in the sector. Secondly, irrigation being the largest user of water, its influence on environment and resource degradation has created a deep concern. It has been reported that large amount of land is degraded mainly due to inefficient use of water, and this has inflicted cost on both the sides, namely on the slowing down investment in the sector and in the resource use pattern. Inefficiency in resource use is caused by exogenous and endogenous factors. The former refers to the organizational structure of irrigation department, whereas the latter includes farm-level inefficiencies. All these factors have led to a strong view of transferring irrigation management to the user groups. With this background, the concept of Participatory Irrigation Management (PIM) became stronger and even policy decisions are being taken to expedite the process of

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

transfer. In this paper, we attempt to analyze the institutional aspects of irrigation management as reflected from the literature and through a few case studies. Our attempt here is to analyze the role of institutions under different settings and property regimes. The focus is on the sustainability of the institutions.

Technology and Growth

In the theory of production economics, technological change shifts production function upwards. The inducement for growth thus comes through the change that takes place in production and its composition. But, the path that induces growth through technology has an important aspect of institutional facilitation, which is overlooked often. The presence of institutions actually facilitates the conduit. In any economy, the process of transformation through technology has a strong interface with the existing as well as emerging institutional structures. Similar is the case of changes that have occurred through the technological revolution of the mid-1960s. In a common parlance, the Green Revolution in India is attributed to the miracle seeds, use of fertilizers and pesticides, availability of irrigation and cultivation practices. It should, however, be noted that along with the technological change that has prevailed in the process of agricultural growth, a significant share was contributed by the institutional change that has taken place. Thus, technological change is often induced either by practice or through an external force, whereas institutions are formed (if not already existing) in order to bring an aggregate change in the use of factors and facilitate the production process.

Role of Institutions

Some theoretical aspects

Any development process comprises three levels. The first stage begins at the preparation for the process of development that essentially requires inducing growth in the first place. Availability of investment and resources for achieving such growth is an important component at this stage. The second step is to ensure the quality of growth and its structural placement. In other words, the

two stages together involve identifying the weak and the strong spots of the economy and ensure that the resources are used in proper direction. The third stage is a crucial one, which translates growth into development through existing or newly evolved institutions. This transfer remains only as a component of the growth process but the role of institutions is quite crucial. Thus, the failure of translation of growth into development rests on the institutions. This has been brought forth historically in different case studies by North and Thomas (1970) and North (1990). Institutions in the general understanding are the rules governing any social and economic process. These can be formal institutions initiated and directed by the state, or informal institutions established by the stakeholders or emerged through cultural dynamics. In the context of irrigation, institutions include the laws, administrative arrangements for operation and maintenance of irrigation systems, institutions associated with the use of land, labor and capital in irrigation systems, and interface of the stakeholders in terms of informal institutions. It is, therefore, clear that the institutions governing irrigation sector have three different actors, viz. the state and state governed laws, the interdepartmental linkages in irrigation administration (Revenue and Irrigation Departments), and private property regimes in terms of land ownership and tenancy contracts. In this entire framework, the institutions intervene exactly like technological parameters in shifting the production function upward, but unlike technological change, institutions do not alter the physical quality of resources. Informal institutions generally interface with resource allocation and government laws, and the stakeholders. Such an interface essentially creates a kind of reaction, depending on the property regime, people involved, and the state control. Institutional theory helps in answering many of these issues where an interface occurs between the state initiated structures and the user groups. Focusing on costs and benefits, incentives and penalties to individual actors, institutional analysis demonstrates the economic rationality of co-operation and possibility of co-operative equilibrium outcomes from the competitive games (Ostrom 1990; and Sengupta 1991). The institutional economics provides answers to some important questions like "What are the conditions wherein individuals realize the necessity of collectiveness and under what conditions they will co-operate?" For example, it helps to explain the conditions under which farmers are willing to act collectively for the management of irrigation. The institutional economics, therefore, offers the possibility to generalize the theory of co-operative actions which developmental agencies require in generating predictable outcomes from planned inputs.

Historical evidence of institutional interventions

It has been an experience since the beginning of this century that institutions have played an important role in enhancing growth, attaining better distribution, and increasing economic welfare. In the early part of twentieth century, the formation of institutions essentially with the state initiatives was not as common as it became after the independence. Cooperatives, labor institutions and legal framework were made stronger during those days. However, during the pre-independence days, the informal institutions were quite strong. These included social institutions like caste, family, village religious groups, sect groups and other such institutional bodies. Traditional village institutions also played a significant role. Among the village institutions, land ownership rights, village functionaries and their economic rights, social hierarchies depending on economical hierarchy, etc. were the prominent ones. Similarly, the traditional institutions governing natural resources were also quite significant. In the post-independence period, initially the community development institutions at village level were established, and the development process was centred around the community development network. This was followed by a strong initiative towards obtaining an egalitarian land distribution through a series of reforms in the land market. Thus, land reforms came up as a recognized institutional intervention. The evidence shows that we achieved mixed results on land reforms across the states. Whatever may be the measure of success, it is quite clear that the land reforms could eliminate the intermediaries, protect the tenants and change the agrarian structure to a large extent. Close on the heels of land reforms were the reforms in the rural credit system as well as the price policy. All these led to a sea change in the rural institutional structure. The traditional village institutions managing natural resources including water were quite prominent. For instance, irrigation was managed through *Phad* system in the west, whereas it was managed by *Khudimarammat* in the south. These traditional institutions emerged in the socio-cultural milieu.

Irrigation: Participation and Institutionalization

As mentioned earlier, irrigation sector has the inefficiency syndrome for two important reasons. First, the sector has not been able to generate the minimum

expected returns from the investment made in the sector. This is mainly due to high operation and maintenance costs of the system. The second important reason for the inefficiency is indiscriminate use of water due to the absence of proper information and guidance. Such information should be provided to water users by either the state governments or the public institutions established for this purpose. The functioning of irrigation sector is controlled by three institutional regimes. First is the administrative mechanism of the state. The second institutional regime pertains to the village-level institutions that are of formal nature. The third institutional regime refers to the water users associations (WUAs); these can be of either formal type established with the state support or informal in nature, initiated and established by the users themselves. Literature suggests that the lack of horizontal integration between different levels makes it difficult to ensure efficiency of the irrigation system. In such a case, a few important aspects of the formation of institutions are quite crucial to improve their effectiveness. We discuss below a few of these.

Collective action and irrigation management

The importance of institutional arrangements in water planning and management has been increasingly recognized. But what makes individuals come together for collective action? Collective action is used to describe the process and consequences of individual decisions to voluntary co-ordinated behavior. In reality, individuals associate themselves for a collective action under uncertainties with an objective to search for the solutions. The individual not only gets an identity but also security in the process of collective action. Since individuals face a number of problems insolvable on their own, they tend to come together to find solutions and this becomes an immediate necessity rather than a choice.

There are various schools of thoughts to explain collective actions. The first (and the most recent) draws on the institutional economic analysis of local forms of collective action to derive generalized principles for collective action. This analysis uses formal models derived from the theory of repeated games to challenge the dominant thesis on the unfeasibility of collective actions among rational self-interested individuals. The second school emphasizes the force of tradition, social rights, value systems and moral codes in generating and preserving co-operative management of resources to ensure, among other things, the minimum food security for community members. Collective dependence on local resources is often institutionalized in religion, folklore, and tradition.

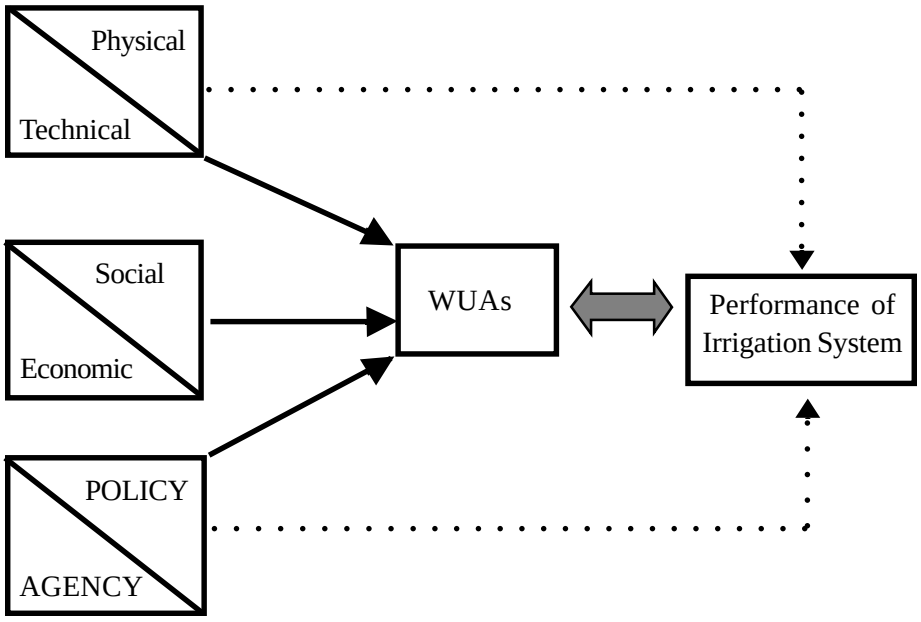
These two schools of collective action arise from two strongly established traditions in social sciences. Even then, the contrasting schools of 'rational choice' and 'moral economy' construct rather similar images of collective action. In 'rational choice' associated with Thomas Hobbes and Adam Smith, a person is first of all a rational self-interested individual (Homo economicus), While in 'moral economy' associated with Durkhem, a person is firstly a social being (Homo socialogicus) guided by social norms and then only an individual. The collective behavior is modeled in the moral economic framework; there it is argued that under the pressure of risk aversion farmers develop collective social insurance mechanism. It has been argued in the literature that Scot's assumption of a risk aversion, or 'safety first' are not necessarily the only reasons of collective action, and Fenny (1983) has argued incorporation of market as an important factor for collective action. Therefore, in any analysis of collective action, the immediate issue is the study of conditions under which collective action emerges, becomes effective, and is sustained over time.

Unmediated effects

The conceptual framework to develop collective action keeping in view water resources has been developed and depicted in Figure 1. WUAs are formed through the synthesis of physical, technical, social and economic parameters. Policy and agency inducing such formations support these parameters, but all these act at different levels. Initially, the technical and physical parameters decide the formation. This is supported and reinforced by the other four components. In addition, the formation of an institution is decided mainly by the homogeneity of the community involved. It is a direct function of the interests and matching of these interests among the members of the institution. The formation of WUAs has also a strong link with the performance of the irrigation system and the condition of the resource, which, in turn, decide the sustainability of WUAs.

In any system of irrigation management, the concerned groups can be categorized into three important hierarchical groups: (i) Public administration or the organizing agencies like the Command Area Development Authority (CADA) or Irrigation Department, (ii) Local level organizational structure like *Zilla Parishad*, and (iii) Farmer groups and individual farmers, their interests, aspirations and limitations. The transfer of irrigation management from government to the WUAs implies, to a large extent, the failure of the interface

Figure 1. Factors affecting the role of Water Users Associations in performance of irrigation system



at these three levels. Researchers believe that the irrigators have an untapped wisdom and local knowledge, which can help in taking a quicker and more effective decision. More than that this will also manage the supply situation more effectively. In order to understand the possibility of shifting from a publicly managed irrigation to a participatory management of irrigation, mapping of the community and farming systems, reaction of the community concerned and the net gains of collective action are essential requisites. Gordon (1987) while elaborating the social aspects of irrigation development brought forth these issues. Irrigation management through the community participation requires fuller understanding of the social engineering in that region. Jamie Morrison and Ian Carruthers have established that imposition of organizational structure may be occurring in the enthusiasm to transfer irrigation management to the stakeholders. This, they argue, should not be occurring without any regard to the existing institutional setting, and that failing to take note of such institutions may bring the performance of PIM below the expectation. The management models can not be imposed from the top or outside. Such reforms must come from the bottom

and with a full understanding of the existing community structure. If there is an imposition of sets of rules and organizational structure formed by the irrigation researchers generalizing on the understanding of a few communities, it will face difficulty in enforcement mechanism.

Formation of WUAs

The process of formation of WUAs emerges through different theoretical constructs. As discussed earlier, the moral economy framework and the collective action framework are predominant factors. Social engineering, scarcity of resources, inability of the state to ensure fair distribution and increasing inefficiencies in resources use contribute towards organizing an user association. In the context of an irrigation system, the WUA originates from either an external initiative (i.e. state or NGO initiated), or from the indigenous efforts of the water users. The difference in the two approaches is that the former will be more legalistic and formal, whereas the latter will be informal and fragile. The process goes through three stages: (1) Felt need (by state, NGO or by stakeholders), (2) external conditions, (3) internal structure, and (4) the formal process.

The pressure of inefficiencies due to the earlier management practices, improper distribution of water, poor maintenance of the system, economic non-viability and inefficient use together provoke the initial process. External factors decide the structure and functioning of WUAs, which include (a) physical and technical aspects of the irrigation systems, (b) social and economic contexts in which they operate, and (c) government and policy forces which regulate the WUAs and the irrigation system. All these factors together set in the precondition for the emergence of a WUA. But these can not be independent of the internal structure of the proposed association. The internal structure includes contours of the proposed structure, legal and enforcement framework and the process of conflict resolution. Thus, the process of emergence is dictated by these components.

Generalization versus local specificity

In India, the WUAs originated either through initiatives from a few NGOs functioning in these regions or by the interested individuals. A large number of

Box 1. Factors affecting structure and functioning of Water Users Associations

External conditions	Internal structures

• **Physical and technical factors**
  • Water scarcity
  • Technology and infrastructure
• **Social and economic factors**
  • Market penetration
  • Farmer incentives
  • Financial viability
• **Local social organization**
• **Policy and government factors**
  • Policy environment
  • Legal framework
  • Agency structure and incentives
	• Origin
	• Membership definition
	• Size
	• Leadership roles and specialization
	• Socioeconomic heterogeneity
	• Rule enforcement
	• Water distribution
	• Conflict resolution

them, in search of a tight legal framework, got registered as registered societies under the Societies Registration Act or the State Co-operatives Act. This ensured a continuum of the state control in a different form. In fact, the very establishment of such users' association faces difficulties when the state functionaries refuse to share their responsibilities with others (Lele and Patil 1994). Experience from Andhra Pradesh is, however, different, where the State Government through its functionaries initiated steps to form WUAs (Raju 2000). It is an accepted fact that with the initiative from the state, the WUAs will be more stable but one cannot opine about their efficiency and effectiveness. Theoretically, as Vedeld (2000) puts it, 'village polity and its nature in terms of political homogeneity or heterogeneity decides the sustenance of the group.' It is possible to form a group induced under the state efforts even under politically heterogeneous situations, but its sustenance is doubtful. As an alternative, if the collusion and collective action germinates out of the pre-formation constraints and without any external force, it remains more stable. Jean-Jacques and Jean-Charles (1997) argued that let the collusion take place and only at that moment collective action on the part of the actors is feasible. This requires the agents to have two sets of information, namely, the information about the mutual and collective requirements, and the contours of mismanagement in the earlier regime. All this leads to the

fact that organizations are readily feasible, largely effective and stable over time if these are formed with complete information about local-level problems.

Property regime

Any collective action is associated with the typologies of property regimes under which it originates. In a private property predominant resource, the collective action does not originate unless the pre-conditions are very strong. The conflict resolving mechanism established by either the state or the state-sponsored agencies does not function satisfactorily in a private property regime. The sustenance of collective action is also jeopardized in a private property regime unless the external conditions are not sufficiently strong in binding. In the private property regime, the required conditions for initiating collective action will require the failure of the state and/or the market in the process of conflict resolution. More than that the message should go very clearly to the actors (participants) that the state/state agencies have failed in resource management. Any collective action stemming out of private property regime, therefore, should have a better conflict resolving mechanism and a clearly defined framework.

Formation of an users' association in the domain of common property resource or open access resource is not as difficult as that under a private property regime. However, if the ownership status is of mixed nature then the stability of the user group gets affected. In a purely 'non-private ownership' situation, the feasibility of users' association is dictated mainly by the inability of the state in ensuring the welfare of the user groups and conflicting/provoking interventions of the state. The social engineering of the formation of an users' association becomes much easier in the common property regime mainly due to five reasons: (1) There are no conflicts of ownership, (2) State is not the solely dictating partner, (3) Formation of the users' association relaxes the state control, (4) Local level flexibility is feasible in organizing the institutions, and (5) The use rates can be clearly defined (see Deshpande and Nikumbh 1993).

The Evidence from Field

On the background of the framework developed above, we have taken up a few case studies to emphasize the precondition for the emergence, process of

formation and characteristics for sustenance of WUAs. We have attempted case studies from three different domains, namely, the associations in canal-irrigated region, tank-irrigated region and groundwater-irrigated region. The rationale behind viewing the collective action from these three dimensions is to bring forth variations due to different property regimes. In surface irrigation, the State has a stronger control on formation as well as sustenance of a user institution. To some extent, tank command areas have private as well as public control on the emerging institutions. We come across a tank command area managed by the minor irrigation department or by village communities. Private individuals rarely own a tank and the management of the tank with private ownership is quite sporadic. In contrast to these two situations, the groups sharing groundwater have a complete private ownership on the system. Thus, we here have for discussion these case studies.

Surface irrigation: institutionalization in a state regime

WUA: Gundur case. WUA functioning in the village Gundur of Koppal district was chosen for the study since it is one of the few associations functioning actively in the command area, that provided a useful laboratory for the study of collective action. Farmers' comprehension of the principles of water management suggested that poor management leads to excess of water availability in some areas and deficiencies elsewhere. This strengthened a collective action in Gundur. The benefits of an organized and justified sharing of water played an important role in determining the strength of the association. It was the water scarcity in the presence of poor management that forced the farmers to maintain sub-distributory and field channels collectively by undertaking weeding and desilting once in a year before the on-set of irrigation season. Since they did not receive grants from any source, the association itself generated financial and technical assistance. Collective action thus relates to the benefits they receive from the maintenance, and the stress on resource distribution. Along with the irrigation infrastructure, the facilities for transport and communication also facilitated the activities by making it easier for members to meet, travel along the system and monitor the compliance. All the members of the association grow only paddy, since they feel that it is the only assured crop, and with good roads and connections the farmers have better access to markets. Hence, the market penetration has increased the economic returns to agriculture, and thereby,

the incentives for farmers to participate in WUA. Other social institutions, such as the village *Panchayat* and the milk cooperatives are functioning quite successfully in the village. This has increased people's experience in forming and participating in the voluntary associations. Thus, we expect this to be a stronger WUA, where there are many other local social organizations playing a supportive role.

More than any other single factor, the long-run sustainability of the association depends upon sufficient incentives to farmers to participate. This includes more efficient and reliable water delivery, control over water management, augmented farm productivity and farm income, empowerment of farmers, etc. The viability of the association is partly due to the process of farmers making investment in maintenance and cleaning of *nalas*. They have no hesitation in paying water charges to association as well as to the revenue department. Some of the farmers were even of the opinion that water rates could be hiked to promote better management of water. This association is stronger in spite of the fact that the group is heterogeneous in terms of social background and assets. Both the local and migrated farmers are members of this association. The usually held view is that the farmers who are economically and politically strong are the ones who play a dominant role as far as the water use is concerned. But this view does not hold true in the case of this association. This is because the incentives to sustain the cooperation are much stronger than the causes that lead to its breakdown.

Leadership for the association came from the tested hands in the community in whom people had reposed trust and confidence. The office bearers of the association have proved their worth by past performance like getting the association registered, contributing money during shortage, conflict resolution, etc., and they share the same egalitarian structure and interest with other irrigators. Farmers are of the opinion that there should be government support and involvement in providing legal framework, technical and organizational training, monitoring and regulating externalities, marketing facilities, credit, financial support for major rehabilitation work, etc.

As the members of the association live in a single village, the disputes are generally settled in the context of shared dependency and loyalty. Although there are sporadic instances of violation of cropping pattern, water-related disputes are very rare. Financial transactions and records are open for verification. A few farmers verify the records and the verification is recorded with their signatures

or thumb impressions. Therefore, transparency and accountability together have strengthened the collective action. Effectiveness of the association in encouraging members to contribute to group effort revealed that given a conducive environment, timely and reliable water supply and political leadership, groups will emerge and survive where a critical mass of individuals have practical knowledge of the potential gains from the collective action.

There are a few interesting points that emerge out of this case study. The association was formed by the stakeholders under the stress conditions caused by mis-management of water distribution system. The scarcity of the resource, good understanding of the technology, availability of infrastructure and market links helped the formation of the group. Its viability and strength was derived out of the incentives in terms of a justified water distribution system as well as a good leadership. Despite the fact that the group is heterogeneous, it has developed a sustainable mechanism for conflict resolution and enforcement of rules.

The case discussed here had the benefit of users' initiative even though it worked in close association with the irrigation bureaucracy. Here, the administration was an involuntary partner and had little influence on functioning of the group. But, we have deliberated below about the groups, which were initiated at the intervention of the irrigation department.

WUA formed by the Command area development authority (CADA). In order to ensure proper supply of water in the tail-end area of the project in Raichur and Bellary districts, 16 WUAs were formed with the initiatives of CADA. A central sector scheme was formulated (to form WUAs) and implemented to meet the establishment cost and other contingent expenses during the initial stage of the society. Financial assistance in the form of managerial subsidy for a period of three years was also budgeted. Study undertaken to find the functioning of the WUAs revealed that all the associations have become defunct. A number of factors are responsible for the failure of these WUAs. Water did not reach the tail-end of the project due to indiscriminate use of water in the head region of the distributory system, and the sub-distributory systems had become inoperative. As a result, neither the agency nor WUAs were able to prevent crop failure. As water became scarce, even perfectly coordinated actions and investments could not solve water shortages, and thus, these cases provided insignificant motivation for the collective action. Also, the sub-distributory system became inoperative, due to non-availability of technology and infrastructure, which further reduced the incentives for the WUA activities.

This reflected on the sustenance and financial viability of the WUAs. Neither CADA officials nor their nominees to the association spent time with the irrigators. No emphasis was given to help the farmers to identify their problems, bring out alternative solutions and assist the irrigators in identifying appropriate strategies. This failed the formation and sustenance of the group. If the WUAs have to function, immediate repair and rehabilitation of the canal system should be undertaken by the irrigation department. And the rehabilitated canal system should be handed over to the associations, which would generate income by charging for water use, and this would be an incentive to maintain the system efficiently.

Finally, since the irrigation agencies are traditional engineering organizations, the professional reward is always identified with the design or efficient implementation of physical projects and not in the routine operation and maintenance (O&M) or dealing with farmers' demand. This ultimately resulted in the failure of collective action. In the absence of pressure from the user groups, this was neither attempted nor feasible.

Financial assistance by way of managerial subsidy for a period of three years given by CADA provided incentives for sixteen WUAs to be registered. However, after three years of checkered functioning, the efforts declined both in quantity as well as intensity. While non-receipt of salary dampened the enthusiasm among the employees of the association, the difficulties in procuring water made the members of the association lose faith in the group functions. The Tungabhadra project also presented a similar picture and WUAs created in a top-down administrative fashion generally lived a short life.

Tank irrigation: interface of public and private regimes[1]

Traditionally, tanks were one of the important sources of irrigation and were usually managed under village-level institutional arrangements. Tanks also served as a major source to recharge groundwater. But tank irrigation has been declining at a very rapid rate. Among the main reasons for neglect of this source of irrigation are the property ownership patterns, absence of sufficient funds for O&M, abolition of village institutions and transfer of tank administration to the

[1]We are grateful to Dr M. J. Bhende for discussing the case with us.

Table 1. WUAs formed with state initiative and failed to sustain

Name of WUA	Taluka	Year of regist-ration	Area of operation	Extent of land (ha)	Number of farmers
(A) Bellary District					
1. Jowka	Hospet	1991	D2,5R,7R	825	200
2. Mannur Sugur	Sirguppa	1991	Sugur dist.	1018	100
3. Amarpur	Bellary	1991	D-15-L	1325	200
4. Bandral	Sirguppa	1992	D-2,1R,2Dp	503	100
5. Karur	Sirguppa	1992	D5,5R,6R, 8R,7L,9L,10L	1000	100
6. Kolur	Bellary	1992	13/9 of RBHLC	243	100
7. Andral	Bellary	1992	D-15-L	1440	200
8. Chaganur	Bellary	1992	D-34	488	100
9. Balkundi	Sirguppa	1998	Not available	480	100
Total				7322	1200
(B) Raichur District*					
1. Dhadesugur	Sindhanur	1990	D-36/5B	799	100
2. Somalapur	Sindhanur	1992	D-32-19	1000	100
3. Diddigi	Sindhanur	1992	D-54,10L	800	100
4. Manvi	Manvi	1992	D-85/6	1000	100
5. Gadar	Raichur	1992	D-104-A	501	100
6. Sindhanur	Sindhanur	1993	D-54	550	100
7. Belliganur	Sindhanur	1996	D-54,10L	875	100
Total				5525	700
Total of (A)+(B)				12847	1900

Source: CADA, Munirabad

(*Note: from November 1997, Raichur district has been divided into two districts: Koppal district and Raichur district. Raichur district is undivided here).

minor irrigation department (Thippaiah 1997). The selected case studies relate to Mullaskere-Arenahalli tank, which comes in Periyapatna taluka of Mysore district of Karnataka. The catchment is 17 sq. km and water spread is 7.2 ha. The tank has a command area of 18 ha and canal length of 1 km. The problem includes siltation at a very fast rate, breaches in making them defunct, canal and improper functioning of sluices. Vegetation (weeds) have infested even the tank bed, reducing its water holding capacity. There was an attempt to form a group to repair the sluice, bund and canal on the initiative of an influential farmer having land under the command area. They could repair some of the breaches and enhance the water flow. But, the attempt was short-lived and the problem surfaced again. Now, as the maintenance of the tank has been handed over to the *Zilla Parishad*, the villagers (irrigators in the command area) have made a representation to the *Parishad* asking for rehabilitation of the tank. However, a more serious factor responsible for neglect of the tank is installation of bore-wells by some of the farmers in the command area. These farmers are least bothered about the repair of the tank as they get sufficient water for irrigation through bore-wells. Thus, in a typical mixed property regime between the state and private ownership, the incentive to start a user group is quite negligible in tank-irrigated region. The maintenance of tanks rests with either the minor irrigation department or the *Zilla Parishad*. Also, there are not enough funds earmarked for the maintenance purpose. An alternative and more efficient source of irrigation (bore-wells) is available which comes under private ownership, thereby having little incentives for collective action.

Groundwater irrigation: managing in a private regime

The initiative for groundwater development and use has always rested with individual farmers exploiting and using the resource at their own will. This has led to the abuse of the resource in a spatially and temporally differentiated manner, resulting in inequity, inefficiency and interference. The direct participation of the government in groundwater development has been limited to state tubewell programs. The government institutions dealing with groundwater like the Central Ground Water Board, State Ground Water Departments, the National Bank for Agriculture and Rural Development (NABARD), etc. have been playing the role of observing institutions rather than monitoring bodies. Therefore, we have large patches of 'gray' and 'black' regions depicting shortage of groundwater

of different intensities. As regards the ownership, groundwater presents a typical case of ownership. The key feature that distinguishes groundwater markets from other forms of irrigation is that water pumped is the property of the pumper. But a water seller neither owns nor produces the water he sells, in effect what the water sellers do is to lease or sell the service of their irrigation equipment and enjoy ownership rights over the community groundwater resource (Shah 1993).

It is the ownership of a groundwater extracting mechanism (WEM) that decides the access as well as the ownership, and therefore inequity in the access has been one of the typical problems. As a natural resource, groundwater should be shared by all users. Equal rights over groundwater resources are not being enforced effectively for all members of the community; hence the owners of WEM are able to usurp others' share without having to compensate the community. This causes the problem of well interference in the absence of equal access, and results into a variety of contractual relationships. For example, in many parts of Gujarat, it is for a well owner to lay underground pipelines through neighbours fields at his own cost, and dissuade them from establishing their own WEMs by informal long-term contracts for the supply of water at mutually agreed prices (Shah 1998).

Large water sellers are known as water companies–7 to 150 partners jointly owning and operating a WEM; they invest primarily for selling water to other farmers. This is being attempted in some parts of the country. In Narsanda village of Kheda district (Gujarat), a co-operative tubewell has been in successful operation since 1952. The association controlling it has been selling water to members and non-members at different rates (but lower than the market prices), has distributed bonus to members, and has been competing with the neighboring private sellers. However, another such co-operative tubewell started in Bamroli by the leaders of the Narsanda co-operative themselves, failed. Similarly, in Mehansa and Ankalav (Gujarat), water companies have proliferated and are doing well–more professional in managing business, keep regular accounts, issue printed receipts, distribute profits at the year end, etc. In Navli and neighbouring Karamsand village of Kheda district in Gujarat, the sellers made efforts to unionize in the late 1960s and a pump owners association was registered which still exists, but later on, the well owners started pursuing their individual interests (Shah 1993).

Groundwater- *Pani Panchayat* as an institution of collective action

'Pani Panchayat' was started on the background of the severe drought of 1972/73 in the state of Maharashtra. A forum of industrial technologists was organized under the leadership of Shri Vilasrao Salunke in the Western Maharashtra to suggest ways and means to deal with the drought situation. The group went around the drought-affected region and felt that only collective action can help to mitigate the effects of drought. Similarly, they also wanted that drought preparedness could be organized in a similar manner. The choice was quite difficult. Maharashtra being a hard rock aquifer region, groundwater was not plenty in supply so that each farmer could dig irrigation well. Water impounded in the percolation tanks was to be utilized and the natural feasibility was to get a group organized to share groundwater.

As a first step in the process, a trust under the name *Gram Gaurav Pratishthan* (GGP) was registered in the year 1974, and it leased-in a 16-ha plot of land on a long-term basis at Naigaon in Saswad taluka for the work. It had set the following objectives for the drought preparedness and sharing of the resource (GGP 1983):

(1) To provide initially relief to the farmers of Purandhar taluka (Pune district) by improving their economic conditions and mitigating the cause of droughts recurrence.
(2) To create facilities to raise social and economic conditions of the people in this taluka.
(3) To conduct research studies in socio-economic conditions, so that the urban interests could be linked with the process of creating integrated rural development.
(4) To do all such lawful things as are conducive or incidental to the attainment of all the above aims and objectives.

The experience of the Naigaon farm from 1974 to 1979 and a continuous thinking about the GGP's objectives gave rise to certain principles in water sharing. Shri Salunke started a co-operative lift irrigation scheme with the initiative of the farmers. The initial scheme was started at Naigaon itself. The following seven basic guidelines were formulated to run the scheme (GGP 1983; and Kolhe et al. 1986):

(1) GGP would help in formulating lift irrigation scheme for the cohesive groups. Individual schemes will not be undertaken.

(2) Sharing of water would be on the basis of the number of members in a family and not in proportion to the land owned by them. Every household would get water rights to the maximum of 2.5 acres with an allocation of 0.5 acre per capita. The land in excess shall remain under rainfed conditions. This particular clause incorporated the principle of equity in water sharing.
(3) A beneficiary shall not have exclusive rights to irrigation. These will not be attached to the land. If the land is sold, water rights shall revert back to the Trust.
(4) Initially, all the members would contribute 20 per cent of the capital cost in cash, and the balance 80 per cent will be provided by GGP in the form of interest-free loan (wherever, subsidy was not available), or 50 per cent would be met from the government subsidy and remaining 30 per cent would be given by GGP as interest free loan.
(5) A landless laborer would also share water on a similar basis. He could enter into a contract with the cultivator and use his water rights on that land.
(6) High water consuming crops like sugarcane, banana and paddy will not be included in the cropping pattern of the beneficiaries.
(7) The project should be entirely administered by beneficiaries with the help of '*Panch* Committee' from among them.

With these principles and the administration by the beneficiaries, the first scheme started functioning in 1979. The functional steps in the *Pani Panchayat* scheme were simple and easy to operate. Once the beneficiaries decided to form a lift irrigation society, they had to prepare the guidelines for operating the society. These included the record of rights, cropping pattern, issuing of no dues certificate from bank/village accountant and a consent letter. An account was to be opened in the bank jointly with a representative of GGP and *Gat Pramukh* (group incharge). A *Panch* Committee was formed which was to acquire the necessary land for pump house, pipelines, etc. A *sevak* (worker) was appointed by GGP to operationalize water distribution according to the fixed time table prepared by the *Panch* Committee. The *Panch* Committee was to resolve the difficulties, problems and tensions amongst the beneficiaries. It was also expected to ensure the recovery of *Pani Patti* (water charges fixed on crop/acreage basis) and the contribution towards the loan advanced by GGP.

The basic philosophy of *Pani Panchayat* is to share water on certain commonly agreed principles. These principles foster the people's participation

in three different ways. *Firstly*, every one in the group shares the concern about the principles laid down. Therefore, it is rarely that one comes across the violations of the regulations. *Secondly*, the scheme is operated on horizontal rather than vertical administrative principles. This binds the partners into a theme of mutual development. *Thirdly*, GGP's help is always available on a large number of technical and other matters. This fosters the tie between the nodal agency and the scheme (see Deshpande and Reddy 1990).

The *Pani Panchayat* movement had faced a rough weather some time back and the momentum came down. Three factors were primarily responsible for this situation. The first hurdle came in the form of a parallel lift irrigation scheme promoted through government programs. This scheme also had the advantage of subsidy. It was, therefore, quite natural for the rich elements of the society to take advantage of the state-run scheme, rather than forming a group on the basis of the *Pani Panchayat* principles. These principles would not serve the interests of those who are influential in the society and consequently, in the Government mechanism. Secondly, the scheme involves curbing of private profits and use rights of a group and promoting of the same in another group, the weaker sections. Any such social engineering approach would confront difficulties because of the neglect of the interests of the 'haves'. *Pani Panchayat* was not an exception to this. There are certain examples where outside elements had taken interest in blocking the spread of the scheme. Lastly, a resource-based scheme can not remain away from its politicization.

The success of *Pani Panchayat* was in the form of the spread of the scheme and its effective implementation over the years. Theoretically, the success of *Pani Panchayat* can be attributed to the process of social engineering through which it was established. As a first step, there was severe stress on the resources and the stakeholders came together under the agreement to share it. The second important aspect was the structure of the institution, wherein, three segments worked in close collaboration with each other. The *Panch* committee monitors the conflict resolution and ensures participation. The ground rules guarantee the benefits, rule out the possibility of outliers and ensure sustainability of the institution. The process is thus a well-set process and likely to sustain.

Sustenance and Economic Viability

Preconditions and intra-institutional structure

The emergence of an institution passes through two important domains, namely, the pre-conditions of the emergence and the intra-institutional factors that are conducive to its establishment. The pre-conditions necessarily require the earnestly felt needs by the stakeholders. Such needs arise out of either the stress conditions imposed by the earlier system of management or the material changes that occur in the process. In the literature, the homogeneity of the group is stressed as one of the important prerequisites in forming an institution. However, there is a strong relationship between the felt needs and the extent of homogeneity in the group. These are selected inversely as, even under an extreme stress, the most heterogeneous group will come together in order to form an institution. It is, however, a different matter to discuss the sustenance of such a group over time. Another important issue that comes for discussion here is the condition that defines an acceptable stress level by the group in terms of resource sharing. The extent of departure from such acceptable stress level generates the favorable conditions for existence of an institution.

The intra-institutional requirements for sustenance and economic viability of an institution include quite a few factors. Among these the important ones are the definition of membership and the role of members, mechanisms set in order to resolve conflicts and enforce the basic institutional trade. The qualities of leadership as well as the financial stake also count as important intra-institutional pre-conditions. The size of the institution matters significantly as the larger institutions have lesser control and multifarious leadership has to balance the conflicting interests.

Extra institutional and regime-specific conditions

Sustainability of any institution in a medium-term perspective hinges upon the threat perception from within and outside the institutional domain. The extra-institutional factors include economic and social factors of the region. Market, financial institutions and other local organizations have a significant impact on the sustainability of a resource-using institution. The policy environment and the legal system that governs the areas of interest of the institution make an impact

on the sustainability. Specifically, the extra-institutional conditions are location related and have a clear interface with the society. Technology, infrastructure and interaction of the state with the institutions decide the pattern and the process of the emergence of an institution.

Economic and financial stability

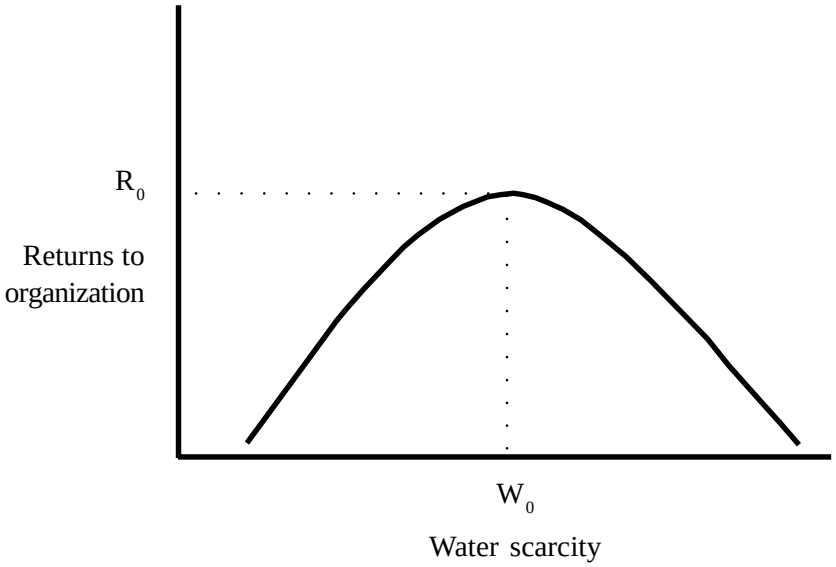
Stability of an institution and its sustenance depend upon the financial control that the institution exercises on its members. This linkage is more important from the point of view of achieving the long-term sustainability. If the financial matters are transparent and beneficiaries have adequate information about them, stability of the institution is more assured. Similarly, negative externalities that emerge out of the functioning of the institution may jeopardize not only the financial stability but also the economic viability of the system. In this process, relationship between the partners, namely, the state, members of the institution, market and other local organizations has to be carefully observed.

Optimizing the gains

Sustainability of an institution relates directly to the process of optimizing its effective components. As mentioned above, the stakeholders in the formation and sustenance of the institution include the state department of irrigation, beneficiaries of irrigation, individuals who are not members of the institution but depend on the same resource and other social and financial institutions in the region. The optimization of gains will require a clear understanding of gains from the formation and sustenance of the institution and how these gains are to be shared by the stakeholders. Sustainability automatically ensures optimum gains to its partners. We hypothesize here an existence of an 'inverted U' type of relationship between water scarcity and returns to organization (Figure 2).

Here, we have defined the returns not simply in monetary terms but also in terms of aggregate welfare gains. When water supply is plentiful, there is a little reason for farmers to organize. As water becomes scarce, even collective actions cannot address water shortages, and thus, the benefits from organizing are extremely low. Therefore, benefits of the organization are high during the situation of moderate water scarcity. The relation between the external condition and internal structures of an institution affects quantum of the returns. By

Figure 2. Relationship between water scarcity and returns to an organization



incorporating this relationship, it is possible to get more insights into the effects of the external conditions (physical and technical, social and economical, policy and governance) on people's behavior regarding water use. Such an understanding is significant for a better maneuvering of the influence of social forces on the actions of water users within a community, and therefore, it is indispensable for searching institutional solutions to the problems of resource management.

Conclusion

The paper is an attempt to understand collective actions and formation of institutions in three different property regimes for irrigation water. An institution is basically a mechanism to help enhance the allocative and production efficiency. Thereby its presence and impact are recognized in terms of a shift in production surface, almost of a similar type as that of technological change or infrastructure.

The irrigation institution has been chosen as a platform for the analysis, since water has been a focal point of many conflicts at the micro and macro levels. The functions of water institution will involve a host of requirements such as efficiency in resource use, allocative efficiency, environmental interface, sustainability and resolution of conflicts. But all these functions alter according to property rights regimes and local-level conditions. The three case studies bring forth the minimal role of the state-initiated institutions, strong interface between an institution and property rights regime, and factors leading to sustainability of the water users' institution.

References

Deshpande, R. S. and S. R. Nikumbh. 1993. Treatment of uncultivated land under watershed development approach: institutional and economic aspects. *Arthavijnana* 35(1).

Deshpande, R. S. and V. Ratna Reddy. 1990. Social dynamics and farmers' society: a case study of *Pani Panchayat*. *Indian Journal of Agricultural Economics* 45(3).

Fenny, D. 1983. The moral or the rational peasant? Comparative hypothesis of collective action. *Journal of Asian Studies* 42(4).

Gordon, E. D. 1987. Social aspects of irrigation development. In *Irrigation development planning*, J. R. Rydzewski (ed.). New York: John Wily and Sons Ltd.

Gram Gaurav Pratisthan (GGP). 1983. Report on *Pani Panchayat* scheme. Pune: Purandar

Jean-Jacques, L. and R. Jean-Charles. 1997. Collusions in organizations: the scandinavian. *Journal of Economics* 99.

Kolhe, A. K., N. R. Paranjape, A. K. Gupte and M. D. Sathe. 1986. *Pani Panchayat: an overview.* Pune: Development Group.

Lele, S. N. and R. K. Patil. 1994. *Farmer participation in irrigation management: a case study of Maharashtra.* SOPPECOM and Horizon India Books.

North, Douglas. C. and R. P. Thomas. 1970. An economic theory of the growth of the western world. *The Economic History Review* 23.

North, C. Douglas. 1990. *Institutions, institutional change and economic performance.* Cambridge: Cambridge University Press.

Ostrom, Elinor. 1990. *Governing the commons. the evolution of institutions for collective action.* Cambridge: Cambridge University Press.

Raju, K. V. 2000. *Participatory irrigation management in Andhra Pradesh: promise, practice and a way forward.* Working Paper No. 65. Bangalore: Institute for Social and Economic Change.

Sengupta, Nirmal. 1991. *Managing common property: irrigation in India and the Philippines.* New Delhi: Sage Publication.

Shah, Tushar. 1993. *Groundwater markets and irrigation development.* New Delhi: Oxford University Press.

Shah, Tushar. 1998. *Efficiency and equity impacts of groundwater markets: a review of issues, evidence and policies*. Research Paper 8. Anand: Institute of Rural Management.

Thippaiah, P. 1998. *Study of causes for the shrinkage of tank irrigated area in Karnataka.* Bangalore: Institute for Social and Economic Change (mimeo).

Vedeld, Trond. 2000. Village politics: heterogeneity, leadership and collective action. *The Journal of Development Studies* 36(5).

7

India's Water Crisis and Institutional Challenges: An Overview

Vishwa Ballabh

Introduction

A mammoth fresh water crisis awaits future generations of India. The emerging water crisis is not the result of natural factors but has been caused by improper management of water resources, pollution of both surface water and groundwater and the shortcomings in the designing and implementation of institutions which address these problems. The intermittent natural factors such as droughts, etc. compound and exacerbate human failures. In this overview paper, an attempt has been made to assess the present and future requirements of water by various user sectors such as household, industrial and agricultural. Water crises in this paper have been defined at three levels. First, water scarcity, which means gap between supply and demand under the prevailing legal, institutional and price arrangements. Second is the water shortage, which denotes the absolute concept indicating low levels of water supply relative to the minimum levels necessary for basic needs. Finally, water stress which signifies acute water shortages for prolonged periods, hampering economic growth and development. It is important that these distinctions are recognized for evolving appropriate policy response to mitigate water crises.

The paper has three sections which follow the Introduction. The first deals with the existing and potential needs of water at the aggregate level and identifies areas of water scarcity at the regional level. Even in those areas where water is abundant, good quality water is not available for domestic purposes due to improper management, leading to soil erosion and drying up of traditional water streams and fountains. Another dimension of water crisis has been related to the problem of water quality. The competition for water leads to over-exploitation of groundwater, which, in turn, affects the quality of groundwater and makes it

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

unfit for domestic purposes. Excessive withdrawal of groundwater from coastal aquifers has led to hydrostatic imbalances between fresh and salt water, resulting in intrusion of saline water along the coastline. The water quality is also deteriorating due to discharge of untreated industrial and municipal effluents in the rivers and streams, affecting not only surface water resources but also threatening the life support systems.

The second section of the paper deals with competition and conflicts over water and political economy of water allocation among various sectors and users. In the face of scarcity, how limited water is allocated is an important question. It has been argued that limited water gets allocated by one of the three methods: (i) Administrative allocation, (ii) user-managed allocation, and (iii) market allocation. These views are simplistic and a complex set of factors determines water allocation. In the absence of explicit and wide spread recognition of the rights and priorities for different claimant groups, the domestic needs of rural population have suffered more than those of other claimants. Water gets allocated as a default option and water management institutions and organizations are unable to resolve the problems. As a result, conflicts over water have been increasing over time. The last section deals with strategies that may avert impending tragedy, and reforms needed in water management.

The paper highlights inadequacies of the existing institutional provisions in tackling water crises in India. The paper suggests that radical reforms are required to tackle water crises in India. The public agencies need to learn from some of the innovative experiments and breakthroughs made by non-governmental organizations (NGOs) in this area.

Pressure on Fresh Water

The rapid increase in the use of water in India during the last three decades has set the stage for competition for capturing water resources by various water use sectors and users. As a result, water resources have been almost fully exhausted in many areas. Steep decline in groundwater levels and deteriorating water quality are some of the manifestations of these competitions and captures. Over appropriation of water has been a major source of conflict among users within and across sectors in many areas, which is evident at both the micro and macro levels. The transportation of water from irrigation reservoirs in rural

areas to meet the domestic and drinking needs in urban areas has sharpened the conflicts between rural and urban areas. The alarming rise in the amount of waste generated by industries and municipalities had an adverse impact on fresh water bodies in the form of water pollution and contamination, leading to several public interest litigations. The crisis in meeting the drinking water needs of rural population is becoming unmanageable. At the same time, the public surface irrigation systems continue to operate at very low efficiency, and salinity and water logging are quite common in canal command areas.

Growth in water demand

The water demand defined as the quantity of water required for consumptive as well as non-consumptive uses. It is influenced by factors such as population, urbanization, demand for food and non-food agricultural commodities, industrial production, energy requirements, quality of life and preservation of environment and flora and fauna. Of these, domestic, agriculture and industrial sectors are the major consumptive water users. The competition for water among these three sectors is intensifying over the last 2-3 decades. The domestic use of water does not increase only in proportion to the population growth but also depends on whether the population growth takes place in a rural or an urban area. The per capita demand for water also rises with the increase in income level, primarily because of increase in the demand for modern sanitation and healthcare facilities.

With the growth in population, the demand for food crops increases, which, in turn, leads to an increased demand for irrigation water. The extraction of groundwater for intensive commercial agriculture has made qualitative and quantitative changes in the value of groundwater resources. From being a source of protective irrigation, life-saving irrigation during monsoon failure and winter period, groundwater use has now become the most critical input in commercial agriculture (Shah 1993). With the commercialization of agriculture, water has become a tradable commodity. Water markets have developed in many parts of the country, even in areas where agriculture productivity is very low such as north Bihar (Shah and Ballabh 1997). The massive private investment in groundwater irrigation coupled with the public investment in surface irrigation systems has helped India to achieve self-sufficiency in cereal production. Today, India produces and consumes about 170 million metric tons of cereals each year

(Bhalla et al. 1999). The question, however, has been raised about the nation's capacity to double its production to over 340 million tons by the year 2020 due to water scarcity (Rosegrant et al. 1999).

India has been persuing a policy of rapid industrialization through state participation since independence. This process got steam in 1991 with the initiation of structural adjustment and economic liberalization to attract domestic and foreign investments. Several Indian states are also pursuing policies to encourage development of industrial estates. All these efforts have contributed to a significant increase in the industrial growth rate since the 1980s. Large concentration of industries, however, increases the demand for water significantly. Further, many of these industries discharge their effluents into surface and groundwater bodies, without any accountability or concern (Sundar 1987; and UNICEF 1997). The neglect of industrial water requirement in water development planning is a matter of concern, particularly when many industries are reserving water for future use and thereby establishing their rights over other potential users.

India's population is over 1 billion, and it is estimated that it will be somewhere between 1.2 –1.3 billion in 2025 (Visaria and Visaria 1998; and GOI 1999). The most important point these projections bring out is that the urban population is expected to grow from the present 25 per cent to 45 per cent by the year 2025. This would have a major impact on water management strategies (Ballabh et al. 1999). The per capita water availability is secularly declining due to increase in population. In 1951, the per capita availability of fresh water was 3450 m^3 per year, which dropped to nearly 1250 m^3 in 1999, and is further expected to decrease to 760 m^3 in the year 2050 (GOI 1999). The situation is already critical in six out of the twenty major river basins with per capita fresh water availability going below 1000 m^3 (World Bank 1996). With such a sharp declining trend in per capita availability of water, meeting the needs of food and fiber for such a gigantic population is a real challenge. The projections made by the Ministry of Water Resources suggest that the water requirement will be in the range of 942-1221 BCM by the year 2025 (GOI 1999), as against the total withdrawal of 518 BCM in 1990. There are, however, strong reasons to believe that existing withdrawal and future requirements have been grossly underestimated. For example, the domestic water requirement has been estimated based on the norms prescribed by the Ministry, which are a way below the actual quantity of water use (Ballabh and Singh 1997; and Prabhaker et al. 1997). Similarly, The

estimate of water used for irrigation purposes suffers on two counts: (i) The estimate is based on utilization of water, while recycling of surface and groundwater through percolation, etc. has not been taken into account; and (ii) in many canal command areas, groundwater is an important source of irrigation due to unreliability of canal water (Ballabh and Singh 1997; and Shah 1993). Often groundwater withdrawal in canal command areas is ignored in estimating the actual utilization of water.

These national-level statistics mask huge inter-basin and inter-regional disparities. The utilizable water resources per capita per year vary between 3020 m^3 in the Narmada basin to about 180 m^3 or less in Sabarmati basin and basins of inland drainage. Out of the twenty major basins, four basins had more than 1700 m^3 per capita per year utilizable water resources, while nine basins have had between 1000-1700 m^3, five basins 500-1000 m^3 and two basins less than 500 m^3 in the year 1991 (GOI 1999). Similar variations exist between different seasons (within a basin), which aggravates the problems of water scarcity.

On an average, the annual rainfall in India is about 4000 cubic kilometre. This is not evenly distributed across different parts of the country, as well as different months of the year. Based on the criterion developed by Falkenmark et al. (1989), TERI (1998) developed water availability map of Indian river basins, which shows that except the north-west (India), central (Mahanadi), north-east (Brahmaputra sub-basin), and western coastal belt, almost every other part faces some kind of water constraint and stress (Figure 1). The water availability above 1700 m^3 in a basin, however, does not mean that it is available for use. Many areas such as south Bihar, Dangs in Gujarat, north-eastern states, and the states like Jammu and Kashmir receive plentiful rainy water, but also experience acute water shortages during the dry season due to institutional and technical failures. Some of these areas had well-developed traditional water harvesting systems, but these systems lie in tatters now (Agrawal and Narain 1997). Loss of traditional water harvesting system causes water scarcity even for drinking purposes in these areas.

The gap between supply and demand for water is growing in almost every part of the country. Purely from the point of view of competitive demand and supply equilibrium, the requirement and actual withdrawal exceed the supply of water resources, and this leads to a competition for capturing the water. The manifestation of these competitions are visible from the attempt to capture water

from deep aquifers, diversion of irrigation water for drinking purpose and reservation of water for industrial and urban townships and municipalities (Ballabh and Singh 1997; and Moench 1995).

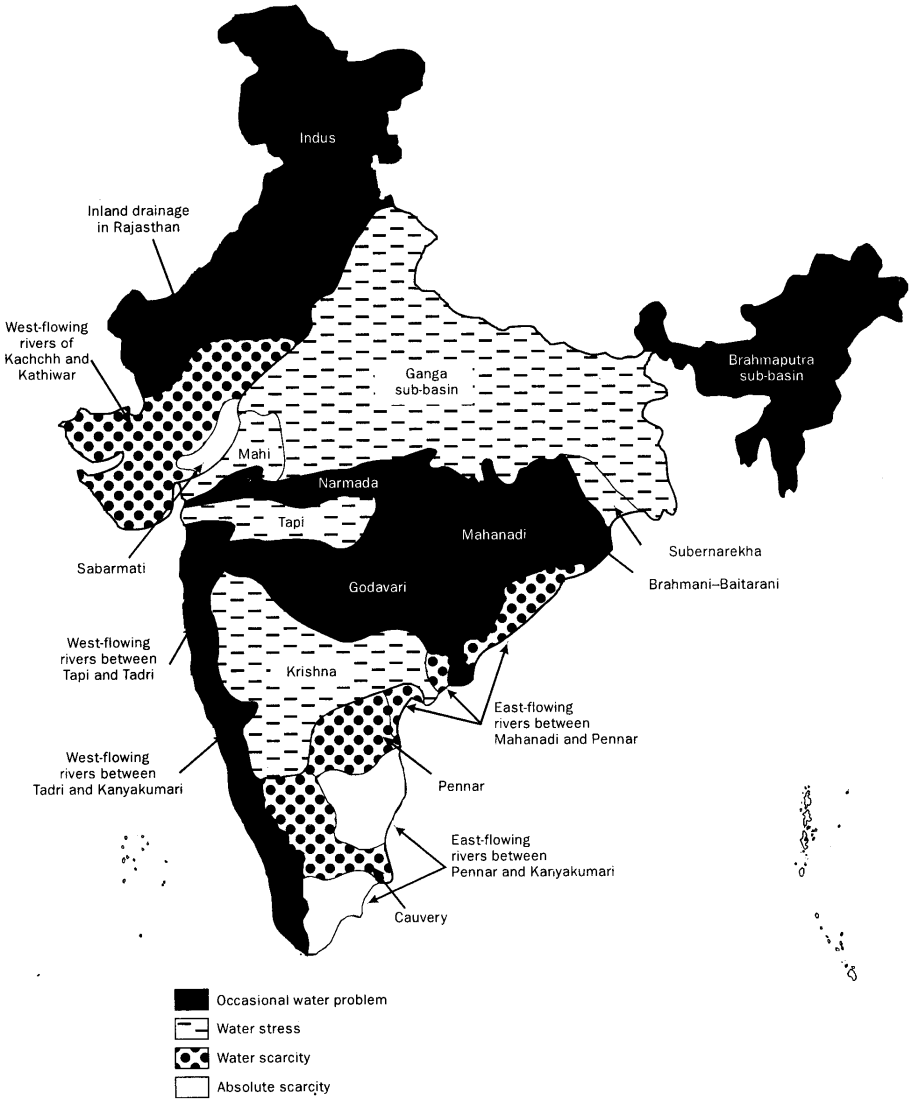


Figure 1 Availability of water in Indian river basins

Source: TERI (1998)

Water pollution

Although industrial and domestic uses of water constitute only a small percentage of the total water use, their impact on water availability is quite significant. The major sources of water pollution are domestic wastewater, industrial wastewater and effluents, and agricultural run off. Water pollution from domestic and human waste causes many severe water-borne diseases. Water quality of the Indian rivers is monitored at 480 stations under different programs such as Monitoring of Indian National Aquatic Resources (MINARAS), Global Environmental Monitoring System (GEMS) and Ganga Action Plan (GAP). A number of physical, chemical, biological and bacteriological parameters are measured (TERI 1998). The questions have been raised about the adequacy of the samples and parameters for monitoring water quality. For example, there are seven locations in the Sabarmati basin where sample for water quality or stream flow are being monitored, and the total number of samples collected from stream flow in a year is over 5000. But, groundwater quality is monitored only through two wells at each station which may not be termed as a representative for the location (Ballabh and Shunmughum 1999).

It is estimated that the sewerage generation from urban centers in India grew from about 5 billion liters a day in 1947 to around 30 billion liters a day in 1997. The total sewerage treatment capacity is estimated to be only 3 billion liters, which is approximately 10 per cent of the present wastewater generation (TERI 1998). Due to inadequate sewage disposal facilities, refuse invariably gets mixed up with freshwater bodies leading to water borne diseases such as malaria, cholera and even epidemics. Eighty per cent of the children in villages suffer from parasitic helminithic diseases caused through mixing of night soil in open water sources (Laxmi et al. 1997).

Wastewater generation from industries has grown from about 70 million liters a day in 1947 to about 3000 million liters a day in 1997 (TERI 1998). Of the total pollution generated by the industrial sub-sector, 40-45 per cent is contributed by industrial chemicals, about 38 per cent by food-processing industries and the remaining part is contributed by the paper pulp and other industries (World Bank 1996). Most of the 22 industrial zones identified as problem areas are located in Maharashtra, Gujarat, Tamil Nadu, West Bengal and Uttar Pradesh. Similarly, of the 24 grossly polluted river stretches, 15 lie in these states (CPCB 1995). Further, industrial units that cause pollution are both big and small. While big

units might have statutory requirements to set up different treatment plants, it has been difficult to enforce pollution control norms on small polluting units and industrial estates. Small scale units though have been operating since Independence, they grew rapidly in number after the 1970s. In 1971, the total number of registered small scale units was 0.24 million, which grew to 1.7 million in 1993 (CMIE 1995). Due to technical and institutional lacunae, pollution has been an intractable problem. The last few years have also seen a rising number of environmental jurisprudence. Citizens' groups have been able to mobilize judicial actions against the erring industries that led to court orders for closer of industries that flouted pollution control norms.

Agriculture has dual impact on water quality. Firstly, the excessive use of fertilizers and pesticides and their leaching into the water aquifers directly affects the water quality. Secondly, over extraction of groundwater causes deterioration of the water quality. The share of groundwater in irrigation has been increasing and that of surface water is decreasing. Of the 3841 administrative blocks in India, 620 (16 per cent) exploit groundwater to capacity or even overexploit it, and the development has been most extensive in Punjab, Haryana, Gujarat and Tamil Nadu (WRI 1994). Punjab which has been a pioneer in adoption of the green revolution technologies and contributed significantly to food self-sufficiency, has been experiencing declining water table for quite sometime (Chopra 1997).

Excessive withdrawal of groundwater without commensurate recharge, as well as leaching of pollutants into the aquifers cause deterioration of the groundwater quality. A survey of groundwater quality in 22 industrialized zones has indicated that in none of the areas groundwater was fit for drinking purposes (TERI 1998). Over-extraction of groundwater from deep aquifers in north Gujarat has resulted in increasing levels of fluorides and TDS in groundwater. Excessive withdrawal of groundwater from the coastal aquifers in Saurashtra and Kutch has resulted in saline intrusion into freshwater aquifers, rendering water in many thousands of wells saline (Bhatia 1992; and Sangvai 1994). Groundwater quality has major negative implications on its availability for various uses. Widespread deterioration of groundwater quality causes sharp reduction in the availability of fresh groundwater that can be used for various needs (Kumar and Ballabh 1999).

Competition and Conflicts Over Water

The growing demand for water poses a serious challenge to evolve more effective water policies to sustain growth in irrigated agriculture, promote efficient allocation of water across competing sectors and users and prevent degradation of the resource without any conflict. The current water management falls far short of the above expectations. Several case studies demonstrate that present patterns of water use in many areas are unsustainable, and that the water is becoming scarcer day by day and a stage is being set for all round competition for capturing the fast depleting water sources. The following few case studies demonstrate the nature and type of the conflicts.

Conflict between upstream and downstream users and inter-state water disputes

The rapid increase in the use of water in agriculture, industries and urban townships is causing scarcity of water down streams. In the absence of well-defined property rights in river/stream flow, surface water sources are *de facto* open access resources and therefore are being over-exploited. The riparian doctrine also does not promote socially optimum use of water (Ballabh and Singh 1997). When a river basin cuts across state boundaries, the upstream state over-appropriates water resources, leading to inter-state disputes. There are several examples of inter-state disputes over water, most notable among them being the Cauvery water dispute between Karnataka and Tamil Nadu. The Cauvery river basin is densely populated and irrigated agriculture dates back to over 2000 years. The Cauvery river system is almost fully utilized. The conflict over Cauvery was first negotiated between Karnataka and Tamil Nadu in 1892; more than a hundred years later, it has still not been solved. The interim award of the Cauvery Water Dispute Tribunal in 1991 created dissatisfaction in both the states, leading to conflict and riots (Folke 1998). Growing scarcity of water and political economy of states often lead to rejection of such tribunal awards. It is argued that the tribunal awards (allocations) take a narrow view of resource management, suggest enforcement of rigid deadlines and technical designs (see Datye et al. 1997). It also does not take into account regeneration of ecosystem and groundwater recharge which often becomes counter productive.

The over-extraction of water from unconfined groundwater aquifers also affects the water movement. For example, in the late 1960s and early 1970s, the flow in Sabarmati declined significantly due to excessive withdrawal by the Ahmedabad Municipal Corporation (Moench 1995). The decline in the river flow had been compensated by increased releases from upstream reservoir since 1976 (Patel et al. 1979). However, it appears that the increased withdrawals in the recent past for domestic and industrial purposes have adversely affected the availability of water in the vicinity of Ahmedabad and the down stream villages (Ballabh and Singh 1997).

Conflicts due to industrial and municipal pollution

As mentioned earlier, the magnitude of industrial pollution has been increasing in several basins. Several public interest litigations are pending in the State High Courts and the Supreme Court. The Supreme Court of India in 1980 invoked Article 21 of the constitution which guarantees right to life (including water and environment), and thereby restored people's natural right to water quality. Similarly, the Kerala High Court upheld the right of the residents of Lakshadeep Islands against the excessive groundwater pumping by large farmers (Saleth 1993). The Gujarat High Court in a landmark judgement declared that the "polluters have to pay". In spite of all these efforts, pollution of water bodies continues unabated in most of the river basins, which often leads to conflicts between industrial units and rural people (IGIDR 1999).

The National River Action Plan (NRAP) program has identified the Ahmedabad stretch of the Sabarmati river as one of the most highly polluted stretches in India. In terms of industrial development, Ahmedabad is one of the top ten cities in India with 15 to 20 per cent of its land occupied by industries. Everyday, 470 million liters of polluted waste is discharged from Ahmedabad city into the river Sabarmati, which consists of 78 per cent of the total waste water generated (Pangotra and Shukla 1994).

Since 1987, some of the sewage water is diverted to one of the medium irrigation systems, Fatehwadi canal, and is used to irrigate agricultural crops. When sewage water is allowed to pass through the infiltration layer, it is automatically filtered and nitrogen, potassium and heavy metals present in it are significantly reduced. But, the raw sewage water also contains pathogens, causing cholera and typhoid, and harbors salmonella bacteria, protozoa, eggs of

worms and all types of viruses (Gupta 1993). Untreated or partially-treated water could be used to provide limited irrigation only to selected crops.

In a study conducted by the Institute for Study and Transformation in seven downstream villages of the Sabarmati basin, 50 per cent of the respondents reported crop failures; 73 per cent yield losses; 69 per cent change in quality of grains; and 93 per cent reported pest infestation in crops due to polluted water. The impact of polluted water is not only limited to the croplands and livestock, but also adversely affects human health. The polluted water which stagnates in ditches and pounds in the villages, has become a convenient medium for breeding of mosquitoes rapidly, spreading malaria. Further, dangerous disease causing pathogens are carried to the downstream villages also. Besides, due to high soil moisture created by the water, a lot of shrubs and trees have come up on the common lands. The bushy growth of the shrubs and trees provides a safe hide-out to thieves and other anti-social elements, leading to increasing number of thefts and looting (Ballabh and Singh 1997).

There are reports that pollution has created acute shortages of drinking water in Tamil Nadu, Gujarat and many other states. This often becomes so acute that people organize processions and picket the Government offices protesting against the erring industrial units. For example, in 1997 in Tamil Nadu about 3000 people organized a procession against a dyeing and bleaching unit. They held the unit to be solely responsible for groundwater pollution and the resultant scarcity of drinking and irrigation water in the area (Moench 1999).

Conflicts due to water diversion to cities and industries

Increasing water scarcity has led to diversion of water to cities and municipalities from the reservoirs constructed for irrigation purposes. As more and more cities are experiencing water shortages and the impact of fluoride content, the state governments and local urban bodies are making provisions to bring water from long distances through pipelines. The most preferred source for bringing water from a long distance is a dam constructed to provide irrigation water. For example, between 1976/77 to 1996/97, water allocation from a multipurpose reservoir to the cities varied from a minimum of 7 per cent to 100 per cent of the water stored in the reservoir (Ballabh and Singh 1997). As fresh and competing claims are being made, farmers in the canal command areas are receiving less and less water, leading to conflicts among different water use sectors.

Several industrial and commercial establishments in urban areas are meeting their water needs from groundwater through their own deep tubewells. As the local supply recedes due to the growth of townships and industrial units, water is brought through long distance pipelines by digging deep tubewells in the rural areas or sometimes water is transported through tankers. This phenomenon is growing fast. As water scarcity becomes severe, the local people start agitating, and protests and demonstrations become a common feature. The most notable example is of Coimbatore and Erode districts in Tamil Nadu where district administration had to mediate between water sellers (who were selling water to industrial units and urban centers through tankers) and farmers. Several negotiations have taken place since 1997 when conflict arose for the first time and agreements were signed between water sellers and purchasers (industrial units) and representatives of farmers before the District Administration officials, which stood as guarantor. It was decided that no new deep bore wells could be sunk in the area. It has been reported that industry owners violated the agreement, as a result protest and conflict have become common features in the area (Janakarajan 1999). In many arid and semi-arid areas, farmers believe that groundwater transportation from rural to urban areas and industrial units is the major cause for groundwater depletion.

The competition for scarce water also leads to wide scale pilferages. It is quite common that farmers capture canal water and transport it to non-canal command areas often at the cost of other farmers in the command area. These farmers not only irrigate their own land but also sell it to other farmers at exorbitant prices. Similarly, the farmers also divert drinking water transported through long distance pipelines for irrigation purposes. The irrigation and water supply departments often do not have any control beyond the capture and release of water to the systems. The allocation of water resources to different sectors and users is determined more by default than by design (Ballabh et al. 1999; and Janakarajan 1997).

Intra-sectoral conflicts in water use

Competition for capturing of groundwater for irrigation purposes results in a decline of water table. Conflicting interests of well owners and profit-motive water sellers further add to this problem (see Shah 1993; and Shah and Ballabh 1997). The development of water markets has several positive impacts and

water is made available to even those who do not have capacity to invest in deep tubewells. However, it also has adverse consequences in terms of sustainability of groundwater. The discourses on development of water markets in the Indian context have largely ignored the impact of water markets on sustainability of the resource base. Further, competitive deepening of tubewells makes the access to groundwater increasingly skewed in favor of large, resource-rich farmers, leaving small farmers at a disadvantage in sharing the benefits of well irrigation (Vaidyanathan 1999; and Shah and Ballabh 1997). Competitive deepening of wells for irrigation also adversely affects the quantity and quality of drinking water in rural areas. As a result, the number of "no sources" villages is steadily increasing over time (Agrawal and Narain 1997).

Another ignored dimension of development of water markets in the Indian context, is that in many areas water markets are not yet fully developed, and therefore, unequal transaction takes place between sellers and buyers, resulting into exploitation of the buyers not only through the mechanism of price but also through non-price mechanisms. In several areas, water buyers have to pay compensation through crop share and labor which is exploitative (Shah and Ballabh 1993 & 1997; and Janakarajan 1997). Although the instances of open conflict between such buyers and sellers are sporadic and infrequent, purchasers are resentful of their conditions in many areas. Often conflict arises in surface irrigation system due to competing claims made by the river delta farmers and those covered by the basin irrigation systems. The general rule to resolve such type of conflicts is that the riparian rights of the farmers in the delta are protected. However, it has been seen over time that the delta farmers are the losers and their share in water is declining over time, which is leading to conflicts among old riparian right holders and new claimants of water resource in surface irrigation system (Appasamy 1997). The mechanism to resolve such conflicts through the court of law is not only costly but takes considerable time.

Intra-sectoral competition is not limited to agriculture only; industries, particularly the large ones, also take precautionary measures. In many instances, they ensure dependable water supply before establishment. The source may be either a river stream or a surface irrigation system or a reservoir. The small-scale industries, however, have to be dependent on groundwater sources and water suppliers through public industrial estates, both of these sources are relatively costlier than the water supplies to large-scale industries. Furthermore, an increasing number of cities and municipalities facing scarcity of water are

finding it difficult to meet the water requirements. Unauthorized establishment of deep bore wells is becoming a common phenomenon. The share of groundwater in the total supply of drinking water in many cities is steadily increasing. As a result, the water table is steadily decreasing; for example, in Ahmedabad, the water table in 1940 was about 12-15 meters, which went down to 60-80 meters in 1984 and further to 90-100 meters in 1997. As a result, a number of tubewells have been abandoned (Gupta 1993).

Who Wins and Who Loses

As the competition for fresh water is increasing, water allocations among different sectors and users is an important issue to understand. Broadly, there are three mechanisms for the allocation of water: (i) Public administrative, (ii) user-based, and (iii) private or market-mediated allocation (Meinzen–Dick and Mendoza 1996). Administrative allocation of water includes publicly managed allocation of water among nations, across sectors, or within basins and irrigation systems, through quantity distributions or administered water pricing schemes. The user-based allocation systems are controlled by the users with a direct stake in the use of water, often operating within pre-defined water right. Market allocation of tradable water rights attempts to structure economic incentives for water users, whether irrigation, industrial, or municipal users, to consider the full opportunity cost of water when making water use decisions. The four categories of users, viz. rural and urban, domestic, industrialists and farmers, are interest groups in the sense that they have specific claim on the resource under contention and lobbies actively promote their interests. In addition to these four groups, there are water managers, pollution control boards and social activists who influence water allocation and management. Among the last three categories, water managers have a strong influence. The irrigation department, water supply departments and municipalities have strong influences on capture, shortage and distribution of water resources.

Table 1 summarizes the basic character of the user groups and other related people, their nature, claims, strengths and ability to influence water management and allocation. It is common knowledge that landowners use maximum amount (about 93 per cent) of the total fresh water. They are also large in number and are loosely organised groups under the banner of farmers' union. They constitute

Table 1. Competition and conflicts over fresh water: Who wins and who loses

Who are they ?	Rural domestic users	Urban domestic users	Land owners	Industrialists	Water Managers/municipalities	Pollution control boards	Social activists/ NGOs
How do they advance their claim	Basic necessity	Basic necessity	Food security/ productivity	Growth of economy and employment	Scientific experts, national and public good	Pollution control monitoring and enforcement	Collective consciousness, equitable distribution and conservation
Are they organized and homogenous	No, dispersed and highly stratified	Concentrated block although no formal association but exert pressure through/on municipalities	Farmers union, large vote bank, but segregated between large & small	Yes, have large clout over Central and State Governments,	Yes, cadre based organization	Cadre based organization	Unorganized and dispersed
What are their goals and interests	Access to safe drinking water	Access to safe drinking water	Reliable and adequate supply of water for agriculture	Reliable, cheap and sufficient water for industrial production and facilities for drain-out waste water	Efficient and reliable supply of water services, conservation of water bodies	Pollution control of water bodies	Conservation of water bodies, efficient and equitable allocation of water

Table 1 Contd.

Who are they	Rural domestic users	Urban domestic users	Land owners	Industrialists	Water Managers/municipalities	Pollution control boards	Social activists/ NGOs
Do their interest clash with other claimants	Yes, with land owners, urban water users and industrialists	Rural water users- both farmers and domestic users	Industrialists, urban domestic water users	Rural people and urban domestic water users, pollution control boards	Farmers and users	Industrialists and urban municipalities	Large farmers, Industrialists
Are they able to achieve their goal	No	Only poor urban slum dwellers suffer	Small farmers suffer	Yes, secured water supply and able to bypass pollution laws	Yes	No	Demonstrate alternative practices but unable to make impact on the sector as a whole

a large vote bank. However, landowners are not a homogenous group and can be differentiated in terms of size of holding and degree of commercialization. Because of their size and unions, they have a strong influence on local legislatures and provincial governments.

Industrialists are the smallest group in terms of their number but have disproportionate influence over the state and central governments. They protect their interests by promoting the national causes of economic growth and employment and use their superior financial powers. As a result, they have been often able to secure rights over fresh water even during extremely adverse conditions and bypass water pollution laws. On the other hand, the urban domestic users who constitute the second largest group, have an advantage over their rural counterparts in terms of concentration. Their main objective is to have secure and safe drinking water. They exert pressure through and on municipalities which, in turn, help them secure fresh water. When water is transported from distant rural areas, their interests clash with landowners and rural domestic users. Urban domestic water users are not a homogenous group and there are differences in access to fresh water, based on their economic strength and location within the city.

The rural domestic water users by far are the largest in number; but they are dispersed, stratified and the weakest among all the claimants of fresh water resources. Although less water is required for domestic purposes, often collecting it needs walking a few miles. In several areas, agriculture receives sufficient water for irrigation but no water is available for domestic purposes. In fact, the high level of extraction of groundwater for irrigation has reduced the water utilization for household purposes in the arid and semi-arid areas (UNICEF 1997). The stated national water policy which gives primacy to drinking water has not been enforced.

The remaining three groups are responsible for managing fresh water resources. Faced with water scarcity, the preferred approach has been the identification of new sources, capture, store and transport of water through a centralized system of administration by the water managers. In the allocation of water, power relations play an important role among different sectors, regions and social groups. There is a complete institutional failure in addressing the issues of efficiency, equity and sustainability in allocation of water resources (Ballabh et al. 1999). In these competing claims and political contestation, the scarce fresh water is allocated to the influential sectors, such as urban domestic

needs and industrial units. Urban domestic users, being more articulate and politically powerful at the state and national levels, along with an organized urban administration, are better placed to demand and appropriate fresh water resources for their own needs, while rural domestic users get the last priority.

The industry enjoys supremacy on account of its concentrated economic power and ability to pay a higher price for water. Also, weak enforcement of pollution laws allows industries to impose water pollution externalities and diseconomies on rural people. The poor people in the villages, in far flung areas and urban slum dwellers are worst affected by these political contestations (Ballabh et al. 1999; and Vani et al. 1999).

The Central Pollution Control Board together with the state-level Pollution Control Boards have the responsibility to determine pollution control norms, and to monitor and enforce them. By and large, the Pollution Control Boards have failed to enforce the pollution control laws enacted by the central and state governments. These institutions are largely concentrating on mega and big cities and ignoring small towns and cities who also contribute a large percentage of the urban sewage. They lack financial resources to invest in waste treatment facilities. Though a Common Effluent Treatment Plant is mooted as a solution to this, its adoption across cities has been very low. The existing institutions have, by and large, failed to address these issues (Bhatt 1986; and Ballabh and Shunmugham 1999).

The response of NGOs and social activists has been critical in identifying alternative technologically feasible and institutionally workable solutions. The NGOs are a very few in number and their scale of operations is also small in relation to the magnitude of the problems. They advocate local water harvesting as a sustainable solution to the rural drinking water needs, and participation and control of farmers in the management of irrigation systems. The involvement of farmer organizations in the irrigation management can lead to decentralized management and local capacity building for greater efficiency in source utilization. So far, 13 states in India have formulated irrigation management policies that encourage effective involvement of farmers in the irrigation management. Under the Participatory Irrigation Management (PIM) program, irrigation management functions below the outlet level are being transferred to farmers organizations. However, the implementation of PIM program has been at a very slow place in many states due to several reasons (Brewer et al. 1999). Lack of commitment on the part of irrigation managers and proper orientation are some of the reasons

for their poor adaptability. The constructive community responses at the moment are sporadic, patchy and unlikely to be a big answer to the emerging problems. Their involvement needs to be enhanced and conditions need to be created for their meaningful participation.

To sum up the discussion, as the situation of fresh water resources is further tightened and the gap between supply and requirements widens, the competition and conflict over water would increase. The political economy of state supports urban rich domestic users, industrial units and rich landowners. The losers are poor farmers, urban poor and people living in remote rural areas who are unable to meet their basic needs. The increasing pollution and lack of proper sewage and effluent treatment further accentuate the problem of water scarcity. A recent World Bank study has estimated that the total cost of environmental damage in India amounts to US$ 9.7 billion annually. The damage to water bodies constitutes substantially to the overall environmental damage (World Bank 1995). Under these circumstances, will India be able to meet the challenges and provide safe water for domestic uses, as well as meet the needs for irrigation water to enhance agricultural production?

Meeting Future Challenges

It is evident from the previous discussions that India will be facing severe water crisis in the coming decades. It is argued that 50 per cent of India's new water demand can be met by improving effectiveness of irrigation. The remaining part of the increased demand can be met by small dams and conjunctive use of aquifers, etc. (Seckler et al. 1998). It is estimated that proper watershed development can conserve a minimum of 10 per cent of the current water use in irrigation from all sources (Vaidyanathan 1999). However, the piecemeal treatments to address land and other problems in implementation of watershed programs, rather than an integrated program has not brought the desired results. Similarly, there were well-developed traditional water-harvesting systems to meet water requirements for agriculture and domestic water purposes (Agrawal and Narain 1997). The first Irrigation Commission had highlighted the importance of minor irrigation and small water-harvesting structures, and their problems. In spite of some efforts, the development and maintenance of traditional water systems succeeded only moderately (Ballabh and Choudhary 1999).

The institutional responses to the current water crisis have been sectoral and segmented. These approaches often have a negative impact on other water users, as well as on water bodies (Ballabh et al. 1999; and Kumar and Ballabh 1999). Property rights over water are contested under four sets of legal framework: traditional, common law, legislative and institutional (Moench 1999).

Past one and a half centuries of water management in India is replete with examples of evolution of relationships between the community and the environment on the one hand, and between the community and the state on the other. This relationship ignored complete social structures, which it was supposed to serve. The users were never involved in the planning of water development projects and evolving water allocation decisions. The conflicts, as highlighted in this paper, can be resolved only through integrated management, involving all stakeholders. The new water management institutions should not only effectively manage ground and surface water bodies but should also determine the import and export of water from and to the basin. Further, the institution should not only be involved in the allocation of water, but it should also involve itself in the preservation and maintenance of the water balance in the hydraulic environment of the basin. This consideration sometimes runs contradictory to the task of allocation and conservation of water. Adoption of these strategies means reorientation of the relationship between state, people and community, which is lost due to excessive involvement of the state in the water sector. The real challenge of mitigating water crisis in India, therefore, lies in creating such robust self-governing people's institutions for water management.

References

Agrawal, Anil and Sunita Narain, eds. 1997. *Dying wisdom: rise, fall and potential of India's traditional water harvesting system.* New Delhi: Centre for Science and Environment.

Appasamy, Paul A. 1997. Managing conflict in the Bhavani basin. Paper presented at the seminar on IDPAD. Amersfoort: IDPAD, October 11-17, 1997.

Ballabh, V. and Kameshwar Choudhary. 1999. *Consultation workshop on small water harvesting structures: technology, institution and management.* Workshop Report No. 15. Anand: Institute of Rural Management.

Ballabh, V. and Katar Singh. 1997. Competing demands for water in Sabarmati basin: potential and future conflicts. Paper presented at the seminar on IDPAD. Amersfoort: IDPAD, October 11-17, 1997.

Ballabh, V. and V. Shunmugham. 1999. Database needs in decision making for sustainable basin management: illustrations from Sabarmati basin. Working Paper No. 132. Anand: Institute of Rural Management.

Ballabh, V., R. Prabhakar, M. Dinesh Kumar, Vina Vani, Arun Mudgerikar and Viswas Joshi. 1999. *Western regional consultation on fresh water issues.* Workshop Report submitted to Unicef, Gandhinagar. Anand: Institute of Rural Management.

Bhalla, G. S., Peter Hazell and John Kerr. 1999. *Prospects for India's cereal supply and demand to 2020.* Discussion Paper 29. Washington, D.C.: International Food Policy Research Institute.

Bhatt, S. 1986. *Environment laws and water resources management.* New Delhi: Radiant Publishers.

Bhatia, B. 1992. Lush fields and parched throats: political economy of groundwater in Gujarat. *Economic and Political Weekly 27*(51-52): A 12-170.

Brewer, J., Shashi Kolavalli, A. H. Kalro, G. Naik, S. Ramnarayan, K.V. Raju and R. Shakthivadivel. 1999. *Irrigation management transfer in India: policies, processes and performance.* Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.

Central Pollution Control Board (CPCB). 1988. *Status of water supply and wastewater collection, treatment and disposal in Class 1 and Class 2 cities.* New Delhi: CPCB.

Central Pollution Control Board. 1995. *Implementation status of pollution in major polluting industries.* New Delhi: CPCB.

Chopra, Kanchan. 1997. Water use in the Punjab region: conflicts and frameworks for resolution. Paper presented at the seminar on IDPAD. Amersfoort: IDPAD, October 11-17, 1997.

CMIE. 1995. *India's industrial sector.* Mumbai: Centre for Monitoring Indian Economy.

Datye, K. R., Suhas Paranjape, K. J. Joy and Seema Kulkarni. 1997. Krishna valley development: emerging options for sustainable development and conflict management. Paper presented at the seminar on IDPAD. Amersfoort: IDPAD, October 11-17, 1997.

Falkenmark, M., J. Lundqvist and C. Widstrand. 1989. Micro-scale water scarcity requires micro-scale approaches: aspects of vulnerability in semi-arid development. *Natural Resources Forum* 13(4): 258-267.

Folke, Steen. 1998. Conflicts over water and land in South Indian agriculture: a political economy perspective. *Economic and Political Weekly* February 14: 1988.

Gupta, S. K. 1993. Water for recharging of aquifer in Ahmedabad, India. *Indian Journal of Earth Sciences* 9(2): 29-35.

Government of India. 1999. *Water resources development plan of India: policy and issues.* New Delhi: Ministry of Water Resources, Government of India.

IGIDR. 1999. *Clean water: environment governance.* Mumbai: Indira Gandhi Institute of Development Research.

Janakarajan, S. 1997. The survival of the fittest–Conflict over the use of groundwater: some evidence from Tamil Nadu, South India. Paper presented at the IDPAD. Amersfoort: IDPAD, October 11-17, 1997.

Janakarajan, S. 1999. Conflicts over the invisible resource in Tamil Nadu: is there a way out? In *Rethinking the mosaic: investigations into local water management, eds.* M. Moench, E. Caspari and Ajay Dixit. Colorado: Institute for Social and Environmental Transition.

Kumar, Dinesh M. and V. Ballabh. 1999. *Water management problems and challenges in India: an analytical review.* Working Paper No. 140. Anand: Institute of Rural Management.

Laxmi, Vijay, Jyoti Parikh and Kirit S. Parikh. 1997. Environment: can neglect no longer. In *India development report 1997*, ed. Kirti S. Parikh. Delhi: Oxford University Press.

Meinzen-Dick, Ruth and Meyra Mendoza. 1996. Alternative water allocation mechanisms: Indian and international experiences. *Economic and Political Weekly* March 30: A 25-30.

Moench, M. 1995. To enable or control? Legal and regulatory approaches to groundwater management in India. In *Groundwater law: the growing debate*, ed. M. Moench. Ahmedabad: VIKSAT-Natural Heritage Institute.

Moench, M. 1999. Addressing constraints in complex systems: meeting the water management needs of South Asia in the 21st Century. In *Rethinking the mosaic: investigations into local water management,* eds. M. Moench, E. Caspari and Ajay Dixit. Colorado: Institute for Social and Environmental Transition.

Patel, A., P. Sharma and K. R. Ramanathan. 1979. Integrated approach to the management of water supply for the city of Ahmedabad and its metropolitan areas. Current trends in arid zone hydrology, today & tomorrow, Delhi.

Prabhakar, R., Vina Vani, Ketan Tatu and Shweta Patel. 1997. *Case study on freshwater management in arid regions* (Gujarat). Anand: Institute of Rural Management (mimeo).

Pangotra, Prem and P. R. Shukla. 1994. *Management plan for river Sabarmati.* Ahmedabad: Centre for Environment Planning and Technology.

Rosegrant, M. W., C. Ringler and R. V. Gerpacio. 1999. Water and land resources and global food supply. In *Food security, diversification and resource management: refocusing the role of agriculture?*. G. H. Peters and Joachim Von Braun (eds). Ashgate.

Sangvai, S. 1994. Peoples initiative to solve water crisis in Saurashtra. *Economic and Political Weekly 29* (34).

Saleth, R. Maria. 1993. Water rights system: is it feasible for India? *Journal of Indian School of Political Economy* 5(3): 578-594.

Seckler, D., Upari Amarasinghe, David Molden, Radhika de Silva and Randolph Barker. 1998. *World water demand and supply 1990 to 2025: scenarios and issues*. Research Paper No. 19. Colombo: International Water Management Institute.

Sengupta, Nirmal. 1985. Irrigation: traditional vs modern. *Economic and Political Weekly* special number, November 1985.

Shah, Tushaar. 1993. *Water markets and irrigation development: political economy and practical policy.* Bombay: Oxford University Press.

Shah, Tushaar and V. Ballabh. 1997. Water markets in north Bihar: six village studies in Muzaffarpur district. *Economic and Political Weekly* 32 (52): A183-190.

Sundar, A. 1987. Water management in Saurashtra region of Gujarat. *Wamana*, April: 1-10.

TERI. 1998. *Looking back to think ahead growth with resource enhancement of environment and nature.* New Delhi: Tata Energy Research Institute.

UNICEF and WWF. 1997. *Fresh water for India's children and Nature.* New Delhi: UNICEF.

Vaidyanathan, A. 1999. *Water resource management: institutions and irrigation development in India.* Bombay: Oxford University Press.

Vani, Vina, R. Prabhakar and V. Ballabh. 1999. *Water scarcity in western India: agenda for future action?* Anand: Institute of Rural Management.

Visaria, L. and Pravin Visaria. 1995. *Prospective population growth and policies for India.* Working Paper No. 75. Ahmedabad: Gujarat Institute of Development Research.

World Bank. 1995. *The cost of inaction: valuing the economy-wide cost of environmental degradation in India*. Washington, D.C.: Environmental Division, World Bank.

World Bank. 1996. *India's environment-taking stock of plans, programs and priorities: an assessment of the environmental action program- India.* Delhi: South Asia Regional Office, The World Bank.

World Resource Institute (WRI). 1994. *World resources 1994-95: guide to the global environment.* New York: Oxford University Press.

8

Healthy Water Bodies and Weakening Institutions: A Historical Appraisal[1]

B. C. Barah

Efficient water appropriation is an ancient tradition in the country. From time immemorial, numerous methods of water appropriation and varied types of structures in the ancient India sustained water resources. The rich heritage and cultural values formed the core to the unique traditional water institutions. Besides being sustainable, the traditional water systems also endowed with in-built environmental merits.

Unfortunately, these wonderful systems have been destroyed beyond repair, and the new approach of irrigation development ignored the traditional water institutions. The new approach (emphasizing on tube wells, taps, canals and dams) unfortunately considers centuries old successful water resource development as irrelevant. The continuation of the neglect of water institution management (including pond, tanks, *tanka*, *talab*, etc.) dragged them to the brink of death. The emphasis on productive consideration of the imperial masters began the neglect of the minor irrigation, which were people friendly as well as perform several environmental and equity functions. On the contrary, the royal patronage (serving as regulatory mechanism), people's participation and collective action, etc. survived the traditional water system for ages. The meticulously designed strategy for water resources embedded in the traditional ingenuity should be properly understood, which is critical to improve several of the modern but unsustainable method of water appropriation. An understanding of the ancient methods of *Kudumaramat, phad* management techniques and the *moghal* architectural designs of *haveli* system, *tanka* and *baori*s, etc. provides important

[1] This paper is drawn from Barah (1996), which provides elaborate discussion on various systems.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

lessons in the context of sustainability. Combining man and water in an interwoven way, the traditional systems manifested the excellence of indigenous knowledge (Chambers 1977; and Chambers et al. 1989). The interface of man and water resources is necessary to ensure sustainable water resource development.

But lack of information and ignorance of technicality of the systems has caused sheer neglect of their maintenance resulting in the demolition of the traditional water institutions. Hence, there is a need for synergy between traditional knowledge and modern system for sustainable development of water resources.

Water Resource Development

The historical empiricism on water resource development is extremely fascinating and the lesson derived from such knowledge has far reaching implication to society, whose neglect contributed to the failure of the system and widening gap between irrigation potential created and utilized. The modern methods emphasize more on engineering solution and push the users to the receiving end rather than being the partners to the management. This is a primary factor leading to the unsustainability. The magnitude and growth of investment on major irrigation systems during the last four decades are mind boggling. Total plan outlay on irrigation, in nominal terms, and flood control in India increased from a level of Rs 6,647 million in 1961 and Rs 169,786 million in 1985-1990 to Rs 389,300 million in 1990-95. But, compared to major irrigation,

Table 1. Growth of irrigation in India

Item	1980-81	1984-85	1998-99
Gross cropped area (m ha)	172.6	176.4	182.7
Irrigation (m ha)			
Major and medium	22.7	25.3	27.5
Minor	31.4	35.2	40.9
Total	54.1	60.5	68.4

Source: GoI (1990)

the minor irrigation, despite negligible investment, demonstrated impressive performance.

The past experience shows that the sources of minor irrigation such as ponds, lakes, tanks (*sagar*), wells, *baories, nadies,* small *kutcha* bunds, *tankas,* kund, *khadins, guhls, ahars,* etc. were suitably located and constructed with excellent engineering techniques. The scarce rainwater was skillfully conserved and stored for future use for man and animal (e.g. the famous chain tanks system in south India). The successful management of water resources was made possible due to royal patronage and peoples' participation. On a number of occasions, kings and chiefs, as a part of self-glorification, used to erect *Jalstambha* (liquid pilar of victory) rather than *Jayastambha* (victory pillar to celebrate the victory from time to time), symbolizing the unique method of success. But the tradition unfortunately, becomes the thing of the past. Yet despite the onslaught, there is ample scope for revival of the traditional systems. Many of the ancient water bodies even today perform useful functions in many parts of the country. There were as many as 58,528 tanks (large water structures) in Andhra Pradesh and 43,474 tanks in Karnataka during 1955-56 (Reddy 1993; and Rao 1988).

Tanka, Talab, Baories, etc. in Rajasthan desert traditionally performed marvellous job of collecting and storing runoff water. The *phad* system in Maharashtra, *Haveli* system in Madhya Pradesh, *Khadin* in Rajasthan and *Ahar-pyne* in Bihar are among such excellent water harvesting systems. This paper presents a brief review of some of these systems.

Declining trends of traditional water-harvesting systems

The so-called "productive consideration" facilitated profit accumulation of the imperial rulers, but the democratic state also continued to neglect the minor irrigation sources in favour of big irrigation projects. Imposition of taxes, water cess, dry and wet assessment and taking away the control of water from the hand of users are some of the state initiatives shattering the community organizations (like *Kudimaramat*) and loosing people's interest in the maintenance of their own water system.

Moreover, mining of water and intensive agriculture severely harmed the catchment areas of old water bodies. The uncared tank bed and large-scale

encroachment of catchment area by individuals and the state are widespread. Large residential colonies were built on the bed of tanks and lakes, and the state machineries encroached the tank bed and auctioned it to the Town Development Trust. Table 2 gives an illustration of the present status of the old water systems of Jodhpur City. In brief, the pond lost the fresh rainwater, soil lost the restitution, the atmosphere lost its purity and the tank lost the pleasantry.

Table 2. Old water structures in Jodhpur city

Old water structure (Talab, sagar, etc.)	Converted to
Phoolalao	Vyas Park
Jagat sagar	Public Park
Bakhat sagar	Nehru Park
Kalyan sagar	Raik Bag(Urban)
Masuria talab	Masuria colony
Fadusar Kaliberi	Mining belt
Abhoy sagar	Residential colony

Need for revival of traditional water systems

The expansion of canal and well irrigation in the last two decades contributed to increase in the irrigated area. But mismanagement of water resources in these two irrigation sources has caused many environmental problems and land degradation. The revival of the maintenance system of tank and other water bodies potentially improves the irrigation potential without harming environment, besides improving the cost effectiveness. Question is how to go about it? The indigenous knowledge base for the management of the traditional water harvesting systems is credited as a necessary requirement in this context. Proper documentation of these water-harvesting systems and understanding of the institutional mechanisms of their management are necessary to derive appropriate lessons for future planning. The information also helps revamp the water policy for sustainable development.

Traditional Water Systems

Water works in south India

The most part of South India suffered severely from water scarcity in the past due to lack of efficient network of water system and erratic rainfall (Raju 1941). The water scarcity was felt so much during the Sangam period (believed to be upto 300 BC) in South India that the kings and people were compelled to invent mechanisms to hold rainwater. By combining technical skill and energy, the people of Kongu valley sunk deep wells and brought out water by breaking hard rocks with their pickaxes, which attracted the royal admirations. The wells supplemented them to great extent and judicious use of limited water supply of the people convert the arid tract into arable lands.

The kings of *Chola* kingdom ingeniously tamed the Kaveri river and supplied abundant water for cultivation. As a result, the region was named as "Punal nadu" (a land of water). The Chola Kings, particularly Karikala devoted much of their efforts to control Kaveri, constructed tanks and bund raising both sides of Kaveri by embankment and dykes, cutting inundation channels, etc. The master plan of raising the banks of Kaveri river and cutting in channels to tame the river was a stupendous task. Should this task be dubbed as "rudimentary" in recent time?.

As there was no supply of water from the rivers (like the Tungabhadra, the Pennar, the Krishna and the Godavari), people in the region had to depend on the storage reservoirs and deep-sunk wells. Kakatiyas of Warangal built large number of artificial tanks, which were suffixed with such terms as *samudra, ceruvu or teruvu, kere or Kereya*. The spatial distribution of various water structures indicates their concern towards the regional imbalances of water resource development; an aspect usually ignored by modern planners. In addition, there were number of streamlets called *Vagus*, to receive rains. The location of tanks in the hilly terrain inter-connecting surrounding hillocks by small bunds indicates the application of technical parameters in planning such work. The use of undisturbed natural contour (physiographical evidence), economics of cost saving, user-friendly management practices and environmental consideration, all combined together sustained the systems. The organization of management of irrigation system involved the village officials (*ayagars*) such as *Karnam*,

Pedda Kapu, talari, purohit, blacksmith, goldsmith, carpenter, potter, waterman (*Vetti*), barber and shoemakers.

The Vijayanagar kings followed the Kakatiya model of rural development. There were elaborate irrigation works throughout the state covering areas south of the Tungabhadra and the Krishna. The Porumamilla tank in Cuddapah is the living symbol of great work of the Vijayanagar period, which continues supplying water without interruption. The engineering specification, art of selection of tank location, materials used, and the anticipated benefits from the water works signify the technical perfection and foresightedness of the early builders.

In the period of Bukka-II, Singaya Bhatta, a hydraulic engineer called *Jala Sutrada*, diverted water of the river Henne through a channel called Pratapa-Bukkaraya Mandala channel to the Siruvera tank at Penugonda. The rulers, village assemblies and *Mahajanas* (money lenders) took active interest in the maintenance of water works and utilized the services of man and materials. Remission of taxes and endowments by village assemblies, temples and philanthropists were encouraging factors too.

The construction of tanks was a societal activity involving kings, queens, members of royal families, ministerial staff (chieftains, officials and nobles) temples, villages and individuals. In fact, tanks in South India were not only the socio-economic and cultural activity but also a source of religious belief. The demand for temple tanks in the area was also a source of development of rainwater harvesting system. Grand celebration to mark the victory of war also associated with digging tanks. The irrigation system in the Madras Presidency was well developed and could be classified into five heads: River-fed canal system, river-fed system of tanks, rainfed tanks in groups, isolated tanks, and wells. There were 30 canal projects, 22 reservoirs, 33,086 tanks and 728,092 wells to irrigate annually between 11 to 12 million acres of cropland during the British period. In addition, there were nearly 35,000 tiny water structures. In total, there were as many as 337,311 water structures in the presidency. That is why Sir Thomas Munro clearly mentioned that the development of water resource was remarkably advanced at the beginning of the British period (Sivakumar 1988).

Golden age of tanks (937- 1336)

This period showed the booming of activities of constructing new villages, *Agrahara, Satra* (guesthouse and temples) and tanks. A significant development

in this period was the institutional arrangement for tank system of empowering the local government. The participation of people was given a high priority. The village headman (*Gaunda)* took leadership representing the institution called *Nagara*. For groups of villages (*Nadur*) Nadagaunda was the leader. The *nadurs* were formed to facilitate construction of common source of irrigation. During the reign of Kalyana Chalukya (973-1184 AD), the tank building activities benefited the districts of Dharwar, Bellary, Chitradurga and Shimoga.

Vikramaditya VI (1080 AD) constructed a number of tanks and repaired the breach tank of Tambasamudra. Somesvara IV (1184 AD) introduced a gift tax called *Punnaya Sunka* to the tank at Gonasamudra in Dharwar, for the purposes of dredging and repairing in stone and wood sluice. Nokkayya (1062 AD) constructed Santagere, Molakere, Pattana- swamigere and Talavidagere in the Santara Kingdom (Shimoga district).

The Vijayanagar empire (1336-1565) contributed significantly in building up of water structures in the pre-British period and gave priority for the upkeeping of water structures. The capital city of Vijayanagar had plenty of water to satisfy the needs of everyone; there were 70 canals running through the city. These structures benefited the common people and enriched the treasury. In 1369 AD, a famous tank called Porumamilla was constructed. The royal reward for merit and recognition of the expertize were important factors for development of the resource.

Thus, the fourteenth century showed humming construction activities of tanks, reservoirs and canals, and in the fifteen century, priority was given to renovation and maintenance of these tanks where cooperation and contribution from people were sought. The modern planners can draw lessons from the success stories and sustainability of old water-harvesting systems. The success was guaranteed on account of the delegation of specific responsibility to person concerned[2] . This limited description of the glory of tank irrigation of Karnataka tells three points. (a) There was consistent effort for building up water structures over many centuries to hold the runoff water and harvest for the benefit of human being. (b) Royal patronage and people's participation together made the system a success and sustainable. (c) The development of water resources

[2] Krishnaraya (1509-1529 AD) while granting *Chandragutti* as an *amaram* (fief) stipulates that the dredging of the silt from the local tank had to be done regularly every year and the responsibility for this essential task was rested on the gaunda Senabova, a resident of the village.

seems to combine sense of fulfilment of basic needs, love for beauty, devotion to religion, the God and sentiments.

Traditional Water Systems: Technology, Design and Practices

The construction of tanks reached a commendable height before the beginning of the British rule. The British rulers attended to renovation and repair

Box 1. Porumamilla Tank

This tank was constructed by connecting four natural hills by three short earthen dams. The length of the bund was 4,500 feet and the total length including the hill is 14,000 feet (about 5,000 rekhadanda). At the deepest portion, the bund is about 12 feet wide at the top and 150 feet wide at the bottom. Its height is about 33 feet. The side slope provided for the bund is 2 horizontal to 1 vertical. Further it was stated that a tank should follow certain norms for its success. A good tank must satisfy some minimum requirements (*sadhanas*), and be guarded against faults (*dosha)* in the construction work (see Annex).

It can be surmized that the construction of bund on a bed of hard impervious clay and providing of surplus escape arrangements through sluices built at the end of the bund were well known and full proof system.

The recognition of hard and successful work and encouragement to scholarly and expert services of the tank systems was also a crucial factor for the success of the system. Employing unskilled labour for earth work and skilled labour for masonry and stone works were usual practices. Utilization of the services of *dasa vidya Chakravarthi* (master of ten sciences) and *Jalasutra* (hydraulic engineer) like Singaya Bhatta, technical recommendation of expert (*siddharasodhadinde*) for the water works indicate the seriousness and respect for the professionals. The site selection and size of tank, position of water weirs, construction material used, speak of the knowledge of the civil engineering sciences. The fact that without separate department of public works, which is common in the present days, and high profile officials for such works, the system worked well; it simply indicated the managerial competence and people's participation.

of these structures selectively. Some of those continue to remain in use for centuries, demonstrating the proof of the indigenous knowledge of the ancient builders in terms of design and construction of tanks. For example, technological specification of the Ananthrajasagar tank at Porumamilla in the Badvel taluk of Cuddapah district, constructed in the year 1367 AD, is one of the few monumental living instances of excellence of the Vijayanagar empire.

There is variation of the traditional water-harvesting technology from location to location. The location specificity, topographical adaptability and community involvement are reflected in the diversity of the technology. The shape and size of the water bodies and the method of water appropriation in South India differ from that in other parts of the country. Among the other variation of systems prevalent in other parts of the country, the prominent ones include *Khadins* in Rajasthan, *Haveli* system in Madhya pradesh, *Guhl* in Himachal Pradesh and Uttar Pradesh, *Ahar* in Bihar, etc. Depending on the nature of water appropriation, the systems are further categorized as check dam, diversion system and water-spreading submergence system.

Khadin system (Rajsthan)

Khadin is an ancient water harvesting mechanism in the desert environment of Western Rajasthan. It is an integrated land and water use system. It is practiced in the rocky catchment area and valley plains in proximity. The run-off from the catchment area is stored in the lower valley enclosed by an earthen bund. Surplus water if any, passes out through spillway sluice. The water so appropriated stands on *Khadin* throughout the monsoon period and percolates down the soil by the first week of November. This leaves the soil moist to enable to plant wheat or chickpea. Thus, these crops can be harvested without irrigation. The soils in *Khadin* are fertile as runoff water carries fine sediments and help soil reconditioning. The rocky catchment areas are mainly sandstone or limestone to generate effective run-off .

Haveli system (Madhya Pradesh)

Farmers in upper part of the Narmada covering Jabalpur, Narsingpur, and part of Damoh and Sagar in Madhya Pradesh have been practicing an interesting water-harvesting system called the *Haveli* system. It comprises of holding

rainwater in the embanked fields, which are enclosed on four sides and retaining the water so impounded until the sowing time approaches. The system benefits more than 0.35 million acres of land by providing supplementary irrigation in the state of Madhya Pradesh. Rainwater is retained in heavy black cotton soil and clay in nature (locally called *kabar*) until the end of the monsoon season and released (called *mongha*) before the onset of the *rabi* season, so that the fields become ready for the *rabi* crops. It not only provides the required moisture for the rabi crop, but also enriches the ground water level through percolation. It also reduces the water distribution and management problems. The indigenous natural control of *kans* weed in the *kharif* season is another remarkable benefit. When rainwater is impounded and made to stand in the fields for months, the weeds rot and die away resulting in free weed control system. The system is probably one of the unique water-harvesting system developed by the *Gond* tribals. However, the system is on the decline because of introduction of soybean in the *kharif* season and the construction of Bargi dam in the region (Pangare 1992).

Drinking water supply (Rajasthan)

The city of Jodhpur, under the dynastic rule made elaborate arrangement for drinking water through different water structures. Between 1459 and till the end of the 19th century (1897-98), the rulers of Jodhpur constructed a number of different types of water structures. The design and material of construction of these structures demonstrate engineering excellence and thoughtfulness of the rulers. The entire Chonka Daijar plateau in this region measuring a length of 30 km and breadth of 5 km served 50 functional surface water bodies like *nadies* (25), *talabs* (40), tanks (5), and lakes (5) and indirectly to 154 groundwater bodies like wells (98), *baoris* (48) and *Jalras* (8). These water structures are as old as 500 years. In the past, the natural bodies are improved and preserved by the people through innovative ideas and full participation of the people. The inhabitants demonstrated immense sense of belongingness and reverence towards the preservation of these bodies. Unfortunately due to the negligence of management, a large number of these bodies are subject to pollution, become unpotable and ultimately destroyed forever. The establishment of public water system set the process of decline, sharply

Table 3. Ancient water structures in Jodhpur city

Catchment	Polluted	Potable	Partially	Preserved	lost	Damaged
Nadies (1458-1600 AD)	13	12	3	10	12	16
Talabs (1458-1885)	19	18	11	17	10	18
Tanka (1794-1887)	5	0	2	3	0	0
Lakes (1126-1931)	0	5	3	-	2	-
Streams	-	-	-	8	4	(functional)
Wells (1460-1931)	33	57	Maintained by PHED			
Baories (1460-1880)	30	18	Lost and non-potable			
Jhalras (1660-1750)	8	nil				

Source: S M Mohnot (personal communication)

around the 1960s. The structures being looked after well are continuing to serve the people.

Interestingly, the pattern for destruction, whatever be the type of water body, is identical. First, the catchment areas are damaged through construction of residential areas, agriculture, mining, road and public entertainment park. Then the water supply is affected by restricting the run-off and making the water structure dry. Thereafter, the bed of the water structure is encroached and converted into a seat of commercial activities. The onus of the development led destruction, therefore, lies on the architects of modern development.

Neo-traditional Water Systems

Pani Panchayat (Maharashtra)

The need for revival of water-harvesting system is not a new idea. A successful work sets example for further works. In this context, the story of *Pani Panchayat* and *Phad* system in Maharashtra and traditional irrigation institutions in Tamilnadu are good examples. The *Pani Panchayat* combines the modern method with the traditional technology and management tools of water harvesting. The famine stricken villagers implanted the idea that the construction of check-dams and percolation tanks to store rainwater is the only remedy for providing employment and finding permanent solution to recurring droughts. The block is considered to be a convenient operational unit for water harvesting. The Naigoan experiment in the Purandar taluk of Pune district is a typical experiment of despair to success. A unique characteristic of the design is to distribute water not on the basis of land area but in proportion to the household size. Thus, it compelled the farmers to adopt the cropping pattern for the best use of available water, and restricts cultivation of high water consuming crops like sugarcane. Care was taken that in the development of such system, the farmers should have financial stake in it. Therefore, it was made mandatory that the beneficiaries must contribute to the development cost. For the success of the new water-harvesting technology not only the community contributed to its better management, but also the Gram Gaurav Pratisthan, a village-level organization, organized necessary training for farmers on the rudimentary knowledge of conservation aspect of the technology. The villagers decide to cooperate, select appropriate location and take decision to start the scheme. The Gram Gaurav Pratisthan offered technical guidance in the construction process. The beneficiaries elected a *Pramukh* (group leader) to liaison between farmers and officials in all matters, ensure uninterrupted working of the system and distribution of water-rationing card to the beneficiaries. All matters relating to the operation and distribution of water and conflicts are recorded by the elected official and communicated to the village community at a regular interval (for details, see GGP 1983; and Chapter 6 in this volume).

Phad (diversion) system (Maharashtra)

The *Phad* system is a successful farmer-managed water-harvesting system of the 16th century in Maharashtra, presently operational in the three river systems, viz. Tapi basin (Panjhra), Mosam and Aram (in Dhule and Nasik districts). This system also existed in Philippines (known as *Zanjaras*), Indonesia (as *Subaks*), Pakistan (as *Guls)* and in Northern Thailand (as *Mung Fai*). These systems with different sizes and types are highly diverse in nature.

Panjhra river *Bandharas* system. To understand the system, it is necessary to know the physical and natural conditions of the location. The river has steep gradient and runs through rocky bed west to east about 88 km. before it falls on the Tapi river at Thalner. This topography makes the construction of the *bandharas* (weir) suitable. A series of weirs (about 45) were built to divert water for agricultural use, but presently only 14 of them are functioning (Patil 1996). Perhaps, the Farukki kings (1370 -1600 AD) permitted the farmers to divert the river water for irrigation purposes. The diversion weirs were raised at different locations and canals were digged to carry water upto the fields.

The *phad* is a well-bounded part of a command area with fullest control of water. It consists of the following inter-related parts:

1) *Bandharas* or low weirs constructed across the river.
2) *Kalva* or canals between users fields and *bandharas*. Each canal has uniform discharge capacity of approximately 150 - 400 litres/second.
3) *Charis* or distributaries for feeding water from the *kalva* to different areas of the *phad.*
4) *Sarang* or field channels for carrying water to individual fields.
5) *Sandam* or escapes along the canal and *charis* for diverting excess water into the drainage.
6) *Kayam Bhagayat* or command area is usually divided into four blocks or *Phads*. Initially, all farmers are said to have land in each of the *phads,* which is changing due to land fragmentation.

The management of the *phad* system is under the chairman of the *Bhagayat* committee (irrigators' committee) consisting of elected members from the irrigators. Number of the members of the committee varies from committee to committee. The membership is not permanent, usually for 2 to 4 years, but can be changed in between depending upon the interest of the members. The

committee is responsible for supervision, protection, administration and maintenance of the system, and conflict resolution. They are assisted by employed official called *halawdar* (overall incharge of operation within a *phad*), *patkaris* (responsible for patrolling the *kalva* within the village). They attend to minor maintenance of the *kalva* like de-weeding, etc. and report to the *halawdar* and *bhagayat* committee on the condition of the *kalva*. *Jaglia* is responsible for watering and guarding the field, turn water flow from one field to another as per the schedule under the direction of the *hawaldar* or the committee. The officials are paid in cash or kind (e.g. 2 kg foodgrains per *bigha* of irrigated area). The main basis of these wages is the minimum wage for agricultural workers. However, owing to urban-rural wage differentials, affected the participation of the members. Increase in water rates, reduction in water supply due to the construction of a dam for water supply to towns, incompatible modernization, etc. deteriorated the system (Patil 1996).

Conclusion

The analysis has clearly brought out that the traditional systems were excellent in sustainable use of water resources. The water structures suited the location specificity, topographical adaptability and satisfied the community requirements. Not only the state, but also the chieftains, service workers and women patronized and promoted the water harvesting systems all over the country. The community participation in the management, methods of fund raising for development activities, utilization and choice of local construction materials (integrated approach to man-material), construction technology and architectural deployment on the structures were highly commendable. Man, material and methods were so interwoven that the resulted system could stand the test of time. These systems passed through several stages, which made them unique and sustainable. Such experimentation include the vast and huge tanks in the South India, extensive moisture retention technique of *Khadins* in Rajasthan, the submergence systems of *Ahar* in Bihar, *Haveli* system in Madhya Pradesh, *Guhl* diversion system of Himachal Pradesh and Uttar Pradesh and *Phad* system in Maharastra. These systems demonstrated excellent technological perfection and the process of social absorption of the technology; an aspect which is missing in the modern methods. Even the traditional water-lifting devices also depicted

scientific excellence. The modern methods, unlike the traditional one, are primarily based on imported technology, and failed to satisfy the local needs, making the water systems unsustainable. Incorporating the best traits of the traditional technology, the alternative strategy of modern methods could potentially make the system more effective and sustainable.

References

Barah, B. C. 1996. *Traditional water harvesting systems: an ecological economic survey.* New Age International Publishers.

Chambers, R. 1977. Man and water: organisation and operation of irrigation. In *Green revolution technology and change in rice growing areas of Tamil India and Sri Lanka,* B. H. Farmer (ed). London: MacMillan Co.

Chambers, R, N. C. Saxena and T. Shah. 1989. *To the hands of the poor: water & trees.* New Delhi: Oxford IBH publishing Co.

GoI (1990). *Agricultural Statistics at a Glance 1990*. New Delhi: Ministry of Agriculture.

Pangare, G. 1992. Chittaur kept head above water in drought. *Down to Earth*, Sept 15.

Patil, R. K. 1996. Phad system of western Maharashtra: a trail method of water harvesting and management by farmers. In *Traditional water harvesting systems: an ecological economic survey*, B. C. Barah (ed). New Age International Publishers.

Raju, S. 1941. *Economic condition of Madras Presidency 1800-1850*. Madras.

Rao, G. N. 1988. Canal irrigation and agrarian change in colonial Andhra. *Indian Economic Social History Review*, Jan-March issue, p 25.

Reddy, S. T. S. 1993. *Forfeited treasure: a study on the status of irrigation tanks in Karnataka*. Bangalore: Prarambha Publishers.

GGP. 1983. PANI Panchayat Purandhan Taluk. Pune: Gram Gaurav Pratisthan.

SivaKumar, S. S. 1988. Problems of participatory approach to irrigation rehabilitation. Paper presented at the national seminar on 'Ecology and Minor Irrigation Development', University of Hyderabad, Hyderabad.

Annex. Requirements for construction of the traditional irrigation tanks

1) A king endowed with righteousness, rich, happy and desirous of acquiring permanent wealth or fame,
2) A *brahmana* learned in hydrology (*pathas sastra*)
3) A ground adorned with hard clay,
4) A river conveying sweet water and three *yojanas* distant from its source,
5) Hill parts which are in contact with it (bund),
6) Between these portions of the hill a dam (bund) of compact stone wall not too long but firm,
7) The two extremes (sringa) pointing away from fruit giving land (*phala sthira*),
8) An extensive and deep tank bed,
9) A quarry containing straight and long stones,
10) The neighbouring fields (command area) being level and with fruit-growing trees,
11) A water course (sluice) having strong eddies (*brahma*) on account of the position of the mountain (*advisthana*), and
12) A gang of men skilled in the art of its construction.

The six faults to be guarded against are listed as:

1) Water oozing from the dam,
2) Saline soil,
3) Situation at the boundary of two kingdoms,
4) Elevation (*kurma*) in the middle of the tank bed,
5) Scanty supply of water and extensive stretch of land (command area), and
6) Scanty land and excess of water.

9

Institutional Aspects of Sustainable Aquaculture Development and Abatement of Conflicts in Resource Sharing

N. Rajalakshmi

Introduction

Human activities can contribute to environmental degradation and resource scarcity in three ways. Firstly, human activities can degrade and deplete natural resources if these are used at a rate faster than the renewal rate. A second source of degradation or scarcity is population growth; a set amount of land and water is shared by increasing number of people, resulting in a steady decline in its per capita availability. Thirdly, weak property rights lead to unequal access to natural resources, leaving the rural poor subject to the scarcity.

These factors are often ignored in exploitation of natural resources. Unfortunately, the success of resource exploitation is judged in terms of immediate economic results, without considering either the impact on ecosystem or knowledge of the users, who are often displaced or marginalized by technically more effective exploiters moving into the area (Berkes 1985). This has led to exploitation of natural resources beyond their sustainable level and added to the miseries of the rural poor as well.

Although intensive aquaculture practices provide valuable foreign exchange, one may strongly question the advantage to the country and their indigenous population in terms of sustained socio-economic benefits (Meltzoff and Lipuma 1986; Goodland and Ledec 1987; Bailey 1988; and Primavera 1991). The switching from food to commercial activities erodes social/cultural experience of sustainable resource use. The progressive exploitation of the ecosystem to

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

expand the economy has today made it necessary to redevelop the ecosystem in order to maintain the economy (Regier and Baskerville 1986). Fisheries and aquaculture are faced with similar problems which need to be tackled from an integrated societal-environmental system perspective, where interrelations between sectors and their dependence on the processes and functions of coastal seas need to be explicitly recognized.

The expansion of aquaculture is not only limited by what is happening in the market or other sectors of the economy, but also by an increasing demand for environmentally safe goods and services. But, such environmentally safe production process can easily be disrupted as the scale of aquaculture grows relative to its supporting ecosystems (Folke and Kautsky 1989), leading to various kinds of conflicts—conflicts of interests, values, actions or directions. Thus, conflicts are inescapable, particularly during the resource-based development stage, and require amicable resolution mechanism. This paper examines the nature of conflicts in the development of coastal aquaculture in southern India. The specific objectives are: (1) To assess the status of aqua-farmers; (2) to examine the economic impacts of aquaculture farms; and (3) to analyze the nature of conflicts in the use of common property resources.

Study area

Sirkazhi (Tamil Nadu). Shrimp culture in Sirkazhi taluka and in the entire district was introduced with full support from the Government as a viable alternative to paddy cultivation and also to utilize barren and uncultivable, alkaline lands. The unexpected protests due to various reasons gave a dead blow to the growth as well as to the future of the industry. Despite the country's apex court's rulings, the industry still survives contributing to the state economy.

Nellore (Andhra Pradesh). Shrimp culture in Nellore district is perhaps the pioneer in aquaculture development in Andhra Pradesh, and the farming activities are confined to about 24 villages near the Kandleru creek and no farms are located near the sea. Shrimp culture has helped the area directly and indirectly with more business and economic activities.

Status. Most of the aqua-farmers in Sirkazhi (Tamil Nadu) and Nellore (Andhra Pradesh) have taken up shrimp culture mainly for export purposes. Good quality shrimps cultured on these farms are directly sold to the exporters, and aquaculture

is a financially lucrative venture. This has been revealed by the information collected from aqua-farmers in the regions. Profit rate ranged from 20 to 50 per cent per annum, which can not be thought of in any other activity. Unemployed coastal folks and agriculturists are offered jobs on the aqua-farms and are paid higher than in any other farming activity. Thus, increased profits and better wages contribute to overall economic welfare and better standard of living of the people in the region. However, advancement of shrimp farming has polluted drinking water, and this has forced the society to spend money on drinking water. As per the NEERI's estimate, the value of environmental costs is more than the value of shrimps produced in Tamil Nadu. For Andhra Pradesh, the estimated value loss due to the damage caused by aquaculture was about four-times of the earnings. However, economic benefits to the society from the development of aquaculture in Tamil Nadu and Andhra Pradesh have been enormous.

Socio-economic Status of Aqua-farmers

The socio-economic survey conducted in the coastal Tamil Nadu and Andhra Pradesh to study the standard of living of people around the ponds has revealed a significant increase in annual income of the farmers. The reason behind this increase was the vast employment opportunities generated by aqua-farms. However, the income level in Tamil Nadu was more than twice of that in Andhra Pradesh. The standard of living of the people, measured in terms of possession of consumer goods, also increased significantly.

Infrastructure facilities are the most basic need of the people, which is the responsibility of the government. These facilities have been lacking in many places of Andhra Pradesh. Infrastructure facilities like transport and communication are better developed in Tamil Nadu. Apart from this, Tamil Nadu was also found to possess more of other infrastructural facilities like educational institutions, banking and non-banking services and a number of voluntary organizations. Infrastructural changes are significant in the area of prawn cultivation both in Andhra Pradesh and Tamil Nadu. According to the response of the interviewed people, there have been significant changes in infrastructure facilities like new roads, transport and communication facilities, offices, and markets (Table 1).

Employment opportunities

The importance of fisheries as a source of employment is highly significant. It has been shown that it is more productive and profitable than any other agricultural activity. Fisheries provide employment directly to about 0.25 million people out of a total of 0.55 million fishermen in Tamil Nadu, whose livelihood depends upon marine and inland water fisheries (Rajalakshmi 1999a). About an equivalent number of people take up fishing as a part-time job. Nearly 0.2 million persons earn their livelihood from associated vocations such as fish transportation, basket making, ice and salt manufacturing, etc. It is a way of life for the whole fishermen population. In Sirkazhi taluka, about 2,800 fishermen and 200 fisherwomen are directly employed on aqua-farms and depend on aquaculture for their living. The survey also indicated significant increase in employment opportunities after aquaculture development in the study area (Table 1).

Common Property Resources: Rights and Conflicts

Generally, there is open access to common property resources and nobody is willing or able to control the use of these resources. Common property resources may be divided into local or regional and global commons (Berkes 1985). Examples of the former include many of the world's grazing lands, fisheries, deep ocean mineral deposits and the Antarctic region, and examples of the latter are the world's atmosphere or ozone layer and geosynchronous orbits. Biogeochemical and biogeophysical cycles are crucial for the maintenance of a number of global commons and are at risk from or already disrupted by human activity. Common property resources can be further divided into three categories: (1) Open access resources belong to no one, have no restrictions on their use and are difficult to manage; (2) Community-owned resources mean that the co-ownership can exclude outsiders; and (3) State-owned resources might be better managed, although that is not the case always.

The most common property resources in the study area are creeks and coast lines which are used to set up shrimp farms. These resources as well as the sea have been used by the local fishermen for their living from time immemorial, due to open access to them. These interests have caused conflicts and clashes, resulting in protests and threats to destroy the shrimp farms in the state of Tamil Nadu.

Table 1. Institutions, infrastructure facilities and employment after development of aquaculture

Institutions	Tamil Nadu	Andhra Pradesh
	(percentage of respondents indicating improvements)	
Education facilities	94	32
Banking and non-banking	76	54
Communication	82	44
Voluntary organizations	54	56
Transport facilities	100	100
Status of employment		
Change in employment	30	72
Family employment	18	60
Women employment	18	48
Village employment	14	74
Infrastructure		
New roads	46	40
Construction of new houses	48	96
Improvement in transport facilities	4	32
Change in communication facilities	32	22
Offices	66	44
Quarters	2	12
Market facilities	22	82

Types of conflicts

As a result of rapid expansion of aquaculture, a number of shrimp farms have been set up in Tamil Nadu and Andhra Pradesh. There are instances of violation of many rules as there is no proper system for supervizing and monitoring these farms. This has resulted in various conflicts in the use of common property resources. The shrimp farms fenced their area without giving any notice and did not allow the public, especially the fishermen who were using the beaches

for years together. The shrimp farms have been set up without considering the hardships of the local fishermen. The open access system has given rights to the fishermen for using the seafront for their livelihood. Likewise, the owners of the shrimp farms just purchased the cultivable lands from agriculturists and converted them into aquaponds. This is also resulting in conflicts with the users of land for agricultural activities. Some of the farms have not shown any concern when the groundwater became brackish. Only a few farms have made arrangements for the supply of sweet potable water to the local people. Such conflicts have made the local people to voice and protest severely against the shrimp farms.

Conflicts between fishermen and aqua-farms. The shrimp farms do not provide access to the beach for traditional fishermen who reach the sea from their villages. As aqua-farms are located on the sea front and entry is restricted, the fishermen have to take a longer route to sea for their operations. The traditional, local fishermen doing fishing for years are subjected to such hardships because of the newly emerging aqua-farms.

Social conflicts. Social conflicts arise between the local people and aqua-farmers due to salinization of drinking water, salinization of land, and fear of floods during the rainy season. It is reported that salinization of land is spreading further and even the wells are yielding saline water. The agricultural farms adjoining the shrimp farms are also affected; aqua-farms are developed right on the banks of the creeks without leaving any space for draining of floodwater. Due to physical obstruction caused by the dykes, the natural drain is blocked and floodwater stagnates on agricultural lands. Therefore, protests are voiced by the affected people.

Conflicts in the land-use pattern. Indiscriminate conversion of fertile agricultural lands into aqua-farms has led to many problems. This practice aggravates landlessness among the farmers. Absentee landlords sell away their lands to aqua-enterprizes, who offer attractive prices of land. Those who undertake jobs or cultivation under tenancy farming lose their livelihood occupations, and agricultural production of crops is also affected. In the earlier years, vast areas of mangroves were destroyed for agriculture. Though mangroves are conserved ecological habitats by the law, they have been destroyed for constructing aqua-farms in the recent years. However, this activity has been curtailed by the enforcement of strict rules and regulations by the government.

Conflicts between aquaculture and agriculture. Water and land are finite resources, and their use for fish production is highly competitive with other economic uses. Competition can be expected to increase with population growth, demand for food, energy and employment. The growth of aquaculture will depend on its ability to compete successfully for these resources.

Conflicts between profits and survival. It is the market mechanism and the invisible hands which underline the choice of new fishing technologies and the harvesting patterns. Conflicts at sea today are essentially the conflicts between the few, spurred by the motive of profits, and the many, whose objective is survival. The formers are largely catering to the ever increasing demand for sea food from the over-fed metropolitan consumers in the developed countries and the latter to the basic protein needs of rural masses of the region.

When water resources are abundant in relation to their demand, there will not be any difficulty, but the reality at present is entirely different. As population grows, economies develop and megacities expand, freshwater will be in greater demand. Unlike a resource such as oil, for which coal, wind or nuclear power can be an alternative, water has no substitute. The indiscriminate exploitation of basic natural resources for development has begun to flicker the warning signal about the limited potential left over for future.

As a matter of fact, economists typically recommend stringent controls to protect common property resources from over exploitation. Yet, it cannot be denied that the recommendations tend to draw attention of those who make policy in this area. Managing common property resources, for example, will carry more weight when we are able to identify more precisely maximum incentives faced by those who will use, or misuse the resources. Pollution can even be considered a "negative resource" rather than an externality. Climate and the processes regulating it may be considered as fundamental, vital resource under this paradigm (Rajalakshmi 1999b).

Economic Aspects of the Conflicts

In the case of blocked access to the beach or creek, the fishermen require more time to gain access to their boats which are kept on the beach. Before the development of shrimp farms, the fisherman had a direct path to their fishing crafts. With shrimp farms situated between fishing villages and the beach,

occupying several hectares of land, direct access between the beach and the village is clearly blocked. This has led to several other implications such as a longer and more difficult transport route of fish catch to the local village market. This has been a major conflict in the region of Nellore where fishermen have blocked access to the Kandleru creek.

Salinity of agricultural land is reported to be another problem faced by the agriculturists. Some of the village wells have become unusable as a result of salinity. In the extreme cases in Andhra Pradesh, where all the village wells have been contaminated, it has been found that women had to walk for longer distances to fetch potable water from the nearest water source. However, it appears that well water salinity is seasonal and related to the intensity of rainfall.

The demands on women's time are further strained as a result of problems with fodder and fuel wood collection. Semi-structured interviews of women have suggested that in the farming communities, women are required to spend more time in searching for fuel for homes and fodder for their animals. This is perhaps a result of the growing number of shrimp farms, occupying wasteland once used to graze animals and collect fuel wood. With the advent of shrimp farms, large areas under thorny bushes (used as a source of fuel wood) have been cleared.

The fishermen's productivity and general wellbeing are reported to be affected by health-related problems associated with shrimp-farm effluents discharged from the jetties into the near shore area where they fish. This has been reported in certain areas of Nagai district of Tamil Nadu and Nellore district of Andhra Pradesh, whereas others do not complain any ill effect. In addition, fishermen complain that their nets get snagged by the effluent discharge pipes that extend up to 50 m out to the sea.

Employment issues are also said to affect the fishing communities since the direct purchase of wild seed has declined rapidly over the years. This is perhaps a direct result of the growth of operational seed hatcheries in the vicinity of the shrimp farms. It is important to mention here that the development of shrimp farming has further paved the way for the growth of shrimp hatcheries, supplying viable seeds to the shrimp farms. This again provides employment opportunities for many coastal folks. The shrimp farmers in the region once relied solely on the wild seed purchased from fishermen before the growth and development of hatcheries. This has resulted in unwanted conflicts since the hatcheries offer

the shrimp farms a steady seed supply at a rate scaled by the quantity purchased as opposed to per individual seed (Patil and Krishnan 1998).

Conversion of agricultural lands

It is generally considered that productive agricultural land is the most ideal land for aquaculture. But large-scale conversion of such land into aqua-farms leads to hyper-nitrification that, in turn, leads to high production of phytoplankton, affecting the standing crops. High levels of nutrients can cause blooms of toxic species, which may result in mass mortality of the cultured species. Increased level of dissolved organic matter increases the number of micro-organisms, especially bacteria. Growth of filamentous algae and macrophytes may also occur. In marine environment, changes in the natural production of phytoplankton and macro algae have been recognized in the vicinity of farms, where there is vigorous flushing. Besides stimulation of primary production, changes may occur in the prevalence of species, abundance of phytoplankton and growth of macrophyte.

The nature of fauna of the receiving water is influenced by the dissolved oxygen concentration, nature of substrate and availability of food in aqua-farm effluents. It is a common practice to convert agricultural land and the land under salt production, into coastal aquaculture units. Conversion of agricultural farms and salt-making lands had been rampant in fragile coastal areas of Tamil Nadu and Andhra Pradesh.

Conclusions and Suggestions

A developing country like India needs more foreign exchange for importing basic raw materials, advanced technology, etc., and therefore, export of marine products is also encouraged to earn foreign exchange. Shrimps continue to be the largest item realizing the maximum foreign exchange among the marine products. Shrimp culture has been undertaken in many parts of the country, mainly due to its lucrative export earnings and inability of capture fisheries to meet the increasing demand of shrimps. As a result of the new techniques of producing shrimp seeds in hatcheries, shrimp culture has become an attractive

enterprize. But shrimp culture in Tamil Nadu and Andhra Pradesh is facing serious oppositions and has been denounced on the ground that it pollutes the environment and degrades the resources.

Public opinion about closure of the existing aqua-farms is primarily based on the perceived pollution problems. A section of the public opined that these farms must be closed, as they damage environment significantly and cause hardship to local people. Another section feels that aquaculture is a panacea for all the ills, and therefore, should be encouraged for the economic welfare. Reduction in jobs on agricultural farms, pollution of groundwater and foul smell have also been reported as important disadvantages of aquaculture. However, it is opined that the aqua-farms should be allowed to continue with the measures to check pollution and other negative impacts.

If landless laborers and fishermen are involved directly in shrimp culture, they shall be able to enjoy the benefits. Some fishermen in the area have taken up shrimp farming and derived higher income. However, if the capitalists are allowed to capitalize the high profit generating opportunities, inequalities in income and wealth will get accentuated, resulting in clashes between local population and shrimp industrialists. In order to resolve these conflicts and develop sustainable aquaculture, the following suggestions are made:

1. Proper land-lease policy will help the landless laborers in becoming aqua-farmers. Setting up of aqua-farms based on co-operative principles will be helpful to small farmers, as well as to the industry. It will improve socio-economic conditions of the people in the region.
2. Efforts should be made to ensure that the local people are motivated to accept the steps taken to protect the environment. Without the co-operation of the local people, any solution will not be a lasting one. Also, the 'precautionary principle' as well as 'pollutor pays principle' should be used wherever necessary.
3. Various government agencies, research institutes, private sector and coastal management projects should exchange information regularly. Also, a specific system may be evolved to help improve cross-sectoral co-ordination in the development and management of coastal areas.
4. Effective procedures specific to aquaculture should be established to assess environmental and social consequences of water extraction, land-use, discharge of effluents, use of drugs and chemicals and other aquaculture activities.

References

Bailey, C. 1988. The social consequences of tropical shrimp mariculture development. *Ocean and Shoreline Management* 11: 31-44.

Berkes, F. 1985. The common property resource problem and the creation of limited property rights. *Human Ecology* 13: 187-208.

Folke, C. and N. Kautsky. 1989. The role of ecosystems for a sustainable development of Aquaculture. *Ambio* 18: 234-243.

Goodland, R. and G. Ledec. 1987. Neoclassical economics and principles of sustainable development. *Ecological Modelling* 38: 19-46.

Meltzoff, S. K and E. Lipuma. 1986. The social and political economy of coastal zone management: shrimp culture in Equador. *Coastal Zone Management Journal* 14: 349-380.

Patil, G. and M. Krishnan. 1998. The social impacts of shrimp farming in Nellore district, India. *Aquaculture Asia.* 3-5.

Primavera, J. H. 1991. Intensive prawn farming in the Philippines: ecological, social and economic implications. *Ambio* 20: 28-33.

Rajalakshmi, N. 1999a. *Tamilnadu Economy*. Mumbai: Business Link Corporation.

Rajalakshmi, N. 1999b. *Environment and economic development.* Manak Publications Pvt. Ltd.

Regier, H. A. and G. L. Baskerville. 1986. Sustainable redevelopment of regional ecosystems degraded by exploitive development. In *Sustainable development of the biosphere*, eds. W. C. Clark and R. E. Munn. Cambridge: Cambridge University Press.

Discussant's Note

R. Maria Saleth

This note discusses some of the important issues raised in the six papers that were presented in the technical session on 'The Role of Institutions in the Management of Common Pool Resources (CPRs)'. Even though the papers are few in number, in terms of their coverage of issues, depth of analysis, and level of treatment, they are representatives of the larger body of literature that is already available on the subject. All papers underscore the role that institutions — both formal and informal — play in the management of natural resources, in general and CPRs, in particular. They all argue, in fact, that it is the erosion of the traditional institutions and the state's inability to fill the institutional vacuum with new and alternative institutional arrangements that has led to the mismanagement of CPRs and other natural resources.

While Marothia's paper reviews and synthesizes both the theoretical issues and empirical evidences on the role, effectiveness, and replication scope for institutions in the context of five set of CPRs, the other two papers concentrate their analyses in the specific context of water resources. Of the latter two papers, the one by Deshpande and Mini demonstrates the emergence and operation of institutions in the context of detailed micro case studies of the *Pani Panchayat* system of Maharashtra and a few select Water User Associations (WUAs) in Karnataka. The other paper by Ballabh starts its argument for water institutional reform essentially from macro perspective, though micro-level issues and cases are also used intermittently. While Rajalakshmi's paper deals with the institutional issues within the case study framework based on a detailed study of aquaculture farms in Tamil Nadu, Barah's paper evaluates the same within the context of a historical review of traditional irrigation and other water storage systems. Joshi's paper is somewhat unique as it evaluates the implications of institutional aspects (especially, participatory arrangements) for the performance of watershed programs based on a meta analysis of 311 case

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

studies. With this general characterization of the papers, let us now identify some of the important issues raised in these papers.

Embedded Nature of Institutions

There are two dimensions to institutional embeddedness: linkages of institutions with the physical, social, and political economic aspects (i.e. the institutional interface with the physical, socio-economic-political environment), and linkages within institutional components (i.e. the structural linkages within and among institutions). The first dimension relates to institutional replicability, whereas the second determines institutional effectiveness. The papers under consideration here address/recognize these dimensions in varying degrees.

Institutional environment

All papers recognize, with differing details, the embedded nature of institution with the socio-cultural environment. Interestingly, however, there is some ambivalence in understanding the erosion of traditional institutions. These institutions have disappeared in most cases because the social, cultural, and economic conditions that supported them have themselves changed with time. Even in the limited number of informal and local-level institutions with success (e.g., *Pani Panchayat*, Ralegaon Siddhi, and Sukhomajiri), their performance is critically linked to the particular physical and social environment. While this fact is well known, there are few issues that require attention in future research. *What are the physical, social, economic, and other conditions [including personal attributes of leader(s)] that underline the successful performance of these local institutions? Are there any broadly identifiable typologies among them?*

Intra and inter-institutional linkages

All papers, with the exception of the one by Joshi and Rajalakshmi, draw our attention to the second but very critical dimension of institutional embeddedness, i.e., the structural linkages among institutions at different levels. The linkages that received attention in all the three papers are essentially in

terms of the need for "polycentric governance" or "distributed governance" to bring together various stakeholders– mainly the state and the people– within a common institutional framework. Deshpande and Mini's paper considers the intra- and inter-institutional linkages in the context of micro-level water institutions/ organizations. Marothia's paper not only deals this aspect in detail but also underlines yet another aspect of inter- and intra-institutional linkages, i.e., "institutional thickening". He also cites some evidence to show that multiple institutions (institutional thickness) are more effective than a single or few institutions. But, under conditions where many institutions are loosely linked or intensely competing for the same space (e.g., *Panchayats*, organizations like WUAs, Watershed Committees, and various other committees), multiple institutions are no guarantee for institutional effectiveness. The key issues that emerge for discussion are: W*hat are the layers or components of the institutional framework that is essential to operationalize the idea of "polycentric" or "distributed" governance? How can we engineer and strengthen the intra-and inter-institutional linkages and achieve institutional thickening? Can the joint or shared management arrangements (e.g., Joint Forest Management) be graduated into polycentric governance mechanisms? If so, what are the alterations needed and additional conditions to be ensured?*

Scarcity-Induced Institutional Change

Although all papers argue or provide evidence for the fact that it is the resource scarcity that motivates institutional change both at the micro- and macro-level, the papers by Deshpande and Mini, Ballabh, Rajalakshmi, and Barah are more explicit on the issue of scarcity-induced institutional change. Deshpande and Mini provide evidence for the fact through detailed micro-level case studies of *Pani Panchayat* and WUAs, whereas Rajalakshmi shows the same fact based on an intensive study of aquaculture farm in Tamil Nadu. In contrast, Ballabh describes the scarcity-induced institutional change from a macro perspective in terms of the institutional implications of scarcity-induced water conflicts, Barah's attempts are from a historical perspective of decline and revival of traditional water institutions.

Interestingly, Deshpande and Mini attempt to explain these interrelated issues using a figure (on page 119) in which return to organization is measured on the Y-axis and level of water scarcity is measured on the X-axis. The relationship shows an inverted 'U' curve, implying that the return to organization increases with scarcity to reach the maximum at a given level of water scarcity but begins to decline beyond that level. The result is very provocative partly because the return to organization is related to the physical aspect of scarcity and partly because the return is considered for a given level (or structure) of organization. When water scarcity is increasing, the value of the resource should be increasing providing incentive for the adoption of even organizations with higher transaction costs. The argument holds still true even as we generalize organization to institution. The fact that scarcity induces institutional change, though seems to be tautology on the surface, throws, however, some interesting and theoretically challenging issues. *Does resource scarcity always prompt institutional change? Or, more aptly, at what level of scarcity can institutional change or organizational innovations be reasonably expected?*

Technology-Institution Interface

From the perspective of the main theme of this Seminar, the interface between institution and technology assumes a special significance. Extending the argument on the relationship between resource scarcity and return to organization (or, institution), we find that scarcity-induced higher value of the resource also prompts technological innovations that conserve the resource from conventional sources and augment additional resources from non-conventional sources. *Interestingly, there are important linkages between technology and institutions, both in terms of technology-induced reduction in transaction costs as well as in terms of institution-induced economic incentives for the adoption of technological innovations. The implication of this issue is another aspect that deserves our attention.*

Deshpande and Mini also observe an important similarity between institutions and technologies as both of them induce a shift in the production possibility frontier. However, they also point out that technology enters on the production sphere, whereas institutions enter into the allocation sphere of economic activities. Thus, technology adds resources through productivity change whereas institutions

augment resources through allocation and use efficiency. This suggests an implicit linkage between institutions and technology as it is the motive of efficiency that prompts technological change and in most cases, the effectiveness of technology development and application is itself critically influenced by the prevailing institutional arrangement. Other than these implicit and tangential linkages, the papers under consideration deal mainly how institutions enhance resource-use efficiency rather than how institutional change enhances the impact of technology in the resource context.

Joshi's paper highlights yet another dimension of the technology-institution interface in the context of watershed performance. Here, there are indirect evidence that the effectiveness of watershed programs — both as a package of technologies and as a part of organized institutional interventions — depends on the effectiveness of institutions that facilitate participation. Since the paper also shows participation to be more in resource scarce regions, there is also a potentially interesting issue of whether scarcity contributes to the effectiveness of technology via the former's direct relationship with institutional thickening and its effectiveness.

The Political Economy Context of Institutional Design

The political economy context of institutional design is an important issue, especially at the macro level. For this purpose, *it is necessary to develop an analytical framework to capture the inter-relationship among various stakeholders as well as their rights and duties, objectives — both conflicting and synergetic, and organizational potential. Such a framework can then serve as a vehicle to structure hierarchically their rights and duties, synthesize their objectives, and resolve their conflicts.* The paper by Ballabh presents the rudiments of such a framework in the particular context of water resource allocation and use (see Table 1). The paper interprets the analytical framework presented in the table essentially to identify the winners and losers among the stakeholders (rural domestic users, urban domestic users, landowners, industrialists, water managers, pollution control agencies, and social activists/ NGOs). But, the framework, if refined and developed further, can be used for a much wider purpose of institutional design within a political economy context. For, it brings together the intricate linkages both among and between users and

providers of the service, highlights the hierarchical nature of the rights and duties (i.e., the rights and duties of the users are defined within the rights and duties of the providers), and indicates the differing power relations and conflicting objectives.

Nature of Institutional Change

While this point is not directly related to the papers being considered here, it is important to set an important fact straight as some participants have talked mistakenly about the "rate of institutional change". As argued already, since institutions are embedded within the socio-politico-economic environment and structurally linked with other institutional components, institutional change is an amalgam of concurrent changes in a number of institutional dimensions. From this perspective, there is not one 'rate' but several interrelated and dependent 'rates' of institutional change. Although it is possible to conceptualize these rates within the marginalist paradigm of the neo-classical approach, it has doubtful policy relevance, as there is no tractable framework to trace these rates of changes. Furthermore, since institutional change is an intricate process evolving gradually over a long span of time, often exceeding the time horizon of even long-term planning and usually characterized by discontinuity. Thus, the notion of the "rate of institutional change" should not misguide us from the main idea of the "process of institutional change", where the focus will be on the correct policy aspects of identification, creation, and strengthening of right institutional components.

10

Agricultural R&D Reforms in India: Policy and Institutional Imperatives

Suresh Pal and Raka Saxena

Introduction

A number of developments that have taken place in the recent past in the economic and scientific environments call for reforms in agricultural research and development (R&D) system in India. Liberalization and integration of the economy with the rest of the world require efficient growth in the agricultural sector, which primarily has to come through technology-led growth in productivity. This growth, unlike in the past, should be sustainable, equitable and widespread in terms of sectors and regions. This is an enormous task to be achieved in an environment of scarce, if not declining, public support for agricultural R&D.

On scientific front also, there have been significant developments. For example, advancements in biotechnology have provided new opportunities for growth in the agriculture. It is poised to make significant contributions in terms of productivity gains, reduction in productivity losses due to biotic and abiotic stress, reduction in post-harvest losses, improvement in product quality, animal health, etc. At the same time, it has posed a number of institutional, ethical and bio-safety issues to be addressed by the developing countries including India. Increasing participation of new performers of biotech research, particularly private sector, scope for globalization of biotech research, and regulations for transfer and use of biotech products, require careful analysis and response. In particular, the roles of public and private sectors, a balance between biotech and natural resource management research, and the management of intellectual property call for changes in the institutional and policy framework. A partnership between research performers, participation of the stakeholders and the enabling regulatory mechanisms are indispensable in making the system more responsive and efficient.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

The public research system needs to address its 'second generation' problems to improve its efficiency and effectiveness. Therefore, policy, institutional and management reforms should always be encouraged for improving efficiency of the research system. The Indian Council of Agricultural Research (ICAR) has made a beginning in implementation of the recommendations of the review committees, and more recently, through implementation of the National Agricultural Technology Project (NATP). The former mainly deals with governance and organizational reforms, while the latter focuses on improved research planning, information system, research partnership, etc. (ICAR 1988 & 1998; and Mruthyunjaya and Ranjitha 1998). Although ICAR is the main agency responsible for agricultural research in the country, it is important to consider the national agricultural research system (NARS) in totality for reforms. This paper examines the policy and institutional imperatives of reforms in the NARS. The paper first discusses the issues relating to governance, organization and management of agricultural research in the country. This is followed by an assessment of adequacy of regulatory framework, affecting incentives and performance of the system. Lastly, the measures to strengthen linkages between research and extension systems have been outlined.

Governance

The governance of agricultural research broadly comprises funding, development and implementation of regulatory framework and appointment of governing board and chief executive. However, the difference between governance and management seems to have blurred in the Indian R&D system, and this has been the main concern of successive reviews of ICAR. Reorganization of ICAR in 1973 provided some professionalism to the governance of research, but the system is still firmly under the control of the government. This section spells out some of the broad governance issues to be addressed.

Policy environment

Public policies are important instruments for setting incentives and objectives of any organization and the agricultural research system is no exception to this.

Unfortunately, there has been no science or research policy in the country. The draft National Agriculture Policy also does not offer much to reform the technology system. Nevertheless, there have been some significant policy initiatives in the past. The most important is the continuous support of the government for agricultural R&D, and this support has remained intact even during various political and policy regimes. The public policy should now create an efficient institutional mechanism which could address the emerging R&D issues.

The first objective of the public policy should be to develop a pluralistic institutional and funding base for agricultural research. In other words, the policies should strengthen the NARS where several actors pool their resources and perform agricultural research in the areas in which they have a comparative advantage. For this, it is important to put a proper incentive and regulatory system in place. The government has provided lucrative incentives like tax benefits and research grants to attract private investment in research. The industrial policies were liberalized under the process of economy-wide reforms in 1991. The second issue relates to the providing of an enabling incentive and regulatory framework for the system. In this context, protection and importation of intellectual property are extremely important in an era of biotech research. The issues are that there should be a cost-effective and credible framework for the regulation and protection of intellectual property. The credibility will be established when there is an independent body to enforce the regulations, and the instances of 'rent-seeking' are absent. The regulations should be cost-effective, in terms of their transaction costs as well as delay in the transfer of technology. In particular, the case of genetically modified organisms (GMOs) has focused attention on these issues. The third issue needing attention of policy-makers is the focus of public research institutions. In the context of NARS, the public institutions should focus on provision of public goods, which do not attract the private sector. Also, the public research institutions should ensure that R&D needs of marginal and inaccessible areas are adequately addressed. If necessary, there could be some incentives for meeting the technology needs of these (often) neglected regions.

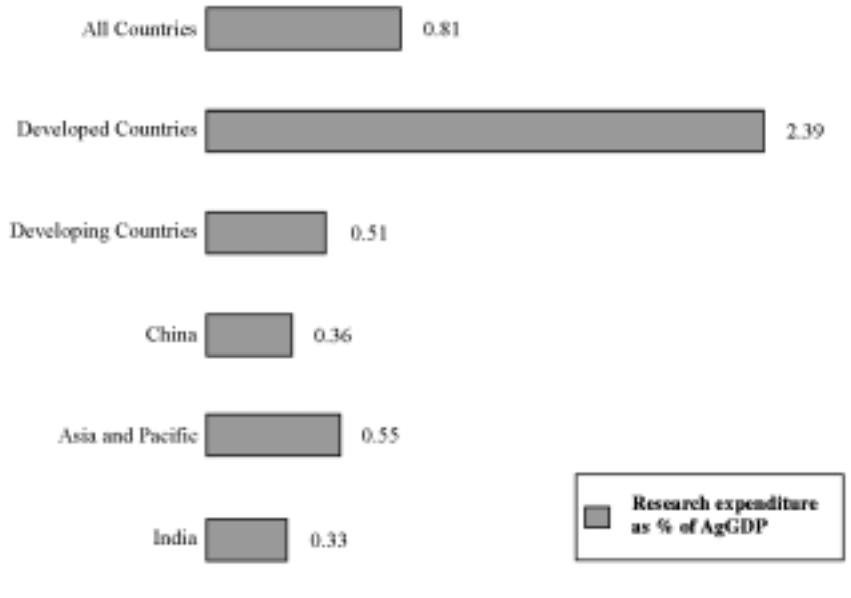
Funding

In India, unlike the developed countries, almost the entire funding of agricultural research is from the government, and private funding is at the margin.

The government expenditure on agricultural research, in real terms, has shown a consistent increase (Pal and Singh 1997), but the intensity of expenditure has remained well below than that in the developed countries (Fig. 1). The immediate response to this could be that this intensity should be raised to commonly prescribed norm of one per cent of the agricultural gross domestic product (AgGDP). The second policy response could be to correct the shares of cost-factors in the total expenditure. The share of salary has been increasing at the cost of operating and capital expenses on research, both in ICAR and SAUs, impairing their efficiency. The incremental expenses therefore should augment the operational and capital expenses. This has been initiated under NATP, which should be continued in the Tenth Plan also.

The mode of funding has also changed over time and now the effort is towards striking a balance between block grant and competitive funding. A

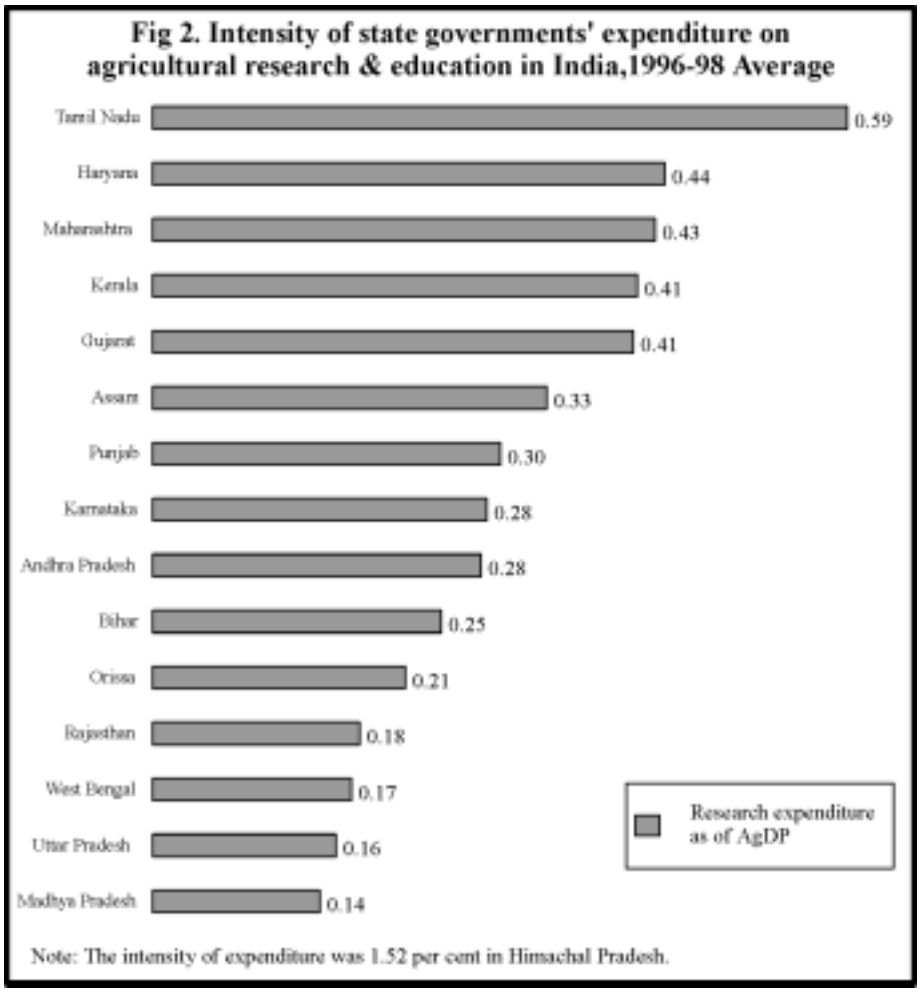
Fig 1. Intensity of public expenditure on agricultural research, 1991



Note: For India, data corresponds to triennium average ending 1994/95.

significant reform effected in the developed countries is the separation of funding with execution of research and shifting from block grant to competitive mode of funding. This change has primarily originated from the exceptional growth of the private sector, which now contributes to about 50 per cent of the total research expenditure (Alston et al. 1999). It is not likely that such a situation will happen in India in near future, and therefore, block grant system of funding should continue. Moreover, the transaction cost of competitive funding is comparatively high and productivity is rather low (Huffman and Just 1994). However, competitive funds like the Agricultural Produce (AP) Cess Fund and the Competitive Grant Program (NATP) of ICAR should be strengthened to fill gaps in critical technology, foster inter-institutional linkages (including linkages between the public and private sector) and instil institutional reforms. These funds could be made more effective and efficient by defining their objectives, research priorities, and strengthening the monitoring and evaluation system (Gill et al. 2000).

The relative contribution of the central and state governments to the research funding is another issue that needs some discussion. Although agriculture is a state subject under Constitution of India, the major responsibility of funding and execution of research is with the centre. About half of the national expenditure by agricultural research and education is done by the central government, and most of the expenditure of state governments is on education. In fact, nearly 20-30 per cent of the expenses of SAUs are met by ICAR through either the direct grants or research schemes, such as All India Coordinated Research Projects (AICRPs), AP Cess Fund Schemes and NATP. The intensity of research efforts is very low in the states, particularly in Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh (Fig. 2). These states should get high priority in allocation of resources in the Tenth Five Year Plan. It is also important that major responsibility of applied and adaptive research and education is shared by the states, and ICAR focuses more on basic and strategic research, capacity building in frontier areas of science, gap filling, etc. A consistent emphasis on location-specific research in the ICAR institutions would weaken basic and strategic research in the country. Moreover, the relevance of applied research conducted in a centralized mode may be weak due to less or no involvement of stakeholders. These factors will prove to be counterproductive in increasing the efficiency of the system in long run.



Autonomy and accountability

One of the most important tasks to address the 'second generation' problems of the NARS is to make public research system autonomous and accountable. This point was also echoed by the review panel of ICAR (ICAR 1988). When liberalization, privatization and deregulation are parts of the economy-wide reforms, there is no reason why the public research organizations should not be made fully autonomous for improving their flexibility and efficiency. It is also important to recognize the fact that research is a highly specialized creative

process with uncertain outcomes, and it requires different working rules, incentives system and flexibility in management of resources. Thus, autonomy should ensure flexibility in the governance as well as management functions such as research program planning, HRD, finance, administration procedures and international collaboration (Nickel 1997; and Byerlee and Alex 1998). Several models have been tried all over the globe; they vary from a complete autonomous system of the CG Centres to the corporate model of Embarapa in Brazil. In the Indian context, autonomy on the pattern of the Aeronautical Development Agency (ADA) in the Defence Research and Development Organization (DRDO) could be considered. The ADA is supported with a professional body for technical matters, and enjoys complete functional flexibility in a decentralized fashion. At the same time, the agency is accountable to the government.

ICAR's vision document, ICAR Vision 2020, states the need for debureaucratization of the governance and replacement of civil service rules by the new business-oriented rules, so as to make the system more autonomous, efficient and accountable. For this, the Governing Body of ICAR should be made more independent, the professional and financial rules and personnel policies should be modified. The system should have complete flexibility in generation and utilization of resources, establishing linkages including international linkages and adoption of personnel policies. The governance, however, must articulate role of R&D in attaining national objectives, ensure accountability in utilization of public funds, encourage reforms and bring transparency in management. A similar change is required at the state level. It should be realized that if the system has to deliver in an environment of competition, it must have the same flexibility as exists in those organizations with which it has to compete. Moreover, the cost of micro-management is very high. For example, ICAR and SAUs spend 17 and 11 per cent of their resources on management, respectively. If we add to this the time spent by scientists on management-related work, which is reported to be about 10 per cent, the total cost would be in excess of 20 per cent, which is high enough by any standard.

Organizational Structure

Public institutions for agricultural research are organized mostly on commodity/resource and disciplinary setup. This pattern has its own merit of

blending of strategic and applied research with input- or product-based interventions, which may be valid even today. However, now the challenges demand for production system-based technological interventions, requiring increasing interactions between various institutions and disciplines. This section deals with these issues, in general, and public-private partnership, in particular.

Contemporary developments

Agricultural research in India has been largely in the public domain. At the centre, there is ICAR to plan, coordinate, promote and execute research in the country. It has a network of institutions (about 93 institutions) to conduct research– national and central research institutes for basic and strategic research, and national research centres, project directorates and AICRPs for applied research. At the state level, there are SAUs for education and conducting state-specific research. These SAUs, 31 in number including the central university in the northeast, have regional research stations established under the National Agricultural Research Project. The participation of the private sector, particularly in seed, is now growing rapidly.

Thus, the country has well developed research institutions, and there are about 22,000 qualified scientists working in the ICAR/SAU system. However, the level of funding and research infrastructure varies – scientists in ICAR are better funded and equipped, while their counterparts in SAUs, particularly their regional stations, are constrained due to inadequate resources. Addressing resource constraints and improving research planning and linkages in these public research institutions should be a high priority agenda.

Future perspectives

There are two important issues relating to future orientation of agricultural research organizations in the country. First is to encourage non-public research organizations to strengthen the NARS. This requires action on two points: (a) Appropriate regulatory framework and incentive system to attract private sector, both for profit as well as non-profit, in funding and execution of research (the issue discussed later in detail); and (b) separation of funding from execution of research, so that various actors can pool their resources and perform, based on their comparative advantages. For example, public research programs can focus

more on strategic research, while private research programs can cater market-oriented applied research. Private funds can also support public research programs for strategic research directed to strengthen applied research in the private sector. On a similar pattern, public funds can support private research directed to benefit weaker sections of the society or a research program with societal orientation.

The second issue relates to bringing necessary changes in the public research organizations for addressing future research needs in multi-institutional, inter-disciplinary and system perspective. This requires some changes in research planning to solicit effective participation of stakeholders and supporting institutional linkages and systems research through competitive funding. These issues are discussed below.

Research planning. An advantage of commodity/resource and disciplinary-based organizations is that final output or technology can be easily visualized and planned, producing a higher degree of research success in the past as witness. However, in a complex production system such visualization may not be sufficient unless it is based on a system perspective. As the system complexities are increasing overtime, there is a need for change in research planning—it should now shift to matrix mode of research planning where scientists from various disciplines and institutions are pooled for a mission-oriented project. This essentially involves planning for addressing production constraints, filling gaps in critical technological and exploiting opportunities in various agro-ecological regions. A multidisciplinary team of scientists from the institutions located in an agro-climatic region is commissioned to address a particular research problem. The AICRPs and NATP envisage research planning in this mode, but their share in the total research funding is very small. Therefore, increasing proportion of the plan funds should be allocated to this mode.

The participation of stakeholders helps in improving not only the relevance of research, but also facilitates research planning in systems perspective. Scientists can identify research problems for the required technological interventions in the system. Individual scientists or team of scientists, however, may still work for a component of technology, but they together can contribute to the development of targeted technology. For such a change, exchange of information between researchers and farmers, and participation of farmers in identification of production constraints and growth opportunities are essential. This approach is being tried under NATP.

Competitive funding. Competitive research funding is a powerful mechanism to bring institutional reforms in the research system. These funds can improve relevance, cost effectiveness, and accountability of research (Kampen 1997). Institutions and scientists compete for funds to work on the identified priorities. Objectives, key concerns (like multidisciplinary and inter-institutional approach for equity-driven research) and modalities of the funds are well-defined and disseminated (Gill et al. 2000). Although some of the funds like AP Cess Fund of ICAR, were established long ago, these are hardly used for bringing institutional reforms. Only recently the Competitive Grant Program of NATP is designed to strengthen public-private partnership in agricultural research. It is, therefore, important that an increasing proportion of research funds are used for competitive funding for specific objectives. Objectives of the fund, operational procedures and research priorities should be determined well in advance for transparency and credibility in management of the fund. In the absence of these, it is likely that subjectivity and inconsistency will be involved in evaluation of research proposals. Peers' perceptions of priorities may vary, 'good science' may overshadow need-based research, and the competitors' credentials may dominate relevance of proposal in terms of clients' needs and objectives of the fund. Finally, in order to make these funds successful, there should be enough flexibility in financial and management operations — an essential requirement often lacking. Here, it is important to note that the competitive funds finance the short-term projects, usually of 3-5 years duration, and therefore, timely availability of resources and flexibility in their use are essential for the successful and timely completion of projects.

Networking. Consortium and networking approaches are powerful mechanisms to bring together institutions and individual scientists. Usually, the former is a formal arrangement between two or more research institutions, while the latter establishes informal but effective links between the scientists working on a common research theme. Both the approaches are gaining popularity in the research systems. For example, the Rice-Wheat Consortium has established joint research programs between CIMMYT, IRRI and NARSs of South Asia for sustaining the productivity of the rice-wheat system in the Indo-Gangetic Plains. Similarly, there are a number of research networks also. Both the approaches are cost effective and can generate synergies, and therefore, should be encouraged. Electronic connectivity and flexibility in establishing linkages, including international linkages are essential for their promotion.

Public-private interface

Private sector is assuming greater roles in funding and performance of agricultural research. Its presence is particularly significant in the developed countries where it contributes about half of the research efforts (Alston et al. 1999). The developing countries have started witnessing such an institutional change. Most of the private funds are utilized to support the in-house research programs even in the developed countries, and public-private research linkages are negligible. For instance, in the US, about 13 per cent of the total private funds for agricultural research were used by the public research institutions. Although instances of public-private partnership in agricultural research are witnessed, their contribution to the total research effort is still negligible (Huffman and Just 1999).

Conceptually, the private sector is expected to build on basic research done in the public research organizations for its commercial application. The products of applied research have high appropriability—a necessary condition for private investment (Umali 1992). Therefore, a closer link between the two sectors can substantially reduce R&D lag and improve efficiency of the research system. These links would also improve client orientation of research efforts, as the private sector works more closely with clients. The available evidences indicate that in such linkages, the government-funded work preceded the industry-funded work and researchers in both the sectors were in constant touch—academic researchers identified problems in consultation with the researchers in industry, while the latter availed the consultancy services from the former. Further, the standard of faculty, scale of research and geographical proximity were found to be positively associated with the perceived contribution of academic researchers to industrial revolution (Mansfield 1995). Such instances of the public-private interface are a few in the developing countries and India is no exception. The more common practice in India is that the products of public research organizations are commercialized by the private sector. If necessary, some adaptive work is also done by the private sector. Availability of information and transparent mechanism for access to the products of public research programs foster this kind of interface (Table 1). Examples of this kind are found in the Indian seed industry (Pal et al. 2000).

The need for public-private interface is likely to increase with further spurt in private research activities because of the recent advancements in molecular

Table 1. Public-private interface in the provision of rice seed

Elements	Nature of interface	Sustainability
Acquisition of source seed	• Open access to public varieties • Supply of source seed by the public sector • Commercial sale of foundation seed by public seed agencies	• The public sector has the incentive of wider technology impact • Resource generation by the public sector • Provision under seed law • Transparent mechanism to acquire source seed
Seed multiplication	Training of private sector personnel in seed production techniques by public research institutions	Increasing understanding of private sector as potential client of public research products
Quality control	Extending public seed certification and testing services to private seed agencies	• Provision under seed law, but seed agencies argue for a liberal procedure • Incentive of subsidy on certified seed of 'new' variety
Conditioning and storage	Private processing of public agency's seed on contract basis and *vice versa*	• Incentive of increasing market share in seed sale • Utilize excess seed processing capacity
Marketing	• Private sale (by seed dealers) of public agency's seed • Trade in commercial seed between public and private seed agencies	• Commercial incentive for the private sector • Public sector to bridge seed demand-supply gap
Seed information	Private delivery of information of varieties through television and farm magazine	• Private media to cover programmes/ information of public (including farmers) interest • Private sector unlikely to promote new varieties

Note: Rice variety development is exclusively in the public domain. However, there is a public-private joint research program on hybrid rice, and there are several private seed companies using public lines in their research program on hybrid rice.

Source: Pal et al. (2000).

biology and genetic engineering. The new trade regime is also expected to help globalization of biotech products, and therefore, developing countries are likely to witness exponential growth in private-sector research. A variety of actors, viz. national public research systems, international public research systems, and national and international R&D companies, may form new alliances and partnerships. Such partnerships should be based on comparative advantage and strengths of the partners. Public research organizations should learn to gain access to proprietary research material through joint ventures, secrecy agreements, licensing purchase and material transfer agreements. They should also learn to manage their intellectual property and exchange it for gaining access to proprietary technologies for larger public interest and social welfare (Byerlee and Fischer 2000). The national research system should initiate a strategic response to development, management and transfer of technologies (Table 2). The success on this front will largely be determined by transparency and effectiveness of the regulatory framework for protection and transfer of technologies and mechanism for sharing of benefits.

A number of initiatives have been taken in India to foster public-private partnership in agricultural research (Mruthyunjaya et al. 2000). However, the response has been mixed. An application of Williamson's (2000) theory of transaction cost in contractual relations help explain this limited success (Fig. 3). There is an increasing realization among the private companies that market dominance is possible only when they have superior product to offer to farmers. This can be realized with adequate R&D support. In case, the R&D support is provided by the public sector, there should be explicit mechanism for joint venture, trust between the partners, benefit sharing and secrecy of contract. India is slowly moving in this direction. These conditions are, however, easily met in the private-private partnership, and therefore, new partnerships between the national and trans-national companies are emerging in India. The most frequently cited examples are in the seed sector — joint ventures of Monsanto and Mahyco, Pioneer and Southern Petrochemicals, and ITC and Zeneca. Monsanto and Mahyco have a joint research program for Bt cotton, while in the other two joint ventures, research is with the trans-national company and marketing is with the national company.

The companies which face high transaction costs of accessing the technologies from the market, but have adequate assets, establish their own in-house R&D programs. These companies need adequate protection of

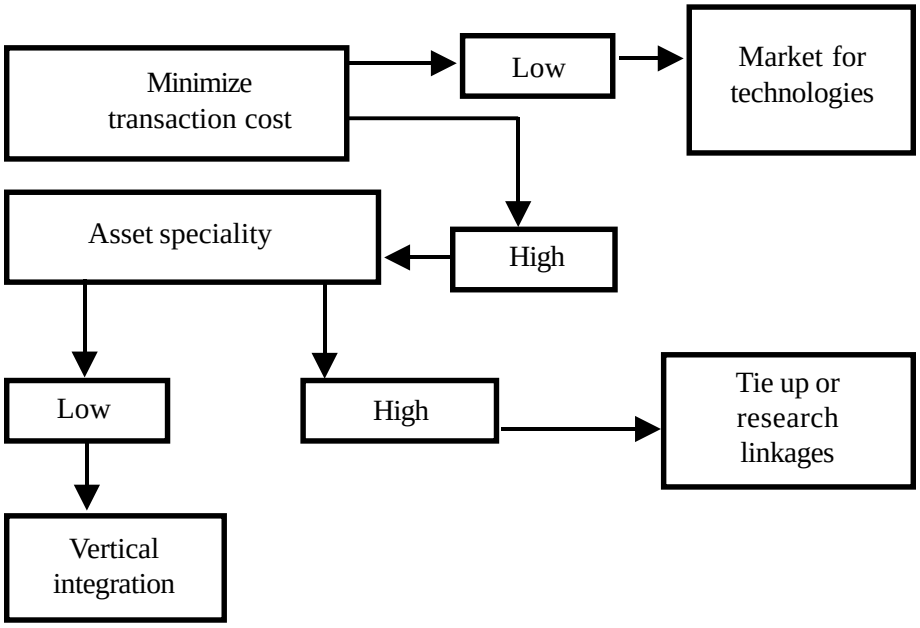
Table 2. Policies and strategic options for the stronger NARSs for biotechnology

Issue	NARSs that already have strong biotech capacity
Public sector research capacity	• Invest in upstream capacity for tool development, and to design around key components • Contribute to global structural and functional genomics consortia and data bases • Define and assert 'ownership' of selected biological assets for specific traits
Private sector research	• Provide favorable regulatory environment on technology importation, protection, and release consistent with societal norms on risks. • Revisit priorities of public sector to ensure complementarity with the private sector
Public-private partnerships	• Negotiate commercial licensing agreement directly with private companies for accessing tools and technologies for commercial and emerging markets • Bargain for royalty-free license for non-competitive market • Develop and protect own IP products and for use as bargaining chips in joint ventures
Regional/ international alliance	• Develop partnerships for upstream research with advanced public and private research organizations and with the CGIAR

Source: Byerlee and Fischer (2000).

proprietary material. The Protection of Plant Variety and Farmers' Right Act (2001) is enacted to provide incentives to the breeders to meet the commitments made by India to the World Trade Organization. But what is equally important is that credibility of the protection mechanisms should be maintained through transparency and effectiveness in their enforcement. Also, as discussed subsequently, the regulatory framework governing development, testing and transfer of technologies should be less cumbersome, more transparent and less time taking. However, this does not imply, by any means, that the mechanism should be less stringent.

Fig. 3. Institutional perspective of public-private interface



The last requirement of joint ventures is the provision for contract research and consultancy. The ICAR has developed the guidelines (ICAR 1997) and now encourages contract research and consultancy. However, guidelines for sharing of benefits under contract research are not so well defined. Also, difference in the work culture of public and private sectors and cost of delays have raised the transaction cost of research contracts. It is expected that the working groups constituted by the ICAR for various sectors (crops, livestock, horticulture, fisheries, engineering, etc) would be able to cut ice on this front.

Research Management

With the increase in size and complexity of the NARS, management issues have become extremely important for efficient provision of research services. Jha (2001) has indicated some of the reforms for efficient management of research system. In particular, he has highlighted the changes required for

addressing research needs of small holders. We have also discussed here, some more changes that are required in management of the public research organizations. The key to success lies in reducing the transaction costs in hierarchies, integrating organizations for synergies and evolving a participatory and decentralized management system. Specific issues in this direction are discussed below.

Decentralization and devolution

As noted above, administrative and other expenses of research management are very high because of centralized management. Now the focus should be on decentralization and devolution, which is also related, to some extent, with autonomy of the system. Decentralization of research management would help in two ways. Firstly, it will encourage management reforms to reduce the transaction costs and improve research efficiency. Secondly, the system can be made more accountable. Here, it is important that the decentralization should be for all research management functions, viz. research planning, management of resources including financial resources, evaluation of research programs, and implementation of incentives and reward system, and should go down to the project level. Lack of flexibility in any one of them may frustrate all efforts. For instance, current decentralization efforts in ICAR are constrained by rigidity in financial procedures.

Research planning and evaluation

Planning and evaluation of agricultural research are extremely important parameters. Unfortunately, the performance of the system is rather uneven on this front. Research performance and effectiveness can be as good as its planning and evaluation during implementation. A weak research planning would lead to poor targeting, cost overruns and frequent delays. At the planning and initial stage of implementation, there is a scope for change, and any oversight identified at a later stage is difficult to rectify; it would simply require repetition of the research cycle. Similarly, concurrent evaluation must be rigorous and objective; research programs meeting the evaluation criteria should be allowed to progress and others should be critically reviewed and if need be, abandoned. This can happen only when evaluation mechanism is stringent

and linked to commitment of resources as well as career advancement of scientists.

Research planning involves two basic factors: (a) Allocation of resources based on prioritized research portfolio developed using objective criteria and systematic analysis; and (b) development of research programs in a bottom up participatory approach. The idea is that resources should be allocated based on expected contributions of the programs to research objectives, and the programs must be of direct relevance to the clients. Increasing use of formal priority assessment methods is recommended (Pal and Joshi 1999). A beginning in this direction has been made under NATP. This, however, requires a system-wide adoption.

Incentives and reward system

For healthy growth of any organization, it is essential that a proper incentive and reward system is instituted and is linked to the performance of individuals and institutions. At the same time, it is important that there is a transparent and objective mechanism for performance evaluation of individuals as well as institutions. As of now, both, the incentive and evaluation systems, are working in isolation in the public research organizations, and therefore, it needs rectification.

Information system

Development of an information system is essential for a proper decision-making. It improves the quality of research planning and enables judicious use of resources, reduces duplication of research efforts, and thereby, contributes to cost-effectiveness of the research system. Past efforts to develop such a system were frustrated because of inadequate infrastructure for the exchange and updating of information and lack of effective information system. Development of information system and electric connectivity are the high priority components of NATP, and therefore, substantial resources are committed to them. Besides hardware, an integrated system of information on research programs, scientific manpower, financial resources, research products including technologies, patent and publications, and other value-added information should also be accorded high priority.

Enabling Institutions

The overall efficiency of a research system is determined not only by intensity, quality and organization of research efforts, but also by the types of institutions or governing regulations. The role of state is now changing from a controller to a facilitater, and therefore, the regulations governing R&D system must facilitate the working of the system. Any effort to control the system, or any actor, would be counterproductive. The state should intervene only when market fails to deliver. The regulations relating to the entry of private companies, import of research equipment, testing, release and commercialization of research products, protection of intellectual property rights, etc. affect the working of the R&D system. Although the public sector is also equally affected by these regulations, we discuss them more in the context of the private sector, who often debate about their effectiveness. These issues are discussed in the context of seed sector—an area where the private sector has shown keen interest.

The protection of plant varieties is expected to further enhance activities of private seed companies. There would be a better access to technologies available all over the globe and a wide rage of technologies would become available to the farmers. It is also expected that the rate of variety release would increase and the older varieties could be replaced frequently, giving some yield advantage. However, there could be indiscriminate import of technologies and attempts to establish broad patents. The government would have to be vigilant on this matter and should regulate import of seeds and their sale in the market. Once the market is mature and competitive and farmers are well informed, the process could be liberalized. In cases of concentration of markets, the government can apply 'compulsory licensing' and/or bargain for free use of proprietary material in lieu of public research material including germplasm.

Another concern relates to the regulations on transgenic products. There is wide apprehension and fear about the transgenic products due to lack of information. The Review Committee on Genetic Manipulation in the Department of Biotechnology has laid down guidelines for transgenic research. Nevertheless, there are some genuine concerns that need to be addressed: (i) The monitoring and evaluation process should focus more on product than on process which is more or less similar. This means that environmental and health risks of transgenic products must be assessed on case by case basis. (ii) There should be a close relationship between regulations governing the transgenics — the Seed Act,

biosafety and plant variety protection. Any confusion and delay in release of the products would prove to be expensive for the companies as well as for the society. (iii) Adequate attention should be given to seek preferences of the producers and consumers. The government and other agencies should inform them, so that they can assess cost and benefits of transgenics and make informed decision about use of transgenic products.

The control of input quality is another area which has received considerable attention. The primary responsibility of providing information and ensuring quality of inputs lies with the government. Accordingly, the mechanisms for quality control should be evolved. For example, seed quality in terms of genetic purity and physical standards, is examined by the government officials at different production stages, and the seeds meeting all the requirements are issued certification tag[1]. In addition, there is a mechanism of point-of-sale seed inspection, and seeds found to be sub-standard at this stage invite legal proceedings against the seller (dealer, company or both). This is a 'third party' case of quality control usually found in the developing countries. Private seed companies argue for liberalization of these quality control measures, and the case put forth is that the companies have incentives in maintaining seed quality to establish their reputation. This is true to a large extent, but there are instances of lack of information about the company, variety and formal seed quality control measures. There could be a case for liberalizing when markets are competitive, farmers are informed about the market and consumer forums are effective to address grievances.

The success of these regulations should be assessed not only in terms of protecting farmers but also effectiveness of their enforcement. Lack of transparency, scope for 'rent seeking,' and long delays in delivery of technologies to farmers may weaken the credibility and basic purpose of these regulations. These may even neutralize other incentives for private research investment, such as tax exemption on private R&D expenditure, concessions on import of scientific equipment, and sale tax benefits on certified seeds. As of now,

[1] In the Seed Act there is a provision of 'labelled seed'. Seed producers can sell uncertified seeds provided a white label is provided with seed indicating name of the variety, physical standards, etc. Most of the companies sell 'labelled seed', particularly of proprietary hybrids to protect the parent lines. But, they prefer to sell certified seed of public varieties to avail tax benefits.

competition guided discipline supported with workable public quality control measures seem to be adequate for the Indian system.

Research-Extension Linkages

Lack of effective research-extension linkage has been a perennial problem of agricultural technology system in India. The main reason for this is that agricultural research and extension functions are conducted by independent organizations and there are no incentives for bringing them together. Researchers consider extension a less challenging activity, whereas there are no incentives for extension agents to establish close links with research institutions. The solution may lie with diversification of institutional and funding base of the extension system, where all actors pool their resources and skills. In particular, participation of the private (for profit) sector and voluntary organizations will be important. Their roles in various extension functions are discussed below.

Provision of information

Provision of information is an important function of extension. The information flow should be both ways — from researchers to farmers and vice versa. With increasing focus on farmer participatory research and involvement of farmers' organizations in research planning is expected to improve information flow from farmers to researchers. Two kinds of information are to be delivered by researchers to farmers. First is the general information like the one about prices and weather. This can be best provided by public extension system through mass media. Second is the specialized information like scientific recommendations, soil tests, animal health, etc. Agricultural research stations can provide this type of information through computerized information system. This information should be gathered based on homogenous production systems.

Some of the specialized information like soil quality, animal health, etc. can be provided by the private (for profit) sector, as there is scope for appropriability in provision of this information, especially in the short run. Farmers are also willing to pay for such services if the stake involved is high, such as in orchards, livestock and commercial crops (Sulaiman and Sadamate 2000). Voluntary organizations independently or with support of public funds can provide the

information having low scope for appropriability, e.g. crop and resource management practices.

Imparting skills

Imparting skills is a specialized task requiring some personal contact with clients. Here also, private sector can play an increasing role. The skills relating to management of high-value commodities can be provided by profit-oriented private sector. The skill required for management of common pool resources, where social benefits exceed private benefits, can be best provided by voluntary organizations. If the front-line extension organizations like *Krishi Vigyan Kendras* and Regional Research Stations of SAUs, can assume significant role and work with farmers to generate resources—more is the resource generation and stronger will be research-extension linkages. Lastly, research-extension linkages in the profit-seeking private sector are bound to be stronger, as both these functions are well integrated in this sector.

Concluding Remarks

This paper highlights policy, institutional and organizational issues for reforming the NARS, in general, and the public research system, in particular, for making the system responsive and efficient. This requires understanding on the part of the policy makers to make the public research organizations autonomous and accountable. The public research organizations should also learn to function in a network mode. The idea behind this is that research agenda should be identified in a participatory mode and the best talent from all the sectors should be put to work under an enabling environment and incentive system. Also, transaction cost of the governance of the public research organizations should be brought low. The institutional framework should be effective, efficient and credible so as to accelerate the rate of technology generation, commercialization and transfer. The technology system will provide a competitive edge in an era of knowledge-based society, and therefore, it must change to keep pace with the rapidly changing world.

References

Alston, Julian M., Philip G. Pardey and Vincent H. Smith. 1999. *Paying for agricultural productivity.* London and Baltimore: The Johns Hopkins University Press.

Byerlee, Derek and Gary E. Alex. 1998. *Strengthening national agricultural research systems: policy issues and good practice*. Washington, D. C.: The World Bank.

Byerlee, Derek and Ken Fischer. 2000. *Accessing modern science: institutional and policy options for botechnology in developing countries.* Paper presented at the 4th International conference on the *Economics of agricultural biotechnology.* Ravello, Italy, 24-28th August 2000.

Gill, Gerard J., Diana Carney and Suresh Pal. 2000. *Improving competitive agricultural research funding in India*. Policy Brief 12, New Delhi: National Centre for Agricultural Economics and Policy Research.

Huffman, Wallace E. and Richard E. Just. 1994. Funding, structure, and management of public agricultural research in the United States. *American Journal of Agricultural Economics* 76(4): 744-59.

Huffman, Wallace E. and Richard E. Just. 1999. The organization of agricultural research in western developed countries. *Agricultural Economics* 21: 1-18.

ICAR. 1997. *Training, consultancy, contract research and contract service in ICAR system: rules and guidelines*. New Delhi: Indian Council of Agricultural Research.

ICAR (nd). *ICAR Vision 2020*. New Delhi: Indian Council of Agricultural Research.

ICAR. 1998. *National Agricultural Technology Project: main document*. New Delhi: Indian Council of Agricultural Research.

Indian Council of Agricultural Research. 1988. *Report of the ICAR Review Committee*. New Delhi: ICAR.

Jha, Dayanatha. 2001. Agricultural research and small farms. Presidential address delivered at the 60th annual conference of Indian Society of Agricultural Economics, January 22-24, 2001.

Kampen, J. 1997. *Financing agricultural research: lessons learnt with agricultural research funds*. Washington, D. C.: World Bank (mimeo).

Mansfield, Edwin. 1995. Academic research underlying industrial innovations: sources, characteristics, and financing. *Review of Economics and Statistics* 77: 55-65.

Mruthyunjaya and P. Ranjitha. 1998. The Indian agricultural research system: structure, current policy issues, and future orientation. *World Development* 26(6): 1089-1101.

Mruthyunjaya, Suresh Pal and A. K. Bawa. 2000. ICAR-Industry interface in agricultural research. New Delhi: National Centre for Agricultural Economics and Policy Research.

Nickel, J. 1997. *Institutional aspects related to agricultural research in Pakistan.* Washington D.C.: World Bank, South Asia Regional Office.

Pal, Suresh and Alka Singh. 1997. *Agricultural research and extension in India: institutional structure and investments.* Policy Paper 7. New Delhi: National Centre for Agricultural Economics and Policy Research.

Pal, Suresh and P. K. Joshi. 2000. *Priority setting, monitoring and evaluation in agricultural research: selected readings.* New Delhi: National Centre for Agricultural Economics and Policy Research.

Pal, Suresh, Robert Tripp and A. Janaiah. 2000. *Public-private interface and information flow in the rice seed system of Andhra Pradesh (India)*. Policy Paper 12. New Delhi: National Centre for Agricultural Economics and Policy Research.

Sulaiman, V. R. and V. V. Sadamate. 2000. *Privatizing agricultural extension in India*. Policy Paper 10. New Delhi: National Centre for Agricultural Economics and Policy Research.

Umali, D. L. 1992. *Public and private sector roles in agricultural research: theory and experience*. Washington, D. C: World Bank discussion paper, 176.

Williamson, O. E. 2000. *The economic institutions of capitalism—firms, markets, relational contracting.* New York: The Free Press.

11

Institutions and Organizations: Agricultural Policy, Research and Extension

Rajeswari S. Raina

The burgeoning stock of food grains is the hallmark of success of the agricultural policy, research and extension organizations that not only led to the green revolution in India but also sustained it. Yet, the ecological, social and political consequences of the green revolution and the impact of these consequences on the development goals of the nation, pose difficult questions, often directed at these institutions.

The social scientists question the unending need for policy regimes that subsidize inputs and provide price protection to the farming community and to consumers (Pingali et al. 1999). The research system is questioned for concentrating heavily on irrigated tracts and major cereals with 'assured benefits,' at the cost of rainfed agriculture and coarse cereals. The inability of 'productivity enhancing technologies' to deliver better livelihoods to the poor in marginal areas demands 'more focused and tightly managed' participatory research with a systems approach to handle the multisectoral and seasonal dimensions of rural areas and ecologies (Mortimore et al. 2000; and Raina 2000). Weak research programs are cited as a major cause of poor performance of agricultural research in many developing countries. For example, in a review conducted by ISNAR, it was found that "Research programs often do not sufficiently reflect the country's development objectives, respond poorly to the needs and demands of the research users, and do not take advantage of technologies and information generated elsewhere" (Collion and Kissi 1994, p. 78). The relevance and quality of scientific research are hampered by the increasing bureaucratization in research organizations, reducing their access to other actors/agencies in the agricultural innovation and agricultural development processes (Raina 1999a; and Mruthyunjaya and Pal 2000). Institutional features like leadership and flexibility

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

to take advantage of new research opportunities vary in different research organizations within the public agricultural research system in India (Evaluation Team 1999)[1]. Fundamental reforms in extension, moving away from hierarchical (top-down) transfer of information or advice, towards a 'mutual learning' process can help better design of relevant research, enhanced uptake of technology and more desirable or less disruptive impacts on development (Nitsch 1994; Roling 1988; and Garforth and Usher 1997). Ultimately, the complex and dynamic relationships between agricultural science, society and ecology demand that all actors in the agricultural innovation system make conscious and consistent efforts for institutional learning and institutional change[2] (Hall et al. 2000; and Raina 2001).

The call for 'institutional change' for a deeper greater agricultural technology impact highlights several issues in the social studies of agricultural science that were taken for granted previously. What is institutional change? How is it different from organizational change? If the Indian Council of Agricultural Research (ICAR) and the State Agricultural Universities (SAUs) are public sector research organizations, how is the 'institutional change' to be negotiated in these organizations? How do these research organizations relate to each other, to policy and extension organizations, to stakeholders (farms and ecosystems) and to the national agricultural innovation system in general[3]?

To achieve the desired impact(s) of agricultural technologies, such as poverty alleviation or reduction in ecological disruption, is highly demanding indeed. It calls for the philosophy of sustainability. Agricultural innovations can no longer

[1] A team of experts assessing the Rockefeller Foundation funded International Program for Rice Biotechnology, noted that leadership and flexibility to take advantage of opportunities (in research avenues and training) are easier to come by in Indian agricultural universities than in research organizations under the jurisdiction of the ICAR (Evaluation Team 1999).

[2] This is a statement that affirms the 'national systems of innovation' approach to understanding and analyzing institutions, their roles and changes in agricultural technology generation and utilization. For a detailed analysis of changing policy goals and institutional reform, see Hall et al. (2000).

[3] The 'national systems of innovation' approach enables us to look beyond our earlier narrower definition of national agricultural research system (NARS), where we excluded the policy and extension systems, and their respective goals and accountabilities from those of agricultural science (see Hall et al. 2000).

depend only on the philosophy of productionism[4] to address the diverse ecological, political and economic demands of agricultural technology generation and diffusion. Impact assessment *ex-ante* and *ex-post*, needs clear understanding of the institutional economics and more inclusive analytical frameworks that can handle bio-physical and socio-economic information. Empirically, the tools of analysis shift from expert-led, assumption-ridden econometrics to participatory, deliberative and rational methodologies, using quantitative as well as qualitative information.

This paper argues that a conceptual and analytical distinction between institutions and organizations is an essential input to planning and managing institutional change. Institutional change involves a transformation of the rules/ norms that govern the research and extension organizations. Examples from the history of agricultural research and extension in India reveal a legacy of conceptual muddles and bureaucratic inertia that have stalled over decades every well-intentioned move for institutional change in the national agricultural research and extension organizations. The paper discusses the role of the social sciences in the conduct of agricultural research, technology generation and impact assessment. It argues that the institutional hardware of the neo-classical economics that affects decision-making in the agricultural research and extension organizations, must change.

Institutions and Organizations in Agricultural Policy, Research and Extension

In the realm of innovations, broadly including technology generation and its impacts, institutions have been characterized as necessary to cope with uncertainty, to manage conflicts and ensure cooperation among different research/development actors, and to provide appropriate incentives for these actors. Institutions may also be used to encourage or hamper certain lines of

[4] The philosophy of productionism that informs modern agricultural science states that continuing enhancement of production is the guiding principle of all agricultural sciences. This belief in technocentric productionism and continued moral pride in production is a form of self-deception. Technocentric productionism with "headlong and unreflective application of …technology for increasing production is anti-environmental" (Thompson 1995, p. 70).

inquiry, and in yet another form can become entities that bring rigidity, allegations of 'institutional sclerosis', and the demand for progressive institutional reform (Edquist and Johnson 1997). The institutional economics classifies 'institutions' into hard and soft, formal and informal, mature and evolving; and 'institutional change' as driven by or preceding technological change, designed or self-grown, exogenous or endogenous, radical or incremental, moving towards a market equilibrium, a series of punctuated equilibria, or a perpetual non-consummatory evolution. In analyzing institutional change for greater agricultural technology impact, we recall the definition of institutions as 'sets of common habits, routines, established practices, rules or laws that regulate the relations and interactions between individuals and groups. Organizations are formal structures with an explicit purpose and they are consciously created. They are players or actors (Edquist and Johnson 1997). Bromley (1985) defined institutions as the "working rules for going concerns", which govern organizations.

The distinction between organizations and institutions is important to understand institutional change. 'If organizations are the players and institutions the rules, then how are the rules changed?' (*ibid* p.57). This is the specific concern when we discuss institutional change for deeper agricultural technology impact. Analytically, this distinction between organizations and institutions is an important input to planning, organizing and executing agricultural policy, research and extension effort to achieve desired technology impacts. An innovation system inhabited by policy, research and extension organizations, each with their own characteristic as well as several complementing or conflicting institutional variables is depicted in Figure 1. Given the three important points of confluence of institutional variables and organizations/ structures, viz. (a) the expectations/policy framework, (b) the knowledge and information, and (c) the technology-society interface, it is possible to identify and target institutional reform to achieve the desired policy goals. For instance, if the incentives and ideologies of dominant multinationals are not conducive to encouraging the research on natural resources in the innovation system, then the policy organizations have to find appropriate institutional change (incentives and ideologies) that will encourage natural resources research in the public sector. Coalitions of interest in directing, generating, diffusing/analyzing technological change, dismissed in mainstream economic analysis as political anomalies, become much more clear when the institutional basis of contending

coalitions are made explicit[5]. While there are institutions that are common to policy, research and extension organizations, their features vary in different organizations and to a large extent determine the relationship of the organization with other organizations in the same or other systems (including cultural or political organizations).

Patronage to agricultural science by the State, middle class professionals and their aspirations, the State's political and economic expectations from and for the agricultural sector, and the assessment of the impact of technological change are all embedded in rules/institutions like hierarchy, attitudes, incentive patterns, or values. Given the distinction between institutions and organizations, agricultural policy can be seen as an institution, a set of guidelines, a rule or framework that the patron-State uses to meet the specific economic and political ends. These ends have been met through several organizational and institutional changes in Indian agricultural research system. Using Figure 1 as the analytical framework, we can see that reorganization of ICAR in 1966 and again in 1974, as well as establishment of the SAUs or the Agricultural Scientists Recruitment Board (ASRB) were all organizational changes. The recommendation of the Marion Parker Review Committee (Ministry of Agriculture 1964) for the "*creation of an incentive system* that would encourage more research from professional personnel, and *establishment of an organizational framework* that would enable them to focus on the most urgent problems," was ignored in the 1966 organizational reform (consolidation and centralization) of agricultural research under ICAR. These unfulfilled recommendations for institutional reform, which were either mistaken for organizational change or neglected in the policy push for the green revolution, led to severe institutional (personnel) problems, necessitating the reorganization of ICAR in 1974. In this instance, the reorganization led to the increasing centralization and bureaucratization of agricultural research. But, the introduction of the Agricultural Research Service (ARS) in 1976 envisaged to be equal in status to the Indian Administrative Service, with its new norms and procedures for personnel evaluation, was an important institutional reform[6]. Yet, the fact that the ARS evaluation processes (the Five

[5] Contending coalitions in technology development and policy research, as espoused by Biggs and Smith (1995), are yet to receive adequate analytical attention within the institutional innovation literature, which can perhaps be characterized as another contending coalition in the academic world.

Figure 1. Illustration of selected institutions and organizations in agricultural policy, research and extension

All organizations are located in specific institutional contexts. They behave according to working rules, norms or institutions The policy, research and extension organizations have common and permissive boundaries as well as crucial interactions.

[6] Among the negative consequences effected by the ARS are: (a) An excessive concentration on short-term applied/adaptive research, at the cost of fundamental/ strategic research (ICAR 1988; and Rajeswari 1992), (b) eventual criticisms of ritualistic and repetitive research (ICAR 1988), (c) unhealthy guarding of specializations, (d) a scramble among scientists for research management positions, and (e) suspicions about the credibility of the Five Yearly Assessments (FYAs) when the quality of peers is doubtful.

Yearly Assessments) were discarded in 1986 proves that 'providing ample incentives to scientists' continues to be an unresolved institutional problem. Now when ICAR and SAUs try to resolve problems of attitudes or incentives that can encourage private-public interaction in agricultural science and development, values or ideologies essential for capacity building for natural resources research, motivations that will establish priority setting methods in research organizations, or management solutions to improve personnel morale, they are forced to face some of these historically unresolved institutional variables.

The extension system, in a similar manner, gone through several organizational changes since its origin in the broad-based Community Development Program in the 1960s. But, it has maintained the norms of hierarchy, linear top-down transfer of knowledge (technology) from research, through extension to farmers. The Training and Visit (T&V) system is the best and most recent example in extension methodology, introduced as an institutional change by the Department of Agriculture in Indian states in the late 1970s. The T&V system rests on "the assumption that an outside agency can accurately assess what is good for rural people and that the solution to rural under-development and poverty is the provision of science-based technical knowledge" (Nitsch 1994). This institution with perfect hierarchy, continues to constitute the functional basis of the 'technology-society interface' (see Figure 1). The history of agricultural research reveals an implicit hierarchy in the generation of knowledge and technology, as well as the dissemination and utilization of this technology in the society. This hierarchy has been amply challenged by several alternatives to mainstream public agricultural research and extension (Chambers et al. 1989; Scoones and Thompson 1994; Roling 1988; Nitsch 1994; and Biggs and Smith 1995). The changing role of extension from technology transfer to mutual learning demands a complete breakdown of the extensionist with reference to the farmer (Nitsch 1994). These institutions that are taken for granted have shaped our view of agricultural research, extension, and the impact of technology. *We argue here, that this unstated hierarchy, from policy down to research and from there to extension is an important institutional impediment in achieving the desired impact of agricultural technology*. Hierarchy essentially precludes institutional learning processes and thereby the scope for progressive change.

The history of agricultural development reveals a remarkable mutual determination of the direction and content of agricultural policy and agricultural

science. A significant shift in research content, from export/cash crops to staple cereals, following independence in all erstwhile colonies (now less developed countries) is a good example. Agricultural policy in most of these countries maintains this emphasis on food security and nutrition, in contrast to the policy almost 50 years ago of increased export earnings or of promoting supply of primary goods to the industries of the colonizers. Recent developments in the world trade regimes and the ecological degradation caused by myopic policies and adoption of technologies, have led to revision of agricultural policies (including subsidies and income support) by several of these less developed countries. This, in turn, calls for a change in the relationship between agricultural science and agricultural policy to spearhead the drive for economic and ecological sustainability of agriculture[7]. The most crucial, however, is a re-orientation, theoretically and methodologically, of the social sciences that form the conceptual and functional relationship between agricultural science and society. In particular, the neo-classical economics with a very limited institutional understanding needs re-examination for its suitability to study and guide agricultural sciences.

Social Sciences and Institutional Change

Social sciences have enhanced our understanding of institutions in agricultural science and development. Agricultural science has been subject to analyses within both endogenous and exogenous theories of economic development. The theory of endogenous growth, when applied to the analysis of agricultural research or directions therein, emphasizes the fact that technological advancements are determined directly by the relative factor scarcities and prices prevailing in the economy[8]. This induced innovation theory

[7] We have argued elsewhere (Raina 2001) that governments, policy makers, agricultural scientists and farmers have not made the essential distinction between sustainability and profitability. The two are often perceived within agricultural research systems as conflicting objectives. We must recognize that profitability is a fickle goal and can be tackled primarily at the policy level (Clark 1999). Science for sustainable agriculture need not focus on the criterion of profitability. It is only one among several other criteria that are more scientifically challenging, and specific to ecological systems, knowledge and technologies, cultural and social contexts, and political commitments.

[8] This is a legacy of the Hicksian labor-capital ratio. It is most profoundly stated in Hayami and Ruttan (1981).

of technological change and agricultural development has been challenged by the exogenous development school (Burmeister 1987; and Grabowski 1988). Olmsted and Rhode (1993) suggest that the institutional innovation hypothesis does not hold for agricultural research and technology generation even in the USA (the prime case generalized by Hayami and Ruttan (1982) to present the induced innovation hypothesis). The commercial crop research agenda in the erstwhile colonies, in response to demand for raw material/commodities of commercial interest to the colonizer's home market, is the most successful demonstration of the exogenous growth model in national agricultural R&D. The commercial crop production technologies, factor scarcities or prices had little to do with the local economies.

In introducing the institutional element in their analysis, the neo-classical economists have gone one step further than the Marxist political-economy analysts who treat institutions as another (dialectical) material input to development. The induced institutional innovation, an after-thought of the induced innovation school, tells us that institutions are also products of relative scarcities (factors or other institutions) and prices (Hayami and Ruttan 1992; and North 1990). The economic phenomena or processes in society thus determine institutions. Accordingly, all institutions governing a system of policing, health services, banks, trade corporations, firms etc. are products of some economic imperative to save costs or increase efficiency or both, in order to ensure increased profits. The third school of institutional economics [to adopt Field's (1984) classification[9]] has produced much of the institutional analysis that is published today. It is marked by the confusion between institution and organization. We argue here, that *the historical understanding of institutions and organizations and their interactions with all relevant systems in their contexts is essential to explain the conduct and performance of the concerned organization (research institute or firm or household).*

[9] Field (1984) presents three schools of institutional economics. The first and the earliest being the Commons variety of context (space and time) specific individual case study method. The second, the assumption-loaded economic analysis of the Marshallian variety, where institutions are uniform and exhaustive across regions, sectors, or actors. The third, the modern neo-classical economists compromise between the two, is based on the assumption that there are costs or transactions beyond the market; but these are quantifiable and can be subject to rational economic analysis.

In the agricultural research system, scientist or research manager makes decisions for public welfare[10]. Managers and experts have well-defined roles within the administrative monolith. This administrative rationalism is "the problem-solving discourse which emphasizes the role of the expert rather than the citizen or producer/consumer in social problem solving, and which stresses social relationships of hierarchy rather than equality or competition" (Dryzek 1997, p. 63).

A key instrument deployed effectively in the decision-making mode of administrative rationalism is the complacency of the bureaucracy and expertise. There is concern (about food production targets, nutrition, trade competitiveness, soil degradation, etc.), and reassurance (about weedicide-resistant or transgenic crop varieties, or impending fossil fuel shortages, or more tangible environmental research projects that tackle issues like pesticide residues or toxicity). The externalities of the industrial model of agricultural growth are either ignored, or assumed to be located in the ill-disciplined socio-political sphere, beyond the control of the rationally administered and disciplined world of science. The superiority of the experts (who represent and work for achieving the State's public welfare goals) is maintained almost perfectly within agricultural research administration. The hierarchy of science and technology, flowing from State, down to policy-maker, scientist, extensionist, and further down to the ultimate adopter, is perfectly maintained.

The administrative rationalism of natural resource bureaucracies the world over, are evident in the 'institutional and policy hardware', which have a very tangible existence (Dryzek 1997). In our attempts at institutional change for greater agricultural technology impact, we must strive to wear out this tangible institutional and policy hardware. Continuous exposure to and open deliberations on ecological, social and political problems in the agricultural sector, can help change agricultural policies, the research and extension organizations and the institutions that govern them. It should not be surprising if in the agricultural innovation systems, the social sciences begin to play the role that plant breeding did in the previous century.

[10] That this decision, in the best NARSs, is informed by the economic rationale of cost-benefit analysis, legitimizes the public servant's (here the expert's) capacity to make decisions about the direction and content of technological change in agriculture. Here, the service or mission of the agricultural research organization is clearly defined — it could be national food security, export competitiveness, or more specifically, land-saving technologies, etc.

Box 1. Dryzek's discourse analysis of administrative rationalism applied to the administration of agricultural research and extension

Dryzek's Discourse Analysis	Crucial counterparts in agricultural technology generation and diffusion
1. Basic entities recognized or constructed	
• Liberal capitalism	- Assured private markets/profits
• Administrative State	- Protectionist policies, regulated markets, public investment and infrastructure
• Experts	- Institutionalization and authority
• Managers	- Bureaucratic organization and management
2. Assumptions about natural relationships	
• Nature subordinate to human problem solving	- Pervasive commodity-based research and production-productivity orientation
• People subordinate to State	- Most favorable tracts, most responsive crops to meet national objectives
• Experts and managers control State	- More and new bureaucracies to manage disaggregated problem components - Research organizations superior to extension organizations and strict hierarchy of information flows and decision-making is maintained within both the organizations
3. Agents and their motives	
• Experts and managers	- Professional/career advancement
• Motivated by public interest, defined in unitary terms	- Cost-benefit analysis in project appraisal - Prioritization of research programs projects to meet targets (of dissemination/adoption) set by the State/policy makers
4. Key metaphors and other rhetorical devices	
• Mixture of concern and reassurance	- Food security vs. transgenic crop varieties or environmental research
• The administrative mind	- Scientific research and extension effort as yet another government service

Source: Dryzek (1997)

Society and Agricultural Technology: The Need for Institutional Analysis

There has been over the years an increasing intellectual and institutional isolation of agricultural sciences (see Mayer and Mayer 1976 for the USA; and ICAR 1988 and World Bank 1990 for India). Intellectually, agricultural sciences the world over, are isolated from other liberal arts and sciences of the general universities. Institutionally, agriculture sector now has its own scientific research organizations, technology diffusion systems, professional, trade and social organizations, and political system (Mayer and Mayer 1976). We agree with the Mayers' that the formidable strength of this agricultural complex is difficult to break or reform.

The theories of economic development, which have been applied to the analysis of agricultural science, share two common features. The first is that they are all grounded in the rational expectation that agricultural science and the technology it generates can lead to economic development. This economic development, in turn, draws from increased production, reduced cost, and/or increased economic efficiency, and from the management of capital and labor resources to cater to this ideal of development. *The economics of agricultural science and development have contributed to these assumptions about, (a) direct causal relationship between science and development, and (b) relative insignificance or non-existence of externalities and institutions.* In the latter case, it must be pointed out that all institutions that are not directly and exclusively the product of changes in economic variables are ignored. In conventional neo-classical analysis, this means that all institutions are either reduced to their simplistic economic expressions or ignored or at best assigned a value as an error term in the econometric model estimated.

The second feature is a relationship based on 'instrumental value' between agricultural sciences and the social sciences that inform it and legitimize its institutionalization and growth. Accordingly, the scientific research and technology generation in the agriculture sector leads to welfare maximization, which is the ultimate mission of all science and technology endeavours. The scientific community and the NARSs within which they work make rational decisions regarding the most efficient technologies and their utilization in society. Thus, the social sciences, economics in particular, measures the welfare gains due to

technological change, and this legitimizes and increases the investment made by the State in agricultural research[11].

The disciplinary isolation of agricultural sciences both within the academic community and from the society, in general, arises from a basic kink in the agricultural science paradigm of using the social sciences. The social sciences are used (a) as a substitute for extension or transfer of technology, (b) for statistical verification of experimental results —an economic viability statement before release of the technology, and (c) for conditional priority setting, evaluation and policy formulation in agricultural research systems.

In all the three cases, *social sciences are of instrumental value within the agricultural science paradigm.* A clear, logical distinction is made between reality and morality. Instrumentalism logically defines the sole task of science "as the discussion of means on the basis of given objectives" (Hagedorn 1993). In practice, in the organization and conduct of agricultural research, be it in the private or public sector, this translates into a division of labor between scientists and politicians. This division of labor is 'postulated in order to guarantee the logical distinction between reality and morality'.

This distinction is most evident in the agricultural science community's defence of itself from the negative social and environmental impacts of science. For instance, in an exercise modelling the effect of precision technologies on agriculture and environment, scientists present the view that "(M) any of our environmental problems are not the result of 'bad science', but are the products of inadequate policies, institutions and management" (Zilberman et al. 1997). The declining rate of growth of food grain production and productivity, as well as declining soil health (in Punjab and Haryana) cause concern (ICAR 1998). Here again, the blame is placed on myopic policies and resource degrading cropping patterns (ICAR 1998; and Pingali and Shah 1999). Though scientists do acknowledge that they attempt to find the absolute truth, verified by an acceptable degree of significance, sometimes do not address the physical, social and economic constraints faced by the farmers. This tendency reinforces the *status quo* of science. Accordingly, it is the government—its policies and institutions—that must change, not the objective morality of science. *The social sciences embody this neutral instrumentalism, keeping agricultural sciences*

[11] Several studies estimating returns to investment in agricultural research are available (see Evenson 1984; Rajeswari 1995; and Alston et al. 1995).

isolated from social and political processes, as well as the consequences of agricultural technologies. What is instrumentalism in theory becomes autonomy and unaccountability in practice. The neo-classical economics provides the main legitimization for this autonomy, by justifying the research agenda that responds only to factor scarcities and price vectors (Raina 1999).

Evaluation: breaking hierarchies

Politicians and policy makers have over the past couple of decades witnessed an increasing reliance on 'expert' advice as a source of resolution and more importantly on legitimization of political decisions. This simultaneous scientification of politics and the politicization of science poses a paradox, ultimately de-legitimizing science and expert advice (Weingart 1999). But, this loss of public faith in the authority of expertise has not prompted the academic community/ scientists to "adapt their ideas on science and its relation to politics" (Rutgers and Mentzel 1999). The reluctance of the agricultural science community to adapt or change their ideas about the morality of science or the institutions that govern their science, is understandable. The theoretical and empirical instruments or methodologies of evaluation (of impact assessments/project appraisals) practised in NARSs today, reveal some major institutional impediments that influence the conduct of agricultural science and its impact on society and environment. The hierarchy in the administrative rationalism of agricultural science, and the neo-classical economics framework used for technology assessment are two of these institutions that deserve immediate attention.

Two major purposes of evaluation are: (i) To help *ex ante* research decision-making through project appraisals, and (ii) to understand the consequences of agricultural technology through *ex-post* impact assessments. Several problems following the green revolution technology (in employment, equity, rural indebtedness, nutrition, soil and water quality, incidence of phyto-pathological problems, etc.) had been highlighted in the 1970s and 1980s[12]. In India, for instance, institutionalization of an effective research monitoring and evaluation system in the NARS could have prevented worsening of several negative impacts of the green revolution technology, or atleast re-oriented much of the research

[12] See UNRISD (1974), Palmer (1974), Farmer (1977), Lipton with Longhurst (1989) and Prahladachar (1983) for different accounts.

that is now criticized as being "repetitive and ritualistic" (ICAR 1988; and World Bank 1990). In practice, these evaluations in the NARS make the entire system suspect and invite criticisms of disciplinary convergence, over-simplification, uniformity in perspective, and coalition between the scientific community and agro-industrial capital (Vorley 1998).

In the State-sponsored administration of agricultural innovation, agricultural technology is evaluated exclusively in terms of commodity production goals (the objectives given by the State). Other impacts/externalities that are direct consequences of agricultural technology are often ignored. *There is a need for methods and practices of project appraisal and impact assessments that can capture the relevant changes in the ecology and society due to technological change.* Evaluation methods must essentially tell us why and how technology generated by the research system leads to sustainable development, or why it does not.

Let us assume that 'greater agricultural technology impact' *does* mean greater technology impact to move towards the dynamic goal of sustainable agriculture. Much change in 'decision-making and evaluation' is needed if agricultural research and extension are to serve sustainable agricultural development (Herdt and Lynam 1992). During the past decade, there has been a conceptual evolution among agricultural economists and policy makers, from drawing lines and demarcating phases to introduce sustainability into the research process, to embracing sustainable development as the ultimate objective of agricultural research (see Lynam and Herdt 1989).

First and foremost,

> "Impact assessment ... must ... focus on development goals, not just on the outputs generated by research. ... Biotechnology, adoption of new crop varieties, higher crop yields, agricultural credit, off-farm employment and industrialization may be components of development, but they are not the goals. ... Genuine agricultural development alleviates rural poverty and increases food production. Agricultural research must ultimately be judged against its contribution to this vision of development. Impact assessment must demonstrate how research leads to technology and how technology leads toward achieving development goals, or alternatively, why it does not" (Herdt and Lynam 1992).

Thus, information about and possible reasons for negative impacts of agricultural research have never been part of the conventional impact assessment studies, which exhibit a characteristic positive bias. *Conventional impact assessment studies are located in an institutional void — there is no policy context or extension system*.

Unfortunately, impact assessments thus far have focused on commodity research programs, and not on natural resources research programs, where impacts do not easily fit into supply curves or production functions. But, even in the commodity research impact studies, "analysts have fudged the analysis" (Herdt and Lynam 1992). The critical assumptions about supply shifts, range of inputs and input quality, measure of research effort, lag lengths, and private and social rates of return, made in economic surplus and production function analysis have been discussed and questioned (Schmitz and Seckler 1970; Binswanger and Ryan 1977; Norton and Davis 1981; Pardey and Craig 1989; Hallam 1990; Rajeswari 1995; and Alston et al. 1995). *These arguments support our view that methodology is increasingly being substituted for data and farm level or social information*.

Development of methodology for assessing the impact of natural resource research programs has been limited by the problem structure of natural resource research. There are more particular spatial as well as temporal scales to be considered, and impacts are highly location-specific (unlike commodity yields, incomes or market prices). These, then pose intractable aggregation problems. Most critically, however, monitoring the multiple bio-physical consequences of natural resources research outputs in the field is very expensive, and the interplay between the economic and bio-physical domain is very strong (Lynam 1994). It is, therefore, a must that appropriate information sources be tapped at the local/ regional level, with increasing participation of stakeholders and a shared knowledge base.

Evaluation of research and technology, thus, has been blinded by a vision of technology as an end in itself; a solitary, isolatable variable that enters a production function of given inputs and transforms production or productivity. In agricultural research (as in research in every other sector), a variable that measures research effort (be it investment, or research publications, or technologies, or personnel), can never enter a production function as an isolated independent variable. All the other inputs that enter the production function are either there solely due to the research effort (technologies it has generated) or have been transformed by

the research effort. This transformation may be quantitative, qualitative or both, and is always accompanied by innumerable changes in the process of application or utilization of the particular input. *These processes, especially of requirement and consequence that are an inextricable part of the generation, diffusion, transformation and utilization of technology, are always ignored when technology is assessed as an isolated independent variable.* These processes that accompany technology utilization are critical to the assessment of research or technology, when we seek the goal of greater impact of agricultural technologies. An evaluation framework based on the 'evolutionary theory' is an important input, to point out where consistent results or impacts can be sought along the technology trajectory (from generation, through development, diffusion, adoption and multiple impacts) (Loevinsohn 1998). An evolutionary economics theoretical framework can also help identify where organizational or institutional problems occur. Here, the need for local information is critical. There is an even greater need for participation and deliberation on the issues, by extension workers and different groups of farmers. Do they understand technology generation and utilization? Or do scientific research decision-makers understand their science and its utilization in rural lives?

Much of the literature on evaluation of agricultural research has concentrated on methods and tools[13]. Little has been said on the need for a change in perspective; though there are brilliant attempts to bring evolutionary theory to define a framework for evaluation of 'participatory research' (Loevinsohn 1998a). Mainstream agricultural science rather innocuously continues to use the same neo-classical theory of market-based technology generation and use for evaluation of and priority setting in agricultural research. This is justified in the name of cost effectiveness, real-world limitations on available information, and want of a complete theory of aggregation (Alston et al. 1995). It is also acknowledged that "to a great extent this literature has neglected" issues of externalities and environmental sustainability. There have been attempts to generate multi-market economic models more sensitive to local and regional agro-ecological concepts and variables, when these models

[13] See Horton et al. (1993) for a comprehensive collection of work in the evaluation of agricultural research, and Alston et al. (1995) for a range of evaluation methods based on a consistent neo-classical conceptual framework.

are employed to make decisions about research priorities or resource allocation (Wood and Pardey 1998). Within the neo-classical economics framework, the lack of disaggregated cross-section and time-series data has made economists substitute methodology for actual data (Herdt and Lynam 1992). The main argument against collection of actual disaggregated data is the cost involved (Alston et al. 1995).

If information is stored and handled by the people of the area, the labor and cost of data collection for each individual evaluation with a pre- and post- program timeframe can be avoided (Raina 2000). It is important for research, extension, ecosystems, and farms to share the same information base about crops, resources, livestock, technologies, markets, labor and capital. In such participatory data collection and use, choice of units, frequency of observation, selection of scale, samples and randomization can be an integral part of the statistical design of the research project (Riley 1996). While aggregation is possible (and required) for selected quantitative and qualitative variables, aggregation is not an essential requirement for analysis at appropriate organizational levels, with befitting institutional flexibilities. Evaluation to this end must use an evolutionary economics approach to understand and assess agricultural and ecological values in different valuation contexts. This also calls for a range of participants in the evaluation exercise who can reflect upon and inform the decision process about the variety of valuations that rural populations make about a natural resource or technology or production practice. *Given the institutional rigidities in the agricultural innovation system in India, it is unthinkable in the given hierarchy that extension officers in the field must be a part of evaluation teams to assess a research program, project or technology.* Agricultural research must now acknowledge the role and credibility of voluntary organizations in 'criticising' agricultural policies, science/ technology, in 'creating more inclusive epistemic networks' around agri-environmental objectives, and in 'the construction of effective knowledge-action links' through information dissemination, mutual learning and technology transfer (Jasanoff 1997). Evaluation, by encouraging the participation of diverse actors and agencies, and building systems linkages among technological, social and ecological variables, can and must provide inputs for further change of policies and institutions in agricultural research and extension.

Conclusions

This paper begins with the thesis that agricultural policy, research and extension organizations are interlinked, and are embedded in a larger framework of institutions or rules. It has highlighted the fact that if technology has to have an impact on sustainable agriculture, then institutional change is essential across all relevant actors/organizations. It concludes by suggesting that evaluation is an important research management input which can gradually bring about progressive changes in the institutions governing agricultural policy, research and extension organizations.

Evaluation informs all relevant stakeholders about how research leads to technology and technology leads to development, or why it does not. Thereby, an evaluation exercise covers an entire range of organizational and institutional variables that govern, generate, develop, diffuse, utilize, and modify/ transform the knowledge/technology, and breaks the neo-classical adherence to exclusively economic variables and non-economic variables that can be quantified and aggregated at the market level (exchange value). By demanding participatory information and analysis, an ideal evaluation exercise breaks the dominant institution of hierarchy, so prominent in agricultural innovation systems. It also remodels the overriding 'instrumentalism' that informs the relationship between agricultural sciences and social sciences. When the social sciences, in an inter-disciplinary fashion, expose agricultural sciences and technology generation, diffusion and adoption process to ecological, social and political issues in the agricultural/rural sector, the institutional and organizational impediments to achieving desired technology impacts become evident. This pro-active role of social sciences brings with it the seeds of autonomy of science from (essentially bureaucratic) institutions or rules that retard or impede the desired technology impacts. At the same time, it also enables greater local agri-environmental accountability. The ambition for greater technology impact demands that the boundaries between extension and research should be blurred. Extension here would be mutual learning in the field, and research would be ideological open quest for basic, applied and adaptive knowledge for understanding and solving problems in a participatory deliberative mode.

The need to distinguish between organizations (structures) and institutions (their rules/norms) is crucial when planning for and implementing 'institutional change for greater agricultural technology impact. Examples from the agricultural

innovation system in India reveal that organizational changes have been implemented time and again, with little or no change in the institutions such as hierarchy, incentives, or work culture. While there are institutions that are specific to each organization, some institutions/norms like hierarchy seem to cut across the entire agricultural innovation system. Institutional innovations must be enabled through a perpetual process of 'institutional learning' where we can analyse and explain as well as overcome our technological, organizational and institutional shortcomings (Hall et al. 2001). We must recognize that farmers, extensionists, input/agro-processing industry, agricultural scientists, policy-makers and politicians have equally crucial roles to play in changing these institutions governing agricultural knowledge and technology in today's society.

References

Alston, J. M., G. W. Norton and P. G. Pardey. 1995. *Science under scarcity: principles and practice for agricultural research evaluation and priority setting*. Ithaca: Cornell University Press.

Biggs, S. D. and G. Smith. 1995. Beyond methodologies: coalition-building for participatory technology development. *World Development* 26(2): 239-248.

Binswanger, H. P. and J. G. Ryan. 1977. Efficiency and equity issues in ex-ante allocation of research resources. *Indian Journal of Agricultural Economics* 32(3): 217-231.

Bromley, D. W. 1985. Resources and economic development: an institutionalist perspective. *Journal of Economic Issues* 19(3): 779-796.

Burmeister, Larry. 1987. The South Korean green revolution: induced or directed innovation? *Economic Development and Cultural Change* 35(4): 767-790.

Chambers, R., A. Pacey and L. A. Thrupp (eds). 1989. *Farmer first: farmer innovation and agricultural research*. London: Intermediate Technology Publications.

Clark, E. Ann. 1999. Tailoring research and extension to support ecologically sustainable agriculture. Paper presented at the Professional Development Program of the Northeast SARE Group, 11 February, 1999.

Collion, Marie-Helene and Ali Kissi. 1994. A participatory, user-friendly method for research program planning and priority setting. *Quarterly Journal of International Agriculture* 33(1): 78-105.

Dryzek, J. S. 1997. *The politics of the earth - environmental discourses*. Oxford: Oxford University Press.

Edquist, C. and B. Johnson. 1997. Institutions and organizations in systems of innovation. In *Systems of innovation, technologies, institutions and organizations*, ed. Edquist C. London: Pinter.

Evaluation Team. 1999. *Capacity building evaluation of the international program on rice biotechnology.* Rockefeller Foundation.

Evenson, Robert E. 1984. The benefits and obstacles in developing appropriate agricultural technology. In *Agricultural Development in the Third World*, eds. Eicher C. K. and J. M. Staatz. Baltimore: Johns Hopkins University Press.

Farmer, B. H. ed. 1977. *The green revolution: technology change in rice growing areas of Tamil Nadu and Sri Lanka.* London: Macmillan.

Field, A. J. 1984. Micro economics, norms, and rationality. *Economic Development and Cultural Change* 32(4): 683-711.

Garforth, Chris and Richard Usher. 1997. Promotion and uptake pathways for research output: a review of analytical frameworks and communication channels. *Agricultural Systems* 55(2): 301-322.

Grabowski, Richard. 1988. The theory of induced institutional innovation: a critique. *World Development* 16(3): 385-394.

Hagedorn, K. 1993. Institutions and agricultural economics. *Journal of Economic Issues* 27(3): 849-886.

Hall, Andrew, Norman Clark, Rasheed Sulaiman V., M. V. K. Sivamohan, and B. Yoganand. 2000. New agendas for agricultural research in developing countries: policy analysis and institutional implications. *Knowledge, Technology and Policy* 13(1): 70-91.

Hall, Andrew, Norman Clark, Sarah Taylor and Rasheed Sulaiman V. 2001. Institutional learning through technical projects: horticulture technology R&D systems in India. *Agricultural Research and Extension Network – Network Paper No.111*. London: ODI.

Hallam, D. 1990. Agricultural research expenditures and agricultural productivity change. *Journal of Agricultural Economics* 41(3): 434-439.

Hayami, Yujiro and Vernon W. Ruttan. 1982. *Agricultural development: an international perspective.* Baltimore: Johns Hopkins University Press.

Herdt, R. W. and J. K. Lynam. 1992. Sustainable development and the changing needs of international agricultural research. In *Assessing the importance*

of international agricultural research for sustainable development, ed D. R. Lee, S. Kearl and N. Uphoff. Ithaca: Cornell University Press.

Horton, D. P. Ballantyne, W. Peterson, B. Uribe, D. Gapasin and K. Sheridan. 1993. *Monitoring and evaluating agricultural research: a source book.* The Hague: CAB International and ISNAR.

ICAR. 1988. *Report of the ICAR Review Committee*. New Delhi: Indian Council of Agricultural Research.

ICAR. 1998. *Decline in crop productivity in Haryana and Punjab: myth or reality?* New Delhi: Indian Council of Agricultural Research.

ICAR. 2000. *ICAR Vision 2020*. New Delhi: Indian Council of Agricultural Research.

Jasanoff, Sheila. 1997. NGOs and the environment: from knowledge to action. *Third World Quarterly* 18(3): 579-594.

Lipton, Michael and Richard Longhurst. 1989. *New seeds and poor people.* New Delhi: Heritage Publishers.

Loevinsohn, Michael. 1998. Developing integrated pest management with Kenyan farmers: evaluation of a pilot project. *Discussion Paper No. 98-13.* The Hague: ISNAR.

Loevinsohn, Michael E. 1998a. Practising evolution: theory for understanding and evaluating participatory research. *ISNAR Discussion Paper No. 98-14.* The Hague: ISNAR.

Lynam, J. K. 1994. Sustainable growth in agricultural production: the links between production, resources, and research. In *Opportunities, use, and transfer of systems research methods in agriculture to developing countries,* eds. P. Goldsworthy and F. P. DeVries. Dordrecht: Kluwer Academic Publishers.

Lynam, J. K. and Herdt, R. W. 1989. Sense and sustainability: sustainability as an objective in international agricultural research. *Agricultural Economics* 3: 381-398.

Mayer, Andre and Jean Mayer. 1976. Agriculture: the island empire. In *Science and Its public: the changing relationship,* ed. G. Holton and W. A. Blanpied. Boston Studies in the Philosophy of Science, 33. Dordrecht/ Boston: Riedel Publishing Company.

Ministry of Agriculture. 1964. *Report of the agricultural research review team.* New Delhi: Ministry of Food and Agriculture, Government of India.

Mortimore, Michael, Bill Adams and Frances Harris. 2000. Poverty and systems research in the drylands. *Gatekeepre Series, No. 94.* London: IIED.

Mruthyunjaya and S. Pal. 2000. ICAR-Private sector interface in agricultural research. Paper presented at the Workshop on ICAR-Private Sector Interface, February 8–9, 2000. New Delhi: National Centre for Agricultural Economics and Policy Research.

Nitsch, Ulrich. 1994. *From diffusion of innovations to mutual learning - the changing role of agricultural advisory services*. Uppsala: Swedish University of Agricultural Sciences.

North, D. 1990. *Institutions, institutional change and economic performance*. New York: Cambridge University Press.

Norton, G. W. and J. S. Davis. 1981. Evaluating returns to agricultural research: a review. *American Journal of Agricultural Economics* 63(4): 685-699.

Olmstead, Alan L. and Paul Rhode. 1993. Induced innovation in American agriculture: a reconsideration. *Journal of Political Economy* 101(11): 100-118.

Palmer, I. 1974. *Science and agricultural production.* Geneva: UNRISD.

Pardey, P. G. and B. Craig. 1989. Causal relationships between public sector agricultural research expenditures and output. *American Journal of Agricultural Economics* 71(1): 9-19.

Pingali, Prabhu L. and Manisha Shah. 1999. Rice-wheat cropping systems in the Indo-Gangetic Plains: policy re-directions for sustainable resource use. In *Sustaining rice-wheat production systems: socio-economic and policy issues,* ed. P. L. Pingali. Rice-Wheat Consortium Paper Series 5. New Delhi: Rice-Wheat Consortium for the Indo-Gangetic Plains.

Prahladachar. 1983. Income distribution effects of the green revolution in India: a review of empirical evidence. *World Development* 11(11): 927-944.

Raina, Rajeswari S. 1999a. Patronage and evaluation in the Indian Council of Agricultural Research. *Evaluation* 5(3): 278-302.

Raina, Rajeswari S. 1999b. Agricultural sciences and the social sciences: an uneasy relationship. Paper presented at the *All India Workshop on Science and Its Public*, Organized by DSF and NISTADS, at NISTADS, New Delhi. 23-24 March 1999.

Raina, Rajeswari S. 2000. Countering seasonal rural problems: integrated participatory information system. *Economic and Political Weekly* 35(37): 3335-3342.

Raina, Rajeswari S. 2001. Sustainable agriculture and democracy: ecological economics for decision-making in the agricultural sciences. *Research Report No. 2*, Ecological Economics. Vasteras: Malardalens University.

Rajeswari, S. 1992. *The Organization of agricultural research in India: an economic analysis of technology generation 1860-1990*. Unpublished Ph.D. dissertation, Kerala University. Trivandrum: Centre for Development Studies.

Rajeswari, S. 1995. Agricultural research effort: conceptual clarity and measurement. *World Development* 23(4): 617-635.

Riley, J. 1996. Impact assessment for participatory research. In *Integrated farming in human development*, eds. F. Dolberg and P. H. Petersen. Proceedings of a Workshop. Denmark: Tune Landbskole.

Roling, Niels. 1988. *Extension science - information systems in agricultural science.* Wye studies in agricultural and rural development. Cambridge: Cambridge University Press.

Rutgers, M. R. and M. A. Mentzel. 1999. Scientific expertise and public policy: resolving paradoxes. *Science and Public Policy* 26(3): 146-150.

Schmitz, A. and G. Seckler. 1970. Mechanical agriculture and social welfare: the case of the tomato harvester. *American Journal of Agricultural Economics* 52(4): 569-578.

Scoones, I. and J. Thompson (eds). 1994. *Beyond farmer first: rural people's knowledge, agricultural research and extension practice*. London: Intermediate Technology Publications.

Thompson, P. B. 1995. *The spirit of the soil – agriculture and environmental ethics.* London: Routledge.

UNRISD. 1974. *The social and economic implications of large-scale introduction of new varieties of food grain: summary of conclusions of a global research project.* Geneva: UNRISD.

Vorley, W. T. 1998. Thirty cabbages: greening the agricultural 'life science' industry. *Gatekeeper Series No. 82.* London: IIED.

Weingart, Peter. 1999. Scientific expertise and political accountability: paradoxes of science in politics. *Science and Public Policy* 26(3): 151-161.

World Bank. 1990. *Agricultural research in India: prologue, performance and prospects.* Agricultural Operations Division, Asia Region. Washington, D.C.: The World Bank.

Wood, S. and P. G. Pardey. 1998. Agroecological aspects of evaluating agricultural R&D. *Agricultural Systems* 57(1): 13-41.

Zilberman, David, Madhu Khanna and Leslie Lipper. 1997. Economics of new technologies for sustainable agriculture. *Australian Journal of Agricultural and Resource Economics* 41(1): 63-80.

12

Restructuring Agricultural Extension in India

Rasheed Sulaiman V.

Introduction

There is an increasing recognition all over the world that institutions are fundamental to the economic change. Agricultural development depends on an efficient flow of information among all the actors in the system, and agricultural extension has been traditionally performing this role with varying levels of success. Its important contributions in promoting agricultural development and increasing food production have resulted in increased interest in extension during the last few years (van den Ban and Hawkins1998).

Notwithstanding methodological shortcomings, there is enough evidence to show that returns to investment in extension education are reasonable and perhaps comparable to those on other public services (Gill 1991). But, the new political agendas, increased cost-consciousness and budgetary restraints, and major technical advances are necessitating significant changes, such as reduction in public sector services, experimentation with new service delivery structures, growing interest in privatization and decentralization of activities and shared responsibilities between central and local governments and private user associations (Rivera and Gustafson 1991). The economic reforms pursued in many developing countries have also accelerated the process of limiting the role of government in provision of several services, including extension. India is also actively considering various options for limiting public sector involvement in extension and is contemplating steps to complement, supplement and replace some of its activities by greater involvement of the private sector (DAC 2000).

Extension managers and professionals are presently engaged in learning lessons from the results of various experiments in funding and delivery of extension implemented in the 1990s. The new millennium is going to see a number of changes in extension funding, delivery and approaches. The success would

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

be based on how extension organizations perceive the changing nature of agriculture and thereby handle the information and educational needs of their clientele and restructure itself based on learning from these experiments, accumulated understandings (in the realm of social, policy and management sciences) and developments in information technology.

Evolution of Indian Extension System

In India, pre-independence extension efforts were mainly driven by humanitarian motives. These had only limited impact and were restricted to areas where these were implemented. The relevance of organized extension was acknowledged quite early after independence. The external aid for agricultural development emphasized the need of extension in the 1950s. The so called "extension bias" till the mid-1960s was mainly attributed to the overall importance given to extension in the Community Development (CD), National Extension Service (NES) and Intensive Agricultural Development Program (IADP). The program could not make much success due to several reasons, as for example, the village level worker (VLW), the lowest rung of the administrative machinery in the Ettawah Project (pre-cursor to CD) and NES Program, continues to remain even now, albeit the numerous deficiencies, the face of extension in rural India.

There have been two reasons behind this extension bias (Goldsmith 1990). The first was the misplaced confidence in the relevance of modern technology, and the second, the view that peasant farming is economically irrational and that ignorance made small farmers hold on to traditional methods. Both assumptions led to the conclusion that the first step in agricultural development should be to establish mechanisms to diffuse the inventory of modern knowledge directly to end users.

With no signs of significant improvement in agricultural development, these views started shaking in the coming decades and the need for development of relevant technologies through research began to emerge. Strengthening and reorganization of the research establishment of state agricultural universities (SAUs) and research stations, and the institutional developments associated with the green revolution corrected the bias against extension and generated a lot of goodwill to firmly establish it as an inevitable arm for agricultural

development. The discipline of extension education also received recognition and it expanded along this trajectory.

The agricultural extension was a function performed under the guidance of the state Department of Agriculture (DoA) until the 1960s. A few voluntary organizations were also doing some effective work in this direction in areas of their jurisdiction. The Indian Council of Agricultural Research (ICAR) started involving itself in the extension activities in 1966, with the initiation of National Demonstration Program. ICAR's involvement increased considerably in the later years, with the establishment and spread of *Krishi Vigyan Kendras* (KVKs). ICAR also initiated such programs as 'Lab-to-Land', and 'Operational Research', etc., which were merged with KVKs in the1990s.

Establishment of radio stations and initiation of rural programs resulted in a wider use of mass media for agricultural development. The print media followed the suit. SAUs also initiated training programs (for officials and farmers), demonstrations, and exhibitions. These got strengthened with the establishment of the Directorate of Extension in each SAU. Organizations created for the promotion of specific commodities (Commodity Boards) and specific areas (Command Area Development Authority) also initiated extension activities. Extension was treated essentially as a public good, and the focus has been on facilitating the reach of extension to all parts of the country through more staff and programs.

Extension paradigms have been changing globally during the last fifty years. The paradigm shifted from "diffusion of innovations" in the 1960s to "constraint identification" in the 1970s, and to "improved management" in the 1980s. This led to a wider acceptability of the Training and Visit (T&V) System across several countries. The 1980s saw most of the states in India embracing the World Bank funded T&V program. It improved the funding and manpower intensity of extension and brought a unified command for it. The 'Straight Jacket' approach of T&V, ignoring the agro-climatic and socio-economic diversity of this country, produced mixed results. A review of evaluation studies on the T&V system revealed its impressive gains (in terms of productivity gains) in the

[1] One of the reasons identified was the similarity between agro-climatic conditions where technologies are generated and where they are to be used and the favorable socio-economic situation and developmental infrastructure prevalent in the irrigated areas for the wider uptake of technologies. In contrast, these were not available in the rainfed areas.

irrigated areas[1] and failures in the majority of the rainfed areas. The need for a proper analysis of institutional and socio-economic factors in the rainfed areas and the importance of varied social science skills for making relevant interventions was also highlighted[2].

Since the 1980s, increasing number of non-governmental organizations (NGOs), agro-input industries and agro-processors have been taking up agricultural extension activities. Farmers' associations and producers' co-operatives are also presently involved in extension services in a few crops and commodities[3]. With the drying up of external support, the states started downplaying the rigor of T&V systems, and the 1990s witnessed several experiments by the state governments in providing extension services.

Post-T&V Initiatives

The uniformity imposed on the functioning of extension systems started disappearing, soon after the creation of funding for T&V system. States started experimenting on their own programs and this has resulted in a number of diverse extension approaches. Some of these are highlighted in this section.

Kerala decentralized the functioning of DoA in 1987 by creating agricultural offices (*Krishi Bhavans*) under each *panchayat*. In 1989, the state initiated the 'group approach for extension' in rice farming, which was subsequently extended to other crops. Rajasthan adopted the 'group approach' to extension and presently the village extension workers operate mainly through *kisan mandals* (groups of 20 farmers). The state has also been encouraging NGOs to participate in the extension activities and has contracted out some extension activities to NGOs, including transfer of entire extension responsibility to NGOs in a few blocks/districts. Rajashtan also experimented with para-extension workers and now Uttar Pradesh is trying this program on a larger scale, with an aim to cover every *panchayat* with a *kisan mitra*, as a "cost-effective supplement to village extension worker".

---

[2] For a more detailed discussion on the institutional and socio-economic issues in rainfed areas, see Farrington et al. (1998).

[3] For a detailed discussion on investments and performance of various extension organizations in India, see Sulaiman and Sadamate (2000).

Maharashtra adopted the 'single window' system in July 1988, by merging the Departments of Agriculture, Horticulture and Soil Conservation at the operational level. This effectively improved its field extension manpower intensity. In the state of Uttar Pradesh, the grassroot link for agricultural extension has weakened with the deployment of *kisan sahayaks* as multi-purpose Village Panchayat Development Officers (VPDOs). Out of the 50,000 odd *gram panchayats*, only 6,000 have the former *kisan sahayaks* as VPDOs, and in the rest of *gram panchayats*, there is no *kisan sahayak* and the multi-purpose VPDO drawn form other departments is doing extension activities.

Punjab has been following the SAU-farmer direct contact method over the past two decades and has upgraded all front-line extensionists to graduate level. The Punjab Agricultural University employs its own multi-disciplinary extension team in each district, which is engaged in adaptive research, training and consultancy. In Andhra Pradesh, the SAU has established one District Agricultural Advisory Technology Centre in all the districts for technology refinement, diagnostic visits and for organization of field programs in collaboration with DoA and allied departments.

Different approaches are also being tried in several project-specific districts. The most ambitious among them is the Agricultural Technology Management Agency (ATMA) model, presently under implementation in 28 districts (6 in advanced stages) in 7 states. The project envisages testing of several new institutional arrangements such as creation of ATMA, a registered society at the district level for integrating the activities of all organizations involved in the transfer of technology, decentralization of decision making at the district level, and increase in farmers' participation in planning and implementation of extension interventions (ICAR 1998; and MANAGE 1999a & 1999b). The program is based on the Strategic Research and Extension Plan (SREP) developed through a participatory approach. The process of implementation of the project, if documented and monitored effectively, would provide rich experience in undertaking future planning for extension in the country.

In Uttar Pradesh, two major programs are presently under implementation, namely the Uttar Pradesh Sodic Land Reclamation Project (UPSLRP) and the Uttar Pradesh Diversified Agricultural Support Project (UPDASP). Both these programs are funded by the World Bank and have a separate component for technology dissemination. Under UPSLRP, the system of farmer-led extension

approach is being tried (*kisan mitra*, *mahila kisan mitra*, group leaders, master trainers, etc.), commodity-based farmer interest groups (FIG) are formed, and the field activities are implemented through user groups. The program is being implemented by the Uttar Pradesh Bhoomi Sudhar Nigam, a government undertaking set up for this project. UPDASP envisages capacity building of the line department functionaries, decentralization of the technical and managerial decision making (SREP, PRA, ATMA, etc), increasing the role of the private sector, enhancing the participation of farming community, Self-help Groups (SHGs) and Farmers Interest Groups (FIGs), etc. and support for HRD and enhanced communication capacity. Interventions for agricultural development under this project are implemented by the field functionaries of DoA.

Another innovative program, again supported with the external funding (European Economic Community (EEC)) is the Kerala Horticultural Development Program (KHDP). Its salient features include, SHGs of farmers, master trainers, field centres for collective marketing, and credit package for tenant farmers (Isvarmurti 2000). KHDP (recently renamed as Fruit and Vegetable Promotion Council) was initiated in 1993, and has been implemented through creation of a new organization comprising consultants and 250 young professionals with university degrees in agriculture, business administration, social welfare, etc.

Programs for training of farm women in technologies were implemented in different states with external assistance. For instance, DoA in Karnataka initiated (in 1983) the Women/Youth Training Extension Project (WYTEP) with assistance from the Danish International Development Agency (DANIDA)**.** The project established training centres for women farmers, arranged extension programs for farm women and organized groups of farm women for taking up collective action for input procurement, learning from each other, thrift and micro-credit activities. Similar programs were implemented in Madhya Pradesh and Tamil Nadu also with the Danish Assistance.

The Ministry of Agriculture has also taken a few important initiatives during this period. These include the establishment of an autonomous training institute, the National Institute of Agricultural Extension Management (MANAGE) at Hyderabad in 1987, initiation of the scheme, "Agricultural Extension through Voluntary Organizations" in 1994/95, and a recent initiative, "macro management", in which 27 centrally sponsored schemes were merged, enabling the states to make their own plans and prioritize them as per felt needs. The states have been urged to follow this approach by providing more flexibility to

the districts in selecting programs that would better serve the needs of the districts.

Another important experiment has been the initiative by the Small Farmers Agri-Business Consortium (SFAC) to set-up 5000 agri-clinics through unemployed agricultural graduates. The agri-clinics would be providing testing facilities, diagnostic and control services, and all kinds of agricultural consultancy services, on payment basis. The program is financed through banks from National Bank for Agriculture and Rural Development (NABARD) to those selected graduates and the government provides 25 per cent of the cost as subsidy.

The involvement of ICAR in extension has increased during the last two decades, with the increase in the number of KVKs. Presently, there are 261 KVKs in the country. The council has also strengthened 53 Zonal Agricultural Research Stations (ZARSs) to take up the additional functions of KVKs. ICAR spent Rs 339 million in 1997/98 on KVKs (Das and Hansra 1999). Apart from KVKs, the frontline extension program of ICAR comprises 8 Trainers Training Centres (TTC), 42 Institute Village Linkage Program (IVLP) centres and 60 centres of Technology Evaluation and Impact Assessment (ICAR 2000). Under the National Agricultural Technology Project (NATP), ICAR extension component comprised establishing of 40 Agricultural Technology Information Centres (ATICs), remandating of the Zonal Agricultural Research Stations to take up the additional functions of KVKs, expansion of IVLP to more centres, and strengthening of the Directorate of Extension of SAUs and the Zonal Co-ordination Units of ICAR. ATIC is a single window delivery system for the products, information and services available from an institution to farmers and functions in a separate building with facilities to access them. Of the 40 centres, 25 would be in SAUs and 15 in ICAR institutes.

The private sector has also been exhibiting a lot of diverse approaches in agricultural extension. The prominent ones include the activities of the farmers associations (e.g. Grape Growers Association of Maharastra); producers co-operatives (e.g. Kerala Co-operative Milk Marketing Federation, sugar co-operatives in Maharashtra); NGOs (BAIF); input industries (fertilizer and seed companies); agro-processors through contract farming (Pepsico and Hindustan Lever in Punjab, VST Natural Products in Andhra Pradesh); mass media (E-TV in Andhra Pradesh and Maharashtra, newspapers and magazines in Kerala) and individual consultants and consultancy firms.

Present Scenario

The study on extension in private sector in India has revealed the presence of a number of organizations providing extension services (Sulaiman and Sadamate 2000). Their presence is highly skewed towards well endowed regions and the intensity in terms of expenditure, manpower allocation and contact varies widely. DoA is one of the most important source of information for farmers, though their role in delivering information on non-foodgrain crops is limited. Farmers' dependence on other farmers and input dealers as source of information continues to be high, reflecting the limited reach of DoA. The main extension function performed by DoA is the delivery of technical messages to individual farmers or their groups through visits of an extension worker to specific locations in his circle/area. These visits are not regular and are influenced by his pre-occupation with the implementation of a number of central and state sector schemes, having input/subsidy delivery. Farmers' associations and producers' co-operatives provide a large number of services including extension to farmers, but they exist only in a few crops/commodities/locations. Same is the case with the Commodity Boards. The field extension activities of the Directorate of Extension of SAUs and ICAR institutes are restricted to a few villages around its location. KVKs are organizing a number of vocational training programs for farmers. NGOs are involved in a number of activities. With very few exceptions, most of the NGOs are small and their activities, though intensive, are restricted to a few beneficiary farmers or at the most to a few villages. Consultancy services are few and are mostly private ventures found in high value crops. The potential of media is under-utilized at present, but agricultural programs of some of the private TV channels and print media have high impact as source of information. Input companies do not have full time extension staff. Its marketing staff organizes the extension activities, such as demonstrations and seminars with the support of dealers and at times, in collaboration with DoA.

With the increasing realization of knowledge as one of the most important inputs for efficient farming, the institutional diversity in provision of extension services would increase in the years to come. Many of the institutional innovations initiated by various organizations in the post-T&V era offer a lot of insights on how to do or not to do extension. An inclination or willingness to systematically document these interventions and to draw lessons for its wider uptake is, however, sadly missing. A number of generic issues still plague many

of these experiments and these need to be addressed before replicating them on a wider scale.

Generic Problems

There are generic problems inherent in extension functions, regardless of the management system or approach to extension. Feder *et al.* (1999) have indicated eight such generic problems, *viz.* scale and complexity; dependence of extension on the wider policy environment and other agency functions; inability to trace cause and effect; commitment and political support; accountability; liability to public service functions beyond agricultural knowledge and information transfer; operating resources and fiscal sustainability; and interaction with knowledge generation. All these are relevant in India too. The key issues in the Indian context are discussed below.

Scale and complexity

The Indian extension system is to cater to the needs of about 90 million farm holdings, cultivating 142 million hectares of land, of which 70 per cent belong to small and marginal farmers. The public sector extension in the country, comprising mainly DoA and other allied departments, has about 1,00,000 extension workers. There is a wide diversity in the manpower intensity ratio across states and districts. For instance, the ratio of technical manpower to cultivator is 1: 300 in Kerala, whereas it is 1: 2000 in Rajasthan. All other organizations in the public and private sectors employ very few personnel and put together, this would not change the ratio much. The DoA still continues to be the only agency which has its presence in all the districts in India, though they often are not the primary source of information for farmers everywhere. With little reliance on mass media to multiply its impact and with continued reliance on individual or group contact, the coverage of DoA remains awfully low.

The changing nature of the Indian agriculture, especially during the 1990s, had its implications on the type of services demanded by the farmers. They now need support from extension system on a wider range of aspects; the most relevant of them are as follows:

(a) What technological options could be used profitably, keeping in view the potential resource constraints in terms of land, capital, labor and knowledge?
(b) How to manage various technologies (how to make optimal use of new inputs in his farm)?
(c) How and when to change the existing farming system (e.g. diversifying from crop production to mixed farming or vegetable or animal production)?
(d) For which type of product, there is a good demand in the market?
(e) What are the quality specifications required to get a good value for the produce and how to achieve them (e.g. for export markets, organic farming)?
(f) How, when and where to buy inputs and sell products?
(g) How to make decisions collectively on resource use and marketing?
(h) How to find quickly the most reliable knowledge and information?
(i) What are the feasible off-farm income generation options and how far they are dependable?
(j) What are the possible implications of his farming if the input subsidies are phased out and the trade in agriculture is liberalized? (van den Ban1998).

To make good decisions, farmers need information from different sources and often need help to integrate them. Due to its sole dependency on knowledge and information mainly from SAUs and ICAR institutes, the public sector extension is able to provide information only on technologies generated in these research stations. The emphasis continues to be on foodgrains, though broadbasing of the agricultural extension (including messages for other crops/ enterprizes) is an accepted philosophy.

Linkages

Though extension has to maintain effective linkages with several systems (and each system comprising organizations having different types of information), only the research-extension (R-E) linkages have been emphasized so far. Several measures to improve the R-E linkages have not yet yielded positive results. Information flow has been mostly top-to-down (Macklin1992) and the weak feedback has not resulted in any fundamental change in the way research priorities are set at the research stations (Jha and Kandaswamy 1994). Even after two decades of our efforts to strengthen the R-E linkages, they continue to elude the system, even in those districts wherein some sort of integration of

activities of all research and extension agencies are being attempted through the ATMA model. For instance, DAC has recently come up with a new set of guidelines for establishing R-E linkages under the Innovations in Technology Dissemination Component of NATP. These may not also be able to change the ground situation, as our approach to this important issue has been too mechanistic and the premise is based on the linear model of innovations,[4] which has outlived its utility.

Even within the research and extension system, the linkages between different organizations working on the same crop/commodity/enterprize/ geographical area have been weak. This has been severely restraining the performance of these systems, especially in the public research system on which the public extension system heavily banks for technological support. Case studies on the horticultural research system have amply illustrated this aspect (Hall et al. 2000 and 2001). Inter-department and intra-department co-ordination for extension programs, in both the ICAR and SAU systems, appear to be weak (ICAR 1996). In the case of extension, the linkages between KVKs and DOA in most of the cases, are less than satisfactory. Though a number of other organizations have come up for doing extension in selected regions, crops and enterprizes, DoA continues to operate alone, ignoring the presence of these organizations which can potentially supplement its efforts.

Apart from linkages for receipt of technology, the capabilities of the extension agencies to assess and refine them for integration in their knowledge base have been very weak, mainly due to lack of qualified human power. Extension's inability to influence the type and direction of research has also affected its performance. Several states lack competent Subject-Matter Specialists (SMSs)

[4] In the linear model, the knowledge flows are modelled quite simply – the initiator of innovation is science and an increase in scientific inputs into the pipeline will directly increase the number of new innovations and technologies flowing out of the downstream end. In reality, however, ideas of innovations can come from many sources and at any stage of research, development, marketing and diffusion. Biggs (1990) discussed the multiple sources of innovation model of agricultural innovations. He explains that agricultural innovation does not take place in the ordered linear fashion that current public sector research and extension arrangements would suggest. Many other actors are involved in the process. Most importantly he suggests that the outcome of research is determined by the institutional context, by which he means the political, social and cultural backdrop as well as the actors and organizations involved.

at the district level, a major factor that contributes to poor-research-extension linkages and lack of integration across crops and livestock systems. These constraints severely limit the capacity of the technology dissemination system to assist farmers in utilizing improved production practices, and in incorporating high value commodities into their farming systems (Sharma 1999).

Extension's linkages with other institutions, whose polices have a direct bearing on its performance, have been virtually non-existent. For instance, it does not have linkages with the input supply system, credit system or marketing system and has no influence on the policy or political system deciding on investments or priorities regarding research, infrastructure, public administration or technical education. Extension continues to be a passive recipient and often a victim of the decisions taken by all these systems. Part of the loss of credibility of extension could be attributed to its failure in influencing other systems.

Operational resource and fiscal sustainability

Inadequate operational resources have been a perennial weakness of the public extension systems and it has been crippling its effectiveness. Macklin (1992) in his study of T&V extension in India had noted that the level of operational funding was not maintained in real terms, thus reducing the mobility of extension workers. Salary alone accounts for about 85-97 per cent of the total expenditure of DoA in the states (Sulaiman and Sadamate 2000). According to Swanson (1996), the allocation of operating expenses in DoA is around 15 per cent, whereas a fully functional extension system should have 30-35 per cent of its total expenses as the operational expenses. This has resulted in the under utilization of the existing facilities and personnel. Ameur (1994) has portrayed the problem as a vicious circle of fiscal difficulty, curtailed services, inefficient operation, poorer results, and less staff motivation, training and competence. The increasing budgetary constraints on the states have its fallout on the budgetary allocations for DoA and questions are being raised on the financial sustainability of the vast extension infrastructure in India (DAC, 2000). Adoption of the measures to recover at least a part of the operational expenditure is rather slow; due to lack of pay-worthy value-added services and political sensitivity involved in charging for the government services which have been traditionally available free of cost. Though a sizeable number of farmers (48 per cent) are willing to pay for the quality extension services in horticultural and high value

crops (Sulaiman and Jha 2000), measures to capitalize on these opportunities are still lacking.

Conceptual problems

The major factor underpinning the above generic issues is the lack of a shared understanding on the role of extension – what each extension organization should do, keeping in view the country's socio-political and agro-economic setting?

Many extension organizations have a very narrow view of extension and see it as a process of supplying information to farmers on demand, and of introducing technical changes in agriculture which they consider to be desirable, rather than one of promoting farmers development and independence (van den Ban and Hawkins 1998). But the role of extension is much wider as it needs to develop the management and decision making skills in farmers, help the rural people develop leadership and organizational skills, enabling them to organize better, operate and/or participate in co-operative credit societies and other support organizations, as well as to participate more fully in the development of local communities (Swanson and Clarr 1984). A study on the Indian extension system commissioned by MANAGE articulated that besides technology transfer, the public extension in India should embrace other roles like human resource development, broadbasing and farming system perspectives and gender differentiated strategies (MANAGE 1993).

The Indian extension system, in general, is based on the transfer of technology mode, with a few dispersed attempts at embracing functions beyond technology transfer. Due to its preoccupation with input delivery and scheme implementation, DoA has failed to do justice even to the function of technology transfer. Field extension workers of DoA are implementing a number of programs, involving distribution of subsidies and subsidized inputs, and have little time for field visits or solving field problems of farmers. Jinraj (1999) has found that agricultural officers and agricultural assistants get only 40 per cent of the time for extension activities, whereas administrative takes away 60 per cent of their time. The much publicized group approach embraced by DoA in various states though resulted in formation of farmer groups, but, most of them remain dys-functional or inactive, due to lack of clarity on its purpose and follow up efforts for strengthening groups for various activities. This type of business needs a high degree of social science skills (skills related to group formation, leadership

development, conflict resolution and negotiation between different interest groups, management of common property resources, etc.) which is lacking with DoA. Organizations which have been successful in this regard, for instance KHDP, recruited personnel with these type of skills and expertize and out sourced the services of organizations to train the staff and group members (Isvarmurthy 2000).

Though the availability and diffusion of right type of technologies continue to be a challenge for the extension system in the majority of the rainfed and disadvantaged areas, a wider adoption of technology also requires joint efforts of the farmers, as many of the technologies for rainfed agriculture are knowledge-based and need community action (integrated pest management, management of common property resources, etc.). Therefore, farmers groups have to be organized and sustained at the grass root level. It is also essential for transferring some of the extension functions to the farmers groups in the long run. Unless extension expands its role beyond technology transfer, its relevance and utility to the farmers would remain subdued and the public support and commitment to it may decline further. The complexity of this challenge, as illustrated by Van Beek (1997), is given in Box 1.

What is the view of the Indian extension system on taking these responsibilities, and how much prepared it is in undertaking some or all of these roles? A debate on this issue is long overdue.

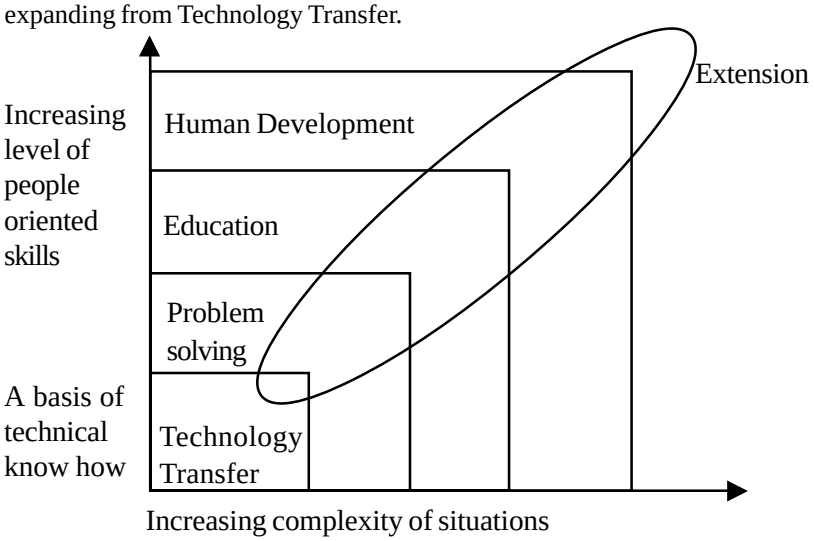
Capabilities

Many of the questions on the capabilities and functioning of extension organizations in future would essentially depend upon the identification of roles each extension organization is going to play in the Indian context.

Several organizations with varying resources and professional capabilities exist in the country. The performance of the public extension agencies in integrating knowledge and skills from these various sources has been limited. In total, the states have some 1,10,000 extension staff presently, of which only around 20 per cent are graduates. There is now a fairly broad consensus that poorly-trained village extension workers would not be able to deliver goods under the changing extension environment. Some states have already taken a decision to make graduation in agriculture as the minimum qualification for appointment in DoA. But, this is not enough; DoA needs even higher skills in not

Box 1. Extension in complex situations

The model was based on the Knowledge System Approach (Rolling 1998) of the 1990s and would help to conceptualize the complexity of the challenges involved in expanding from Technology Transfer.



Source: van Beek, P. G. H. (1997)

The vertical axis is formed by a base of technical know-how, with increasing levels of people oriented skills added on top of that. The horizontal axis represents increasing complexity of situations, often caused by the growing importance of human factors in situations, rather than by physical or biological ones. Extension in this view occupies the area in the ellipse, where an understanding of the situation comes together with the required technical and people skills, and when the desired outcome is action or change of some nature.

None of the four areas can be left out when considering the lack of effectiveness of an extension project and they are of equal importance. According to van Beek, the total quantity of skills needed to cover all aspects is more than most individual extensionists can or need to possess. However, extension in complex situations needs co-operation between people who together have all these capabilities.

Technology Transfer, which links research in one discipline with users;
Problem-solving, which assists clients with solving individual problems;
Education, which aims to empower people to solve their own problems; and
Human Development, which encourages people to govern themselves and develop their learning capability.

only agriculture, but also rural management, social mobilization, training, finance, credit, marketing, etc.

Though enforcing of minimum qualification as graduation in agriculture at the entry level should be welcomed, the fact remains that agricultural graduates also lack many of the social science skills necessary for field extension work. Post-graduate training in agricultural extension also doesn't address many of these skills (Sulaiman and van den Ban 2000a). As extension performance depends considerably on the quality of agricultural graduates, the extension system should find ways to address the content and quality of agricultural education.

Banning all future recruitment in the Village Extension Worker (VEW) cadre without creating another cadre of qualified people is not the solution. Nor its dependency on para-extension workers (as being done in the state of Uttar Pradesh) is going to deliver results. Evidence from Rajasthan reveals that para-workers though address the thin spread of DoA manpower, are constrained to deliver the same technologies and information that VEWs deliver (Sharada et al. 1996).

The Way Forward

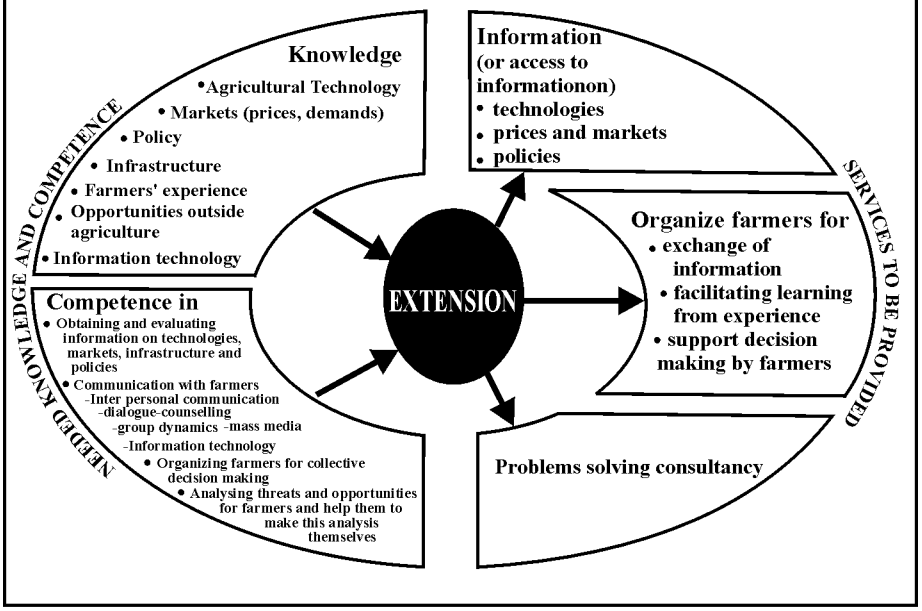
Future roles and competence

To remain relevant and useful in the years to come, the extension system has to strengthen its understanding on technology, markets, prices, demand and policies. The system has to either recruit specialists or hire services of professionals with expertise in these areas. Apart from collecting and integrating information from a number of sources, extension has to provide problem-solving consultancy and initiate measures to organize farmers. To provide these services, the system should have the knowledge and competence in a number of areas (Figure 1).

This necessitates a sound human resource management strategy. This includes a clear analysis of the present and future knowledge and skill needed by the organizations, job design for individuals and teams, matching qualifications with the positions, transparent policies on recruitment, placement and promotions and types of training required on the job. Human resource development (HRD) has been much talked about and the need for a continuous HRD program needs

no elaboration. But, the background and the expertise of trainers need emphasis. There has been a tendency to view training as a substitute for education and in many cases, the trainers themselves do not have any expertise, more than received by him under a similar training program. In several cases, posts of trainers are filled through promotion from officers of DoA. Hiring experts from other institutions as resource persons for training has not been successful due to low amount of honorarium and lack of adequate funds. Plans to set up training institutions as autonomous institutions may partially help in solving this problem.

Figure 2. Future roles and competencies for extension



Source: Sulaiman and van den Ban (2000b).

Redefining extension's role in the agricultural innovation system

As seen earlier, the pubic extension in this country has not expanded its role from technology transfer, and it is less than adequate to address the current and emerging challenges in agriculture. The debate on the knowledge system approaches in extension has brought into focus the diverse sources of information,

and the need for all stakeholders to be involved in all phases of development of an innovation. This has led to the development of a number of participatory approaches as an alternative to the dominance of technology transfer approach. A large number of experiments in the farmers participatory research and extension (FPR&E) and/or participatory technology development (PTD) were also initiated. Despite accumulating body of literature, adoption of these methodologies has failed to improve the performance of the research or extension. Agricultural scientists also often find themselves struggling in applying participatory approaches in an institutional and professional context that implicitly denies such patterns of interaction with clients (Hall and Nahdy 1999). Though extension could have potentially contributed to the experiments in PTD, the social distance between the research and extension system prevented them from undertaking any joint activities.

The need for addressing the institutional dimensions of technology development and the analysis of knowledge flows and interaction among all the actors in the innovation system[5] became more evident in the late 1980s. The emergence of the national systems of innovation (NSI) framework (Freeman 1987; and Lundvall 1992) has been a response to this issue. Analysis based on the NSI approach stresses that the performance of the system as a whole is important and this essentially depends on the effectiveness of knowledge flows among the different institutional nodes in the system.

Several of the institutional innovations that have come up in response to the weaknesses in public research and extension system, have given enough indications of the emergence of an agricultural innovation system in India. This has resulted in the blurring of the clearly demarcated institutional boundaries between research, extension, farmers, farmers groups, NGOs and private enterprizes. Extension has to play a very important role of facilitating the nodes to generate, access and transfer knowledge between different entities in the innovation system. It also has to create competent institutional nodes to improve the overall performance of the innovation system. Inability to play this important role would marginalize extension further.

[5] An innovation system encompasses all the elements of the system or network of private and public sector institutions whose interactions produce, diffuse and use economically useful knowledge. In this way, this type of analysis is more inclusive then the narrower notion of a research or extension system.

ICAR's role in extension

This also brings us to the question of ICAR's involvement in extension. ICAR's increasing involvement in extension has been of concern to the Council for quite some time. Questions have been raised on the increasing share of expenditure on extension and on the continuity of funding support to KVKs. Though these questions are also important, the basic question regarding the appropriate role of extension within ICAR system often seems to be neglected.

ICAR seems to be unable to come out of the technology transfer mode and embrace new and challenging roles. Technology assessment and refinement (TAR) through the Institute Village Linkage Programme (IVLP) is obviously one symptom of this thinking. To redefine ICAR's role in the innovation system, we need to examine closely its functioning over the years. The following questions might be helpful in this regard:

(a) Is TAR a legitimate part of the technology development process itself and if so, would it be better to leave that with the technology development team itself?
(b) How far the extension research findings, in general and the results of TAR exercise in particular, have influenced the research priority setting or research problem identification?
(c) Apart from carrying a public relations role for the institute, facilitating training programs and conducting adoption studies, what other useful contributions, extension scientists can make in research institutions?
(d) What is and what should be its relationship with the general extension system?
(e) How far the extension units/divisions within the research system have been successful in developing institutional innovations leading to development, refinement and transfer of technologies?
(f) How effective has been the extension on facilitating the development of linkages of the research institute with other organizations?
(g) Can extension scientists in research organizations do something more useful than what they are doing now?

Answers to difficult questions like these need to be searched before expanding the roles and responsibilities of extension system in ICAR.

Public-private partnership

There is an increasing realization that "public extension by itself cannot meet the specific needs of various regions and different classes of farmers. Policy environment would promote private and community-driven extension to operate competitively in roles that complement, supplement, work in partnership and even substitute for public extension" (DAC 2000). Though the above policy declaration seems to portray a genuine response to the changing times, the level of preparedness of the public sector extension to work in a multi-institutional environment looks not at all encouraging. The government-NGO collaboration experiment for sustainable agricultural development implemented in Rajasthan has revealed a number of issues that emerged when the government and NGOs were brought together to work in a collaborative mode (Alsop et al. 1999).

Though the private sector involvement in agricultural extension is not uniform across the country, there are several districts, wherein a number of organizations are providing diverse services and working in isolation without any level of interaction. Unfortunately, we do not even have an inventory of these organizations at the district level. As long as the major responsibility of DoA continues to be the implementation of schemes, they would not see enough reason for forging links with the private organizations. The past experience of R-E linkages has not given enough confidence to believe that these partnerships would definitely come through. Partnerships by definition go many steps further than linkage and more serious efforts and time are required to build them. To start with, a series of learning programs to inculcate the right attitudes for building close working relationships with other organizations need to be organized for the extension managers. Documentation and disseminating successful examples from field could be the right starting point.

Organizational and management reforms

Organizational and management (O&M) reforms are long overdue in the extension system. This involves decentralization of responsibility, delegation of a large number of powers to the district heads, autonomy for routine decisions, project-based funding to the district heads for programs identified, planned and

designed based on SREP, provisions to hire special expertise and facilities, separate budget for operational expenditure, and more flexibility in utilizing the funds for approved programs, etc.

This necessitates a reduction in the number of programs designed and implemented by the Centre. Extension of the macro management approach to the states would help the districts to choose programs more relevant to them. It would be worthwhile to do a professional O&M review of DoA at the state and district levels. Evaluation of the performance of many of the extension programs with external funding would also provide indications on factors facilitating a better performance.

Privatization

Use of the term "privatization" has probably created more confusion in the minds of the public and functionaries of public sector extension, and the response of the state governments to the idea of private sector participation in extension has not been encouraging, though most often on the wrong reasons[6]. The fact that the broad term 'privatization' offers a menu of options to improve the efficiency of extension services, has often been overlooked, and the international experience with alternative sources of funding and delivering extension has been mixed (Carney 1998; and Umali and Schwartz 1994).

Though private sector participation in agricultural extension in India is limited to a few crops and geographical areas, the increasing number of private entities, such as NGOs, farmer associations, producers co-operatives, input agencies, agro-processors (especially contract farming) private consultants and media offers much scope for complementing public sector extension. As farmers are also willing to pay for high value services, the challenge is in creating pay-worthy services (by all concerned), so that some cost of providing extension

[6] The draft policy framework for agricultural extension prepared by DAC calls for an increased participation of the private sector in agricultural extension. In the workshop held (18-19 January 2001) to elicit the views of the state governments on this document, most of the states expressed their strong reservation on the idea of private participation in extension. The reasons given against this were the profit motive of profit sector, lack of ability of farmers to pay, no effective private sector, public sector research as the final and impartial source of technological authenticity, etc.

could be recovered by the public sector or these could be left to the private sector to pursue. In an increasingly complex environment, there are a number of responsibilities (so called public goods) to be taken by the public sector, which the private sector would not be doing anyway[7] . All these services, though to be paid primarily through public funds, need not necessarily be delivered through public extension system. Still there is a need for a strong and vibrant public sector extension to exist. Institutional pluralism in extension would only increase in future and the public sector extension has to charter a clear mission and strategy on how it would use the options of privatization to its advantage.

Client involvement in planning and management

The importance of client involvement in planning and management of extension has often been handled as tokenism. The common strategy has been of inviting farmers to some meetings. In most regions and crops, the clients and their representatives are too weak to articulate their concerns. Extension has a primary responsibility of strengthening the clients' hands by facilitating the formation of strong and articulate farmers organizations.

Application of information technology

Information Technology (IT) has a lot to contribute for improving the efficiency and effectiveness of extension systems. Availability and spread of internet has created a lot of interest in cyber extension (Sharma 2000). The excitement generated by internet technologies has tempted many to consider opening of more number of information kiosks/IT parlours and on-line connectivity to ICAR and SAUs as answers to the weaknesses of public extension system. But, research has clearly shown that the information supplied through the media is helpful only at the initial stage of adoption and a more detailed interaction is required at the later stages (van den Ban 2000). As seen earlier, the problem is conceptual and the tendency is to treat extension as something that can be digitally served through computers. The non-availability

[7] Though the literature on public and private goods clearly makes a distinction between these, in reality, the boundaries are not defined that way.

of infrastructure, including software in local languages, and illiteracy would be constraining the use of IT by farmers for availing technical knowhow. It has, however, a lot of potential for improving the effectiveness of research and extension systems.

Conclusions

The post-T&V period has seen experimentation with diverse extension approaches by a large number of extension providers. But, most of them have not addressed the generic problems of extension in the country. The basic issue underpinning many of these has been the lack of a clear articulation of what should be extension's role in India. The public sector extension in the country has to expand its role beyond technology transfer. Unless it takes on more diverse roles and enhances its knowledge-base and competence, it may loose its relevance in the years to come. Extension can play a very useful and productive role in the emerging agricultural innovation system, provided it is clearly defined. Though other issues are also important, solving them alone would not improve extension's effectiveness.

A strong public sector extension having more diverse skills should exist even in a pluralistic extension environment. The public extension has to clearly identify its role and priorities, based on an analysis of the type of information and services needed by farmers, availability and characteristics of the solutions, and the availability and potential for the private sector participation in extension. To meet the increasing needs of farmers, collaboration between various organizations is essential, as it is often difficult to have all the competence and skills in an organization. Public sector extension has to lead this change and it would be unrealistic to expect this to happen without a total restructuring of the public extension system. This would become possible only if we ask the right questions and challenge our basic assumptions.

References

Alsop, R., E. Gilbert, J. Farrington and R. Khandelwal. 1999. *Coalitions of interest: partnerships for process of agricultural change*. New Delhi and London: Sage Publications.

Ameur, C. 1994. *Agricultural extension: a step beyond the next step.* World Bank Technical Paper 247. Washington, D.C: World Bank.

Biggs, S. P. 1990. A multiple source of innovation model of agricultural research and technology promotion. *World Development* 18(11): 1481–1499.

Carney, D. 1998. *Changing public and private roles in agricultural service provision.* London, UK: Overseas Development Institute.

DAC. 2000. *Policy framework for agricultural extension (draft),* New Delhi: Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India.

Das, P. and B. S. Hansra. 1999. *Status report on Krishi Vigyan Kendras - A reality*. New Delhi: Indian Council of Agricultural Research.

Farrington, J., Rasheed Sulaiman V. and Suresh Pal. 1998. *Improving the effectiveness of agricultural research and extension in India: an analysis of institutional and socio-economic issues in rainfed areas.* Policy Paper 8. New Delhi: National Centre for Agricultural Economics and Policy Research.

Feder, G., Anthony Willet and Willem Zijp. 1999. Agricultural extension - generic challenges and some ingredients for solutions. Policy Research working paper No. 2129, Washington, DC: World Bank.

Freeman, C. C. 1987. *Technology and economic performance - lessons from Japan.* London: Pinter.

Goldsmith, A. A. 1990. *Building agricultural institutions transferring the land grant current model to India and Nigeria*. USA: West View Press.

Gill, D. S. 1991. Economic returns to expenditures on agricultural extension system. *Journal of extension systems* 7: 44–61.

Hall, A. J. and S. Nahdy. 1999. *New methods and old institutions: systems problems of farmers participatory research*. Agriculture Research and Extension Network Paper No 93. London: ODI.

Hall, A. J., Rasheed Sulaiman V., N. G. Clark, M. V. K. Sivamohan and B. Yoganand. 2000. *Public and private sector partnerships in Indian agricultural research: emerging challenges to creating an agricultural innovation system.* Paper Presented at the XXIV International Conference of Agricultural Economists, August 13–18, Berlin, Germany.

Hall, A. J., Norman Clark, Sarah Taylor and Rasheed Sulaiman V. 2001. *Institutional learning through technical projects: horticulture technology R and D system in India.* Agriculture Research and Extension Network Paper 111. London: Overseas Development Institute.

ICAR. 1996. *Report of the review committee on extension system of the ICAR (Surjewala Committee report).* New Delhi: Division of Agricultural Extension, Indian Council of Agricultural Research.

ICAR. 1998. *National Agricultural Technology Project: main document*, New Delhi: Indian Council of Agricultural Research.

ICAR. 2000. *Annual Report 1999/2000.* New Delhi: Indian Council of Agricultural Research.

Isvarmurthi, K. 2000. Kerala horticulture development program – new way to help farmers, *Agriculture and Industry Survey* 10(11): 23-34.

Jha, D. and A. Kandaswamy (eds.) 1994. Decentralizing agricultural research and technology transfer in India. Washington, D.C: IFPRI and ICAR.

Jinraj, P. V. 1999. *Performance evaluation of Krishi Bhavans set up in Kerala.* Thiruvanthapuram: Centre for Development Studies.

Lundvall, B. A. ed. 1992. *National innovation system towards a theory of innovation and interactive learnings.* London: Pinter.

Macklin, M. 1992. *Agricultural extension in India.* Technical Paper 190. Washington D.C.: World Bank.

MANAGE. 1993. *Farmers participation in agricultural research and extension systems.* Hyderabad: National Institute of Agricultural Extension Management.

MANAGE. 1999a. *Innovations in technology dissemination, NATP series 1.* Hyderabad: National Institute of Agricultural Extension Management.

MANAGE. 1999b. *Agricultural Technology Management Agency, NATP series 2.* Hyderabad: National Institute of Agricultural Extension Management.

Rivera, W. M. and D. J. Gustafson. 1991. *Agricultural extension: worldwide institutional evolution and forces for change.* Amsterdam: Elsevier Publishers.

Roling, N. 1998. *Extension science – information system in agricultural development.* Cambridge: Cambridge University Press.

Sharada, H. C., P. Ballabh, M. Chauhan and P. K. Labh. 1996. Process documentation of client drives agricultural research and extension – experiences of VB KVK, Udaipur. In *Process documentation and monitoring in action,* eds. D. V. Rangrekar and John Farrington. Pune: BAIF.

Sharma, R. 1999. Reforms in Indian agriculture: the case of agricultural extension. Paper presented at the NCAER–IEG–WB workshop on Agricultural Policies, 15-16 April 1999, New Delhi.

Sharma, V. P. 2000. Cyber extension in the context of agricultural extension in India. *MANAGE Extension Research Review* 1(1): 24-41.

Sulaiman, R. V. and V. V. Sadamate. 2000. *Privatizing agricultural extension in India.* Policy Paper 10. New Delhi: National Centre for Agricultural Economics and Policy Research.

Sulaiman, R. V. and A. W. van den Ban. 2000a. Reorienting agricultural extension curricula in India. *Journal of Agricultural Education and Extension* 7(2): 69-78.

Sulaiman, R. V. and A. W. Van den Ban. 2000b. *Agricultural extension in India – the next step*, Policy Brief 9. New Delhi: National Centre for Agricultural Economics and Policy Research.

Sulaiman, R. V. and Dayanatha Jha. 2000. Determinants of demand for paid farm extension services in India: a discriminant function approach. *Afro-Asian Journal Rural Development* 33(2): 57-67.

Swanson, B. E. and J. B. Clarr. 1984. The history and development of agricultural extension. In *Agricultural extension – a reference manual*, ed. B. E. Swanson. Rome: Food and Agricultural Organization.

Swanson, B. 1996. Innovations in technology dissemination component of NATP. Delhi: Ministry of agriculture, Government of India (mimeo).

Umali, D. L. and L. Schwartz. 1994. *Public and private agricultural extension: beyond traditional frontiers.* Discussion Paper No 236. Washington, D. C.: The World Bank.

van Beek, P. G. H. 1997. Beyond technology transfer. *European Journal of Agricultural Education and Extension* 4(3): 183-192.

van den Ban, A. W. and B. S. Hawkins. 1998. *Agricultural extension.* New Delhi: CBS Publishers & Distributors.

van den Ban, A. W. 1998. Supporting farmers decision making process by agricultural extension. *Journal of Extension Systems* 14: 55-64.

van den Ban, A. W. 2000. *Different ways of financing agricultural extension.* Agricultural Research and Extension Network Paper 106b. London: Overseas Development Institute.

13

Farmers' Participation in Sub-Surface Drainage Project: Experience from Haryana

K. K. Datta

Introduction

Several scholars have highlighted the extent of waterlogging and secondary salinization due to mismanagement of irrigation. At the global level, 45.4 million (m) ha land is salt-affected in irrigated areas and the estimated annual loss is of the order of US $ 11.4 billion (Ghassemi 1995). In India, the estimated loss varies across command areas. The pure effect of soil salinity in terms of declining yield ranges from 1 to 3 per cent for sugarcane and wheat in the Western Yamuna Canal and the Bhakra system, to as high as 64-74 per cent for paddy and other crops in the Sharda Sahayak Irrigation Project (Joshi et al. 1995). In the Western Yamuna Canal and the Bhakra system, net worth of the loss at present is about Rs 23,900 per ha. The estimated annual loss from waterlogged saline-area is about Rs 1,669 million (Datta and de Jong 2001). Besides causing significant economic losses, waterlogging and soil salinity also present threat to sustainability of land resources and reduce their productivity. At the regional level, the consequences are displacement of labor from agriculture, widening income disparities and adverse impact on the secondary and tertiary sectors. At the national level, negative effects of waterlogging and salinity are in the form of decline in agricultural production and gross domestic product, slowing down of agricultural exports and increase in import bill (Joshi et al. 1995).

A number of measures such as a better water management, conjunctive use of surface and groundwater, improvement of surface drainage, management of shallow groundwater and national land use have been suggested to address the problems of waterlogging and salinity. Increasing ground water discharge

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

and controlling water table can be effective by vertical (skimming well) or horizontal drainage. In the approach paper of the Tenth Five-Year Plan, it is proposed to improve water efficiency through adoption of water-efficient devices and promote conjunctive use of surface and groundwater. But, in the long run, sub-surface drainage (SSD) is the only effective option to reclaim waterlogged saline lands, where salts are accumulated in both soil and groundwater. In Egypt, SSD is provided on 1.75 m ha of irrigated area, in the western U.S.A. 25-30 per cent irrigated area is covered under SSD, and Pakistan has also embarked upon a big program of providing SSD in the irrigated area. Although the horizontal drainage in India was started in 1925 at Chakanwali (now in Pakistan) and in 1928 at Baramani in Maharashtra, SSD is comparatively a new concept. It is now realized that SSD is one of the important components of the irrigation system. The cost of installation of SSD mainly depends on the soil type, depth and spacing of drains, location under drainage and the type of drainage material used. At present (1994/95 prices), the cost of manually installed SSD varies from Rs 18,525 to Rs 22, 310 per ha in Haryana (Datta and de Jong 2000).

There are basically three reasons for installing the drainage system: (i) for trafficability so that seedbed preparation, planting, harvesting, and other field operations can be done on time, (ii) for protection of crops from excessive soil water conditions, and (iii) for control of salinity. Apart from that, drainage system widens the land-use options, raises crop-productivity, helps bring new land under production, and creates the conditions for using other modern inputs. In other words, SSD restores and sustains the productivity of agricultural lands (Datta and de Jong 2000). There are strong incentives for all stakeholders to participate in the development of drainage system. This paper examines the conditions and modalities for the participation of farmers, using the case study of Indo-Dutch SSD Project in Sonepat district of Haryana.

Constraints to Adoption of Drainage Technology[1]

The study on SSD in Haryana and Gujarat has visualized several constraints in its adoption. These include: (i) indivisible nature of the SSD technology, (ii) no attraction to individual farm households for investment in SSD to prevent or

[1] This section is drawn from Datta and Joshi (1993).

reclaim the degraded lands, (iii) increased economic differentiation and socio-political factionalism, and (iv) internal heterogeneity and inequities. The technical and economic issues relating to curative or rehabilitation of land in saline environment depend on its productivity. Evidence shows that people care more about highly productive lands than for unproductive lands.

Reconciliation of diverge interest groups is essential for the success of SSD. Major improvements could readily be achieved by reclamation of the degraded lands. However, the benefits would be rapidly vanishing when the reclaimed lands are not well maintained subsequently. Datta and Joshi (1993) have identified several factors determining the effectiveness of SSD. These are: (i) problem of free riders, (ii) degree of participation of beneficiaries, (iii) conflicting objectives, (iv) perception of the program objectives, (v) factionalism in the village, (vi) high dependence on government patronage, and (vii) erosion of the culture of group action and sharing of the system.

It has been realized that mere planning and executing the drainage system by a government agency may not yield the desired results unless there is a positive attitude and active participation of the beneficiaries in the program. Higher the participation of the affected population, the greater will be the success. If the conception, designing and implementation of SSD is not clear to the people, then such an intervention will finally lead to disempowerment of the community and disintegration of its stake, and marginalization of local knowledge system and institutional arrangement. It is found that persuasion and education of potential beneficiaries and demonstration of benefits are crucial for the successful operation and management of such land reclamation programs.

Differential resource endowments mainly created the incompatibility of actions of rational individuals. To resolve this problem, any kind of formal or informal group approach must assure each individual participant that decisions of other individuals will not cause any negative externality for him. But, the major problem arises when all villagers do not adhere to the agreed land-use plan. For instance, bigger farmers may choose to grow paddy, whereas small and marginal farmers may prefer to produce sorghum for their livestock. The farmers growing rice deprive the tail-end farmers from maintaining moisture in their fields. Thus, difference in crop preferences of farmers in the drainage area can lead to conflicts. Achieving higher efficiency through the investment in the drainage system can help solve this problem to some extent.

Options for Drainage Organization

For the management of SSD, focus on bottom-up approach, sensitization of decision-makers and local potential beneficiaries, and identification and incorporation of traditional practices into design and implementation of SSD should be encouraged. The centrality of common welfare is expected to trigger off new processes that are self-balancing, both socially as well as environmentally. The state should play a promotional role, and self-governance based on the values like freedom, autonomy and dignity, besides material well-being, should be encouraged. The task of organizing farmers may be taken-up by the government as well as non-governmental agencies. A review of the institutional options for drainage system in Haryana has revealed the following five distinct possibilities:

(1) The recognition/restructuring of the Soil Conservation Office and incorporation of the operational pilot drainage project nucleus organization to undertake large-scale SSD.
(2) Incorporation of operational drainage project into an existing body like the Haryana Land Reclamation Development Corporation (HLRDC) or the Haryana State Minor Irrigation Tubewell Corporation (HSMITC).
(3) Institution of a new non-governmental organization (NGO) exclusively for the implementation and monitoring of SSD.
(4) Creation of a new department of agriculture with the responsibility of reclamation of wastelands where operational drainage project would work as a nodal organizational unit.
(5) Formation of a drainage co-operative on the pattern of *Pani Panchayats* in Maharashtra.

Three general directions for establishment of a drainage organization are: a government agency, an NGO, or a public corporate enterprize. But, scaling up of the existing drainage staff in the department of agriculture to meet the challenges of large-scale SSD seems pragmatic, as this would be a cost-effective solution. The option of NGO appears impractical as they lack accountability and knowledge of SSD, and moreover, these do not exist in a progressive state like Haryana.

Another alternative is the promotion of drainage co-operative on the pattern of the 'Saline Land Agricultural Development Co-operative' in Gujarat which was established in 1989-90 under the Gujarat Co-operative Registration Act of

1860. The main activity of this co-operative is to share the operation and maintenance (O&M) cost. The problem in forming such co-operatives is that the need for soil improvement is not uniform in the entire drainage area, and therefore, farmers located in disadvantageous position may not be enthusiastic to participate in the co-operatives in the long run (Datta and Joshi 1993).

Another option could be scaling up of the Haryana Operational Pilot Project (HOPP) as a para-statal agency. This could be accomplished by either creating a new organization with exclusive mandate for large-scale mechanized SSD works, or integrating the same into an existing corporate entity such as HLRDC or HSMITC. A move in this direction would have significant advantages over the government locus, but its success will mainly depend on commitment and motivation of the staff.

Approach to Ensure Farmers' Participation

In this respect it must be realized that farmers' participation in irrigation management is much below the expectation in many instances. The problem may be more acute in the case of drainage, which is not accorded much importance by the farmers. Therefore, adequate attention should be paid to the following three factors: (a) Motivation and organization of farmers and preparing them for the selected activities; (b) Identification of activities and nature of farmers' involvement; and (c) Assessment of the actual benefits of the increased involvement, and lessons learnt for the future. In the case study project, it was assumed that farmers would not ask for the compensation during the installation stage of SSD, and they would allow free movement of machine for installing the drainage. Cleaning and maintenance of the collector drain would be done after a long interval (10-15 years) under the technical guidance. The main responsibility for O&M was with the drainage and irrigation department and farmers were expected to provide labor. Pumping of drain water was the main activity for which farmers were organized and asked to bear the cost for running the pump. The participants were allowed to reuse the drain water.

The most distinguishing part of the SSD in Haryana was that there was a constant interaction among farmers, implementing agency and other stakeholders. A farmers' participation section (FPS) was established by the implementing agency to create basic awareness about the problems and the program, and to

organize farmers' group to manage the resources. In FPS, there are community organizers (COs) to help the farmers to analyze their resources and organize themselves into a drainage society. A well-defined system of mass awareness with gender focus was developed through the FPS section. This section was always in touch with the village *Sarpanch*, and also developed good rapport with the progressive farmers and influential persons in the villages to settle any dispute arising during the process of installation of drainage. Informal groups of women were also encouraged.

A flexible and learning approach based on the principles of consensus and cooperation was followed to ensure farmers' participation in the project. In order to check the farmers' opinion about the involvement in the project, it was decided consciously that the crop compensation should not be allowed in the large-scale implementation of the project. For accomplishing this task, FPS supported with the consultants was created in the project as an important wing with a major role assigned to the community organizers and the women mutilators in conflict resolution. It also works as a second-line defense for the Farmers' Drainage Society (FDS).

Approach to set up organization of farmers

The FPS acts as an interface between farmers and the project. At the beginning, the FPS familiarizes the local people with the objectives and activities of the project. The section also selects those local people who are interested to participate in the process. To motivate and mobilize people, a written agreement is also made with all farmers on a drainage block basis (area about 50 ha). Farmers are made to realize that major beneficiaries would be those whose lands are covered under SSD. In order to avoid the problem of free riders and minimize the transaction costs, a small number of farm families (30-35) are kept in a drainage block or FDS. These societies (FDSs) are registered under Section 21 of the Cooperative Societies Registration Act (1860). The main objective of the FDS is to take care of O&M of the SSD system. Accordingly, they have created their own byelaws so that the group's activities can address the felt needs of the members. The group has enough solidarity to compel other people and organization to cooperate with them in addressing the common problems. The FDSs tend to be strongest when they (i) collect monthly or yearly fees from members in order to strengthen the financial position of the society; (ii) ensure

availability of members for the society's work whenever needed; and (iii) provide credit facilities to their members through a carefully planned, accountable credit program.

Already about 14 such societies have been registered and made functional. Mid-term review of the project has revealed that participatory aspects are encouraging and responsibilities of O&M could be handed over to the societies. The FDSs require common fund to undertake the O&M work on a sustainable basis. An apex body of all the FDSs is to be established to co-ordinate the work at the project level. The viability of the FDSs will mainly depend upon considerable follow up work to be done by their FPSs. Also, it is essential to solve the problem of de-watering of the system before taking up a new area for drainage installation. Unless a fully operational SSD system is not provided, farmers will be hesitant to take up O&M work. Success of the FDS primarily depends on the strong determination and commitment of the personnel of the project authority to demonstrate exceptionally good performance and to solve farmers' problems regarding waterlogging and soil salinity in their fields.

Profile of the Farmers' Drainage Society in Haryana

Particulars	**Description**
Name of the Society	Farmers Drainage Society
Registration Act	State Co-operative Societies Registration Act, 1860.
Area of operation	Saline and waterlogged areas belonging to the farmers of the Farmers Drainage Society Block
Objectives	(i) To regulate the pumping of saline water and discharge the effluents from the outlet to the main drain (ii) Operation and maintenance of SSD system (iii) To raise resources through collection from the members for meeting the O&M cost (iv) To arrange loans, subsidies, grants, etc. for the society toward reinvestment in the development

Particulars		Description
		of SSD, agricultural productivity and reclamation of saline soils; and
	(v)	To take any official and legal action deemed necessary to achieve the above-mentioned objectives.
Aims	(i)	Increasing agricultural production and reclamation of saline lands
	(ii)	Adoption of improved methods of water and land management
	(iii)	Monitoring ground water level, quality of land and water, and crop yields
	(iv)	Reuse of the effluents for irrigation; and
	(v)	Involving women of the member-households in the management and functions of the society.
Membership	(i)	Farmers, both men and women, who own or have land under their control under the jurisdiction of the Society and their spouse, above 18 years of age and sound of mind are eligible for membership.
	(ii)	Members have to pay non-refundable fee of Rs 21/-.
	(iii)	Farmers and their spouses who lose possession of land automatically cease to be members.
	(iv)	The ADO (Soil Conservation) of the respective area shall be the ex-officio member of the society.
General Body	(i)	All members together constitute the General Body and any decision of the General Body is binding and final.
	(ii)	The General Body has the power to prepare and amend the byelaws.
	(iii)	The annual meeting of the Society will be conducted during September every year. Special meetings can be convened whenever need arises. At least seven days notice will be given for holding a meeting.

Particulars		Description
	(iv)	To pass a proposal for amendment of the byelaws, vote of at least sixty per cent of all members present is required.
Executive Committee	(i)	The General Body will elect at least seven members to the Executive Committee for one financial year.
	(ii)	The ADO from APO office will be ex-officio member of the society who will be responsible to check the registers and other records maintained by the society.
Funds	(i)	Funds can be raised by the Society for its functioning in several ways, such as membership fee, annual fee, or land fee; proportion of crops; fines; donations from well wishers; loans from banking institutions, etc; and funds from HOPP, Government and other agencies.
	(ii)	The Functioning of the society will be on a no-loss and no-profit basis.
Relation with HOPP and Government	(i)	HOPP–Department of Agriculture (Haryana) officials shall have the right to verify the records and accounts of the society at any point.
	(ii)	On the dissolution of the Society, all its assets and liabilities shall vest with the HOPP-Department of Agriculture, Haryana.
	(iii)	The society is registered under the Cooperative Societies Registration Act, 1860 and all provisions of the said act are applicable to the society.

References

Datta, K. K. and C. de Jong. 2000. Reclaiming salt-affected land through drainage in Haryana, India : a financial analysis. *Agricultural Water Management* 46: 55-71.

Datta, K. K. and C. de Jong. 2001. Adverse effect of waterlogging and soil salinity on crop and land productivity in north-west region of Haryana, India. *Agricultural Water Management* 57(3) : 223-238.

Datta, K. K. and P. K. Joshi. 1993. Problems and prospects of co-operatives in managing degraded lands: Case of saline and waterlogged soils. *Economic and Political Weekly* 28(12&13).

Ghassemi, F. A. 1995. *Global salinization of land and water resources: Human causes, extent and management*. Center For Resource and Environment Studies, Australian National University.

Joshi, P. K., K. K. Datta, B. L. Gajja and J. Singh. 1995. Saline and waterlogged soils: Impact on agricultural economy and feasibility of reclamation. In *Reclamation and Management of Waterlogged Saline Soils*. Karnal: Central Soil Salinity Research Institute, and CCS Haryana Agricultural University.

Discussant's Note

Mruthyunjaya

Three papers on the institutional change in agricultural research and development (R&D) in India have discussed policy, institutional and organizational aspects. The general consensus has been that there is a need for intensification of agricultural R&D in the country, coupled with implementing a variety of reforms for accelerating technology development activities. The focus of reforms should be on reassessment of the priorities in the context of new economic scenario, development of capacity in frontier areas of science, management of intellectual property and improving technology absorption capacity of farmers. The growing literature has also highlighted these issues, and in particular, emphasized the need for public-private partnership in agricultural R&D.

In general, the research system is aware of these pressing constraints and the need for organizational reforms. A number of steps have been taken by the system, particularly by the Indian Council of Agricultural Research, under the National Agricultural Technology Project. Some of these include perspective planning, ecoregional approach in system perspective, public-private partnership, project-based planning, institutionalization of improved research planning, monitoring and evaluation mechanisms, resource generation, organization and management reforms, information system development, modernization of research infrastructure, human resource development in frontier areas of science, etc. On the extension side, integration of extension agencies, skill development, farmers' participation, resource generation, use of information and communication technologies, participation of the private sector, etc. are being given high priority. The progress on these reforms is being monitored closely for necessary modifications and mid–course corrections.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

These reforms are often criticized for their slow progress. But, we should remember that we are dealing with one of the largest R&D systems of the world, and bringing significant changes in such a large system, particularly bringing a change in the mindset of people is a challenging task. Also, we should keep in mind, as pointed by one of the papers, that change is a slow process and drastic changes sometimes may prove costly. Therefore, we should gradually move towards our objectives. This does not mean that we should not be clear about the target, i.e. the direction of change. In order to accelerate the process of change, attempt should be made to learn from the past experiences, and also incorporate lessons from the other national systems and international research centers. In my opinion, the following issues will be critical in the coming years:

Firstly, the public system should learn to identify client needs more clearly and work with other actors in a partnership mode to use available resources more efficiently and effectively.

Secondly, management of intellectual property for resource generation, access to proprietary material and technology and serving the interest of small land holders will be critical.

Lastly, striking a balance between modern science of biotechnology, meeting needs of elite consumers, focusing on traditional agenda of food security, and sustainability of natural resources and production systems will be a challenging task.

Social scientists are expected to play a proactive role in providing systematic information for conscientious decision-making in addressing these emerging challenges.

14

Land Reforms and Agricultural Development: Retrospect and Prospect

T. Haque

Land reforms seem to have lost their traditional flavour and favor among the policy makers of India in recent years. This is particularly so in the wake of economic liberalization and World Trade Organization regime when trade and market reforms occupy the central stage of development policy. However, this does not mean that land reform as an instrument of social and economic change in the country has lost its relevance altogether. The agrarian structure in the country still continues to be as unequal as before. Even today, insecure tenancies and fragmentation of holdings constrain the agriculture growth in many regions. Still above 60 per cent of our workforce is engaged as agricultural workers, and a majority of them are marginal farmers and landless laborers living under abject poverty. In the absence of adequate employment opportunities, in both farm and non-farm sectors, the access to land holds the key to their livelihood. Under these circumstances, there is no reason why land reform should lose its relevance as a development policy.

There are several reasons for the present aversion to land reform. Firstly, various land reform laws passed in the 1960s and 1970s have remained largely ineffective, due to lack of political will to implement them in most of the states. Therefore, there is no hope that land reform would be effectively implemented in the near future, particularly when the political will appears to be weaker today. Secondly, it is being argued that the land sector cannot continue to bear the burden of growing millions infinitely. Already under the impact of population growth, the average size of holding appears to be small and non-viable. Thirdly, land reform, which encourages small holders' agriculture, can be successful only when there is necessary institutional and policy support. Particularly, the roles of co-operative delivery systems and public subsidies are crucial. Since

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

such institutional and policy support may not be forthcoming, land reform is not likely to yield the desired results. Lastly, due to more thrust on export-oriented agriculture, there is a demand for corporatization of agriculture and liberalization of land ceiling and tenancy laws so that both quality and stable supply of commodities could be ensured.

The present paper examines some of these issues in the context of land reform and agricultural growth. Specifically, the paper answers the following questions:

i) Is it really necessary to relax the ceiling laws in order to promote export oriented and diversified agricultural growth? If so, will that mean encouragement to capitalist farming and growth of landlessness? Will such a measure be politically feasible?
ii) What has been the impact of recent tenancy reforms on agricultural growth and equity in the states like West Bengal and Karnataka?
iii) Will legalization or liberalization of land leasing policy help promote economic growth and equity?
iv) Does agricultural tenancy, especially share cropping continue to be an inefficient and exploitative institution? If so, can we replace share cropping by a system of lease for fixed cash or fixed produce?
v) Does contract farming in collaboration with national or multinational agro-processing industries help promote diversified agricultural growth?
vi) Will the entry of the corporate sector in farming either directly or indirectly through contractual arrangements lead to an efficient as well as sustainable use of land and other natural resources?

Relaxation of Ceiling Laws

It is often argued that commercialization of agriculture, particularly for export promotion, requires the size of land holding to be reasonably large so that economies of scale as well as quality of produce could be maintained. In reality, however, this kind of argument seems to be misplaced because countries like China and Vietnam with smaller size of land holdings do influence the international export markets today in a significant manner. What is probably more important in this context is that we should become internationally cost competitive through generation and transfer of cost-effective high yielding technologies, and effective

marketing of agricultural produce through appropriate delivery systems. Several state governments in India have already modified their ceiling laws to exempt orchards, fish ponds, etc. But, the results are far from satisfactory in the absence of other necessary reforms and support. Besides, a generalized relaxation of ceiling laws in all the cases, may neither be socially desirable nor politically feasible, as the resultant landlessness may cause unmanageable tensions in rural areas in the absence of adequate employment opportunities.

Impact of Recent Tenancy Reforms

The states of West Bengal and Karnataka are known for the radical tenancy reforms introduced in the late 1970s. Therefore, a brief critical review of the impact of these reforms would be in order.

'Operation Barga' in West Bengal

The Land Reforms Act (1955) of West Bengal was amended in 1977 to protect the interest of the sharecroppers. According to the amendment Act, owner could resume his land given to a sharecropper if: (i) The land owner or any member of his family resides in the locality of land; (ii) income from land is the principal source of his income, (iii) the resumed land is cultivated with the help of family labor and not hired labor; and (iv) the resumption leaves a minimum of one hectare land with the sharecropper. To implement this Act effectively, the government launched a special campaign to record the names of sharecroppers in 1978. This campaign is popularly known as 'Operation Barga'. It is often said that 'Operation Barga' is a major force behind the recent spurt in agricultural growth in West Bengal, and a number of reasons are cited to support this argument. Firstly, it provided a security of tenure to the sharecroppers which provided additional incentive to cultivate land more efficiently. Secondly, it ensured entitlement of sharecroppers for accessing institutional credit facilities. Thirdly, 'Operation Barga' and other institutional reforms altered the rural power structure, thereby enabling the sharecroppers and poor peasants to have equal access to modern technical inputs. Logically, therefore, the productivity of sharecropped land should have increased. Up to 1980, the agriculture productivity in the state was more or less stagnating. The average annual growth rate of

food production in 1970-80 was merely 0.7 per cent. The coverage under high yielding varieties (HYVs) of rice and wheat was hardly 33 per cent in 1980/81. It increased to 58 per cent in 1990/91 and further to nearly 85 per cent in 1998/99.

The average yield of rice increased from 1.4 tonnes/ha in 1980/81 to 1.8 tonnes/ha in 1990/91 and 2.3 tonnes/ha in 1998/99. Although the rice yield in West Bengal is still lower than that in Punjab or Haryana, the growth rate of rice yield during 1980-90 was the highest (5 percent) in the country. The yield of wheat increased from 1.4 tonnes/ha in 1980/81 to 2.2 tonnes/ha in 1998/99. The average yield of foodgrains increased from 1.4 tonnes/ha in 1980/81 to 2.2 tonnes/ha in 1998/99. Assuming 1981/82 as the base year (100), the productivity index of non-food crops also rose sharply to 189 in 1996/97 (GOWB 1999/ 2000). Similarly, during 1977 and 1993, there was a drastic decline in the rural poverty ratio in West Bengal — it declined from 68 per cent in 1977 to 63 per cent in 1983 and 40.8 per cent in 1993. This decline in poverty ratio in West Bengal was thus about 27 per cent, while the all India poverty ratio dropped only by 16 per cent during this period (Haque 2001).

There is often a debate whether the credit for agricultural revolution in West Bengal should go to technological change or land reform, particularly 'Operation Barga'. As pointed out earlier, the adoption of HYVs and chemical fertilizers was very rapid from 1980/81. Besides, one lakh hectare of additional land was brought under canal irrigation during 1980-90, and another one lakh hectare was brought under government canals during 1990-1997. The number of both shallow and deep tubewells also increased substantially during this period. While the access to additional irrigation by government canals was the result of government initiative, private initiatives were largely responsible for the adoption of new technology and increased access to minor irrigation facilities. The 'Operation Barga' and other land reform measures undertaken by the government have changed the rural power lobby structure in favor of the poor, and has enabled the poor peasants and sharecroppers to enjoy an increased access to credit, irrigation, HYV seeds and chemical fertilizers, which helped in productivity growth and improvement in their socio-economic status. The 'Operation Barga' thus, acted as a catalytic agent for development.

A number of studies have also observed a positive connection between land reform and agricultural growth in West Bengal. According to Banerjee and Ghatak (1995), after controlling factors such as rainfall, public irrigation and

region-specific fixed effect, the growth in production of *aman*, *aus* and *boro* rice was found to be correlated with the progress of tenancy reform. The relationship was found to be statistically significant in *aman* and *aus*, but not in *boro* rice. While the yields of major crops were positively and significantly correlated with the progress of tenancy reform, the evidence about the mechanisms through which the higher yields were associated with tenancy reform was not vivid. Although HYV adoption and increase in shallow tubewells were positively correlated with tenancy reform, the relationship was not found to be statistically significant.

Webster (1992) observed that consolidation of management around tubewell command areas was the major source of growth in the West Bengal agriculture. Earlier tenancy patterns have been reversed for the irrigation-based *boro* paddy cultivation season. Water owners, who have mini submersible tubewells, tend to be the richest and powerful in the villages, rent-in land for *boro* paddy cultivation. This led to the expansion of area under *boro* paddy, the yields of which were much higher than those of *aman* and *aus* paddy and other coarse cereals. At the same time, the slowing down of production in the 1990s, might have been caused by the depletion of groundwater, particularly in the districts of Haora, Hooghly, Murshidabad and Birbhum.

Bhaumik (1993) observed that even after recording of *barga*, resource allocation and productivity still varied between the owned and the share-cropped land. However, the recorded tenants (the result of 'Operation Barga') tend to perform better than the unrecorded tenants regarding cultivation of sharecropped lands. The recorded tenants also extract a much larger share of total returns as compared to the unrecorded tenants, and to this extent, the 'Operation Barga' has led to augmentation of income of a large section of recorded tenants.

The results of a recent study (Haque 2001) have indicated that the cropping pattern as well as the yield levels seem to have changed after recording of *barga*. Nearly 95 to 100 per cent peasant *bargadars* expressed that they are better off financially after 'Operation Barga'. Due to increase in the security of tenure, there is no significant difference in the average productivity of own land and leased-in land, under homogenous agro-climatic situations. In some cases, where it existed, it was due to difference in the qualities of land, and not due to tenancy as such. Sharecroppers are now adopting improved technology and are showing greater interest in raising the crop yields. Although

the average yield of *kharif* paddy has increased only marginally, most of the sharecroppers are now growing *boro* paddy which yields about 5-7 tonnes/ha. The yield of wheat has also increased. Almost all the sharecroppers opined that they are now taking more interest in the sharecropped land due to the new incentives.

The farm level survey however revealed that although recording of *barga* has provided the sharecroppers the access to credit facilities, due to various procedural difficulties and delays in accessing institutional credit, they prefer to borrow money from private moneylenders at high interest rates, ranging from 36 to 48 per cent per year, merely on grounds of convenience. In fact, the credit availability situation was found to be slightly better in the case of non-recorded sharecroppers, although the sources of credit were mainly the land owners and private moneylenders in this case.

Nevertheless, the new incentives created by the operation *barga* have helped the sharecroppers to make investment in various land improvement measures. The sharecroppers have increased access to irrigation due to development of water markets and some of them have installed tubewells with or without government help. A majority of the sharecroppers were found to adopt HYV technology, and input use pattern and land productivity of the owner cultivators and the recorded sharecroppers did not differ significantly within the same size group of farmers. According to the perception, of the sharecroppers, the new incentives, irrigation expansion and adoption of improved technology contribute about one-third each to the incremental productivity of land. Of course, the change in the rural power structure due to recording of land rights of *bargadars* has helped them to have equal access to modern technical inputs for improving land productivity.

It was also observed that the socio-economic condition of sharecroppers has significantly improved due to 'Operation Barga'. A majority of the sharecroppers, who were interviewed, reported that they effectively participate in politics and local level democratic institutions. They are socially treated at par with others. Nearly one-third of household income of the sharecroppers comes from leased-in land, and this is the contribution of share cropping in poverty reduction. If these people could not have access to leased-in land, their income level would have reduced by one-third. Nevertheless, the overall income position of the sharecroppers was not very satisfactory, and they are miles to go for improving their economic conditions.

Occupancy rights to tenants in Karnataka

In 1974, the Karnataka Land Reform Act (KLR Act) 1961, was substantially amended to ban leasing of land in the state, except by soldiers and seamen, and the right of resumption of land was eliminated. The 1974 Act did not spare even widows, unmarried daughters, old and disabled small landowners, who leased out land. Further, through an amendment in 1979, persons inducted as tenants before 1-1-1979 were entitled, with effect from the date of vesting (1-3-1974), to be registered as occupant in respect of the land under his cultivation, subject to the ceiling limit. The Act prohibits the tenants who have been conferred occupancy rights from transferring such land by way of sale, gift-exchange, and mortgage within a period of 15 years from the date of certificate. However, when a tenant dies, the landlord shall be deemed to have continued the tenancy to the heirs of such tenant on the same terms and conditions on which the tenant was holding at the time of his death. The tenant can surrender the land only in favor of the government. Also, he should cultivate the land personally, otherwise, the land shall be forfeited by the government.

Up to July 2000, about 0.49 million tenants under the above category were conferred occupancy rights, covering 1.85 million acres of land. Nearly 10 thousand cases are pending in the state High Court, involving 59.5 thousand acres of land. There are regional variations in the number of beneficiaries. The districts of *Uttar* Kanada, *Dakhin* Kanada, Udupi, Belgaum and Shimoga have a relatively large number of beneficiaries, involving also a larger area under occupancy rights. Both administrative and historical reasons could be behind such inter-regional variations. The coastal region which had high concentration of tenants and had also witnessed several agrarian movements are reported to have done well in this respect. The proportion of area under tenancy was much lower in Old Mysore region and therefore, agrarian unrest was minimal. In northern Karnataka, particularly in Bombay-Karnataka region, the proportion of area under tenancy was higher than that in old Mysore, and at lower level than that of coastal Karnataka. But the lands were mostly dry and the former tenants were largely indebted to local moneylenders (Pani 1997). According to Pani (1997), uniform implementation of the law had different effects on the three regions in the states. In the coastal region, the substantial transfer of land from landowners to tenants fundamentally transformed the agrarian system. But, in Old Mysore district, where tenants were few, the tenancy reform did not

alter the nature of the agrarian system. Since both ex-tenants and landowners belonged to all size of classes, the reform only led to a vertical split in the rural society on factional rather than class lines. This was partly true for northern Karnataka also. However, in districts like Kolar, Bangalore, Hassan, Mandya and Mysore, the proportion of area under tenancy was more in the larger size classes and hence, the law benefited them most. Rao (1992) points out that the benefits were not focussed on the rural poor and landless, who did not gain any land under tenancy legislation. The principal beneficiaries of the tenancy legislation were the lessees having the farm size of more than 15 acres, who were also in a better position to assert their rights as tenants. The agricultural production also lost its momentum in the 1980s and the political wave initiated by Devaraj Urs lost its thrust. Iyer (1997) has shown that despite legal ban, the concealed tenancy exists in all the regions of the state. It varied from 4 to 6 per cent in the central and coastal regions and 6 to 8 per cent in the villages of northern dry region. At the state level, it is about 6 per cent. There also have been a few cases of reverse tenancy.

Nonetheless, the Act was considered to be a revolutionary step in providing security of tenure to the erstwhile tenants. Its impact on agricultural growth and equity, however, needs to be studied systematically. The proportion of gross cropped area irrigated increased from 19.2 per cent in 1979 to 35.4 per cent in 1995. The foodgrain production in the state increased form 6.4 million tonnes in 1980-83 to 7.6 million tonnes in 1990-93 and further to 9.98 million tonnes in 1998. Even if, we accept V.M. Rao's thesis that agricultural growth rate slackened in the 1980's, it was not so in all the districts. In fact, in districts like Belgaum, Bijapur, Mysore, Raichur, Shimoga and Kolar, there was an improvement in the agricultural productivity growth in the 1980s as compared in 1970s. Besides, coastal and ghat region, where incidence of tenancy was large, reform might have helped to reduce the rural poverty ratio to 9 per cent, as compared to the higher state average (India Rural Development Report 1999). Besides, our farm level survey (Haque 2001) reveals that occupancy tenants made investments in the land improvement measures and increased their land productivity. For example in Kolar district, nearly 90 per cent of them invested in the land improvement measures, including fencing, land leveling, construction of wells, etc. However, nearly 90-95 per cent of occupancy tenants depend on non-institutional sources of credit. Although the rate of interest is as high as 36 to 48 per cent per year, they prefer to borrow from local moneylenders than from

banks because of convenience and fear of harassment. This calls for credit reform in the institutional sector with increased accessibility of the farmers to institutional credit. In fact, it is not so much land relations, but credit relations and poverty, which go together. In some areas, there has been emergence of water market. But, it is mainly the large farmers who own and sell water. Since the Karnataka land reform does not focus much on the landless, it is time to see whether ownership of tubewell or tank by the landless would help them to improve their economic condition. Unfortunately, in most areas of the state, the average agricultural wage rates are low, the agricultural laborers hardly get employment for less than six months in a year.

Should Agricultural Tenancy be Legalized?

It is often argued that the restrictive tenancy laws have not served much purpose for either growth or equity and, therefore, tenancy should be liberalized in an appropriate legal framework. A number of arguments are put forward in favor of legalization or liberalization. It is stated that legalization of tenancy would increase the mobility of people from the rural to urban areas and improve the availability of land in the lease market, which may improve the poor people's accessibility to land through leasing (Saxena 1997). At least legalization of tenancy on experimental basis can be tried in selected areas and examine whether this has positive or negative impact.

Legal restrictions discourage the landowners to lease out their land, even if there is a demand for it and take up non-farm enterprizes, which is vital for rural transformation. Secondly, as Appu (1995) points out, if tenancies are allowed legally, tenants can acquire rights on the land they cultivate and the rural poor will have access to a larger area of agricultural land. In many areas, the restrictive tenancy laws have resulted in landowners leaving their land uncultivated due to the fear that they may lose the land if they lease it out. The lifting of ban on leasing in such cases will result in a better utilization of the available land, fuller absorption of human labor and increased farm output. Parthasarathy (1997) has opined that legalization of tenancy would increase the poor peoples' access to land in most places, as large land owners would tend to migrate for taking up non-farm occupation, if there is no risk of losing land because of leasing out. The advantage of cheap family labor favors the poor to lease-in land, and

therefore, liberalization of tenancy would enable the small farmers to augment their operational holdings by leasing in land. In addition, it would promote both farm and non-farm developments by improving the large landowners' ability and incentive to invest.

Thirdly, it is said that the tenancy laws of several states do not permit the landlords to resume land for personal cultivation from a tenant belonging to the scheduled castes (SCs) and scheduled tribes (STs). Such a provision in law discourages the landowners to lease out land to SCs and STs, and, therefore, is anti-poor in effect (Haque 2001).

Fourthly, it is often argued that in progressive states, the landlords tend to assume greater risk and accountability in the process of production and therefore, lifting the ban on tenancy and liberalization of land-lease market would be to the advantage of small operators who would be able to lease in more land.

However, the opponents of liberalization of tenancy argue that it would promote reverse tenancy and capitalist farming in some areas and absentee landlordism in others and the poor would tend to lose in both the situations. In fact, there is a danger that in the absence of adequate non-farm development, liberalization of tenancy and market-led agricultural development may alienate the marginal farmers from land, without an alternative regular source of income. Hence, accelerated diversified development is the answer and not just a legal reform. The shares of marginal farms in the total leased in land are low in a number of states, and in some states, the share of large and medium farms has increased in recent years. Therefore, there is no guarantee that liberalization of tenancy would enable the marginal farmers to have greater access to lease market unless adequate number of large and medium farmers move to the non-farm sector. It is also not certain whether legalization of leasing would sufficiently motivate the large and medium farmers to lease out land and take up non-farm enterprizes and employment unless rural literacy, electricity, roads, communications, markets and credit facilities develop significantly.

Is Agricultural Tenancy an Inefficient Institution?

Agricultural tenancy, particularly sharecropping, as an economic institution has been under criticism since the very beginning. During the first round of land reforms in Japan during the Meiji regime, sharecropping was replaced by a

system of fixed rent leasing. According to Alfred Marshall (1956) , the share tenant would be an inadequate as well as inefficient cultivator. However, the logical basis of such inefficiency argument has been under attack by several economists like Cheung (1969) and Newbery (1974) saying that the argument is misleading since both the landlord and the tenant voluntarily enter into a contract. Cheung (1969) observed that the implied resource allocation under private property rights is the same whether the landowner cultivates the land himself, hires farm lands to do the tilling, leases his holdings on a fixed rent basis or shares the actual yields with his tenant. A study in India by Walker and Ryan (1990) shows that sharecropping accounted for 18.7 per cent reduction in output and a sizeable decline in the average use of family and bullock labor.

However, these formulations represent over-simplification of the land tenure system where the efficiency question of alternative land tenure arrangements cannot be analyzed out of context of various types of land relations. A study by Haque (1996) shows that there are fourteen major types of land relations in India, with wide differences in their relative efficiency. The details could not be presented here due to lack of space. The study bears out that crop productivity varies according to who leases-in and who leases-out land for cultivation. For instance, the marginal and small farmers leasing-in land from resident landowners were found to have comparatively higher gross productivity levels than the marginal and small farms leasing-in land from absentee landowners. But the net returns per hectare for tenants were higher in the case of the latter. Further, the net returns varied widely between various land tenure groups due to varying terms of lease. Under crop-sharing arrangements, tenants get relatively lower returns than under the systems of fixed produce or fixed cash. Pure tenants– those who leased-in land under interlocking arrangements, had higher gross returns per unit of land than the others, because of close supervision and provision of credit and other inputs by the landowners. This confirms the Braverman-Stiglitz hypothesis (1982) that interlinkages of credit and tenancy contracts may serve landlords as a screening device in identifying efficient tenants. But in that case, the extent of exploitation was also more. Furthermore, a recent study of West Bengal tenancy situation by Haque (2001) shows that, *ceteris paribus*, productivity differences between owner-operated land and sharecropped land have more or less disappeared now due to security of tenure of sharecroppers. But, the question is whether we can record sharecropping tenancy in all other regions on the pattern of West Bengal so that the sharecroppers have the

necessary incentive to produce more. Alternatively, can we stipulate replacement of inefficient sharecropping by a system of fixed rent? Probably any legal effort to do so would fail and the emergence of land-lease market will give the signal.

Poor Peoples' Access to the Land-Lease Market

Prior to Independence, the tenants in India were considered to be the poor cultivators who leased-in land for subsistence from either local landowners or absentee landlords. However, with the passage of time, the poor peoples' access to lease market has weakened. Recent rounds of the National Sample Survey Organization (NSSO) (Table 1) show that in several states, including Haryana, Karnataka, Maharashtra, Punjab and Rajasthan, the medium and large farmers (>4 ha) held about 50 per cent or more of the total leased-in area in 1982-1992. In fact, during 1982-1992, the percentage share of the marginal farmers in the total leased-in land was as low as 7.0 per cent in Rajasthan, 1.0 per cent in Haryana, 5.7 per cent in Punjab, 4.0 per cent in Maharashtra, 8.3 per cent in Madhya Pradesh and 7.3 per cent in Gujarat. Considering the country as a whole, the marginal farmers accounted for hardly 16.3 per cent of the total leased-in land in 1992, while their proportion was as high as 60 per cent. In other words, marginal farmers who needed to have greater access to leased land for their viability had, in fact, very little access to such land.

In a number of states, including Assam, Bihar, Orissa, West Bengal, Kerala, Tamil Nadu, Himachal Pradesh, Jammu and Kashmir and Uttar Pradesh, the marginal and small farmers still have a relatively larger share in the total leased-in land. But, there is an apprehension that as leasing policy becomes liberal and market-led agricultural development takes place, the accessibility of small farmers' leased-in land would further decline, particularly when non-farm employment opportunities (either self-employment or wage employment) are growing very slowly. For example, even in a relatively progressive state like West Bengal, marginal farmers in some areas are found to lease out land to large farmers during the *rabi* season for the cultivation of *boro* rice, vegetables, etc., which require large investment. Thus, the dynamics of market-led development may favor the large farmers to have greater accessibility to land-lease market and would, in all probability, be inequitous in nature. The overall economic benefit could be distributed equally, only if the marginal and small

Table 1. Share of various size-classes of farms in total leased-in area (based on operational holdings)

State	Year	Percentage share in total leased-in area by size class (ha)			
		<1	1-2	2-4	>4
Andhra Pradesh	1982	12.69	16.40	28.53	42.37
	1992	20.20	24.40	29.20	26.20
Assam	1982	18.15	30.24	38.43	13.24
	1992	26.90	30.80	13.90	28.50
Bihar	1982	29.73	39.74	20.82	9.73
	1992	45.80	35.30	17.30	1.60
Gujarat	1982	7.87	2.26	11.27	78.55
	1992	7.30	7.30	43.60	41.80
Haryana	1982	3.83	4.24	32.97	58.97
	1992	1.00	2.40	14.40	82.20
Himachal Pradesh	1982	33.43	33.88	16.15	16.14
	1992	49.30	27.20	23.50	0.00
Jammu and Kashmir	1982	17.80	31.05	43.58	7.56
	1992	21.10	51.80	26.00	1.00
Karnataka	1982	3.56	11.17	23.25	56.29
	1992	7.00	15.70	12.40	65.00
Kerala	1982	57.72	18.69	2.83	20.76
	1992	39.00	30.40	13.50	17.20
Madhya Pradesh	1982	4.11	11.68	17.53	66.66
	1992	8.30	18.50	35.60	37.70
Maharashtra	1982	3.21	2.86	16.56	77.39
	1992	4.00	6.20	16.50	73.30
Orissa	1982	17.15	23.59	19.94	39.13
	1992	25.80	45.60	23.40	5.20
Punjab	1982	2.57	10.41	21.60	65.40
	1992	5.70	6.70	21.30	66.30
Rajasthan	1982	2.77	3.89	24.17	69.23
	1992	7.00	5.10	12.40	75.50
Tamil Nadu	1982	34.18	28.85	22.50	14.47
	1992	28.70	28.20	24.70	18.50
Uttar Pradesh	1982	21.46	28.49	27.76	22.07
	1992	26.60	31.10	25.20	17.10
West Bengal	1982	31.93	26.27	25.48	11.61
	1992	50.70	35.70	12.30	1.30
All India	1982	15.57	19.57	23.86	41.03
	1992	16.30	19.30	21.60	42.90

farmers can have improved employment opportunities. A recent study of reverse tenancy situation in Punjab (Haque 2001) shows that this is a win-win situation for both the landowner and the tenant, as small farmers maximize their income by both leasing out land and hiring out labor or by undertaking self-employment. However, a large-scale growth of reverse tenancy, particularly in the backward regions, may alienate the marginal farmers from land without any alternative or additional source of income.

The Case for Contract Farming

Two case studies of contract farming — one each in Punjab and Andhra Pradesh — were conducted by the present author (Haque 2001). The results (Table 2) indicate that contract farming helps in raising the yields and income of the farmers because of the high quality seeds and assured market for the produce provided by the company. It also helps the company to ensure adequate supply of quality and captive raw material for its processing unit, at a pre-determined price. Besides, it helps in meeting the market presentation criteria and sustainability of the processing unit as such.

Agro-processing industries by nature provide a forward linkage to the farmers whenever there is a contractual agreement between the industry and raw material producing farmers. But, the small farmers can effectively participate in contract farming only when there are backward linkages also in the form of assured supply of all critical inputs. In the case of Hindustan Lever Limited (in Punjab), which has contractual arrangement for tomato, It was observed that only hybrid seeds were provided to the farmers. Almost all the 300 contract farmers were large and medium farmers. This is an imperfect and inadequate contractual arrangement from the point of view of small farmers. However, in the case of VST Natural Products Limited (NPL) (in Andhra Pradesh), almost all the contract farmers were marginal, small and semi-medium farmers. This has been possible because the VST (NPL) provides not only seeds, but also other inputs on credit basis, if needed. Since the company takes care of capital and technology needs of the farmers, even the small and marginal landowners have been encouraged to join contractual arrangements. Thus, while the Punjab model of contract farming as practiced by the Hindustan Lever Limited is not easily replicable to large parts of the country in the absence of appropriate

institutional mechanism to provide credit, technology and other inputs to small landholders, the VST (NPL) model appears replicable. Secondly, the contract farming in Punjab has encouraged the large farmers to cultivate land above the ceiling limits by leasing in land from the marginal and small farmers. This has alienated the small farmers from land through reverse tenancy. In other words, the process has been inequitous in nature. But, contract farming of VST (NPL) seems to have promoted equity, as small farmers have also benefited from it.

Table 2. Average per acre income of contract and non-contract farmers

Company	Crop	State	District	Net income of contract farmers per acre (Rs)	Net income of non-contract farmers per acre (Rs)
Hindustan Lever Limited	Tomato	Punjab	Amritsar	20,000	10,200
			Hoshiarpur	9,940	6,440
			Jullandhar	13,000	6,825
			Kapurthala	14,535	8.075
			Ludhiana	8,125	5,600
			Nawamshahar	11,040	7,200
			Phagwara	11,375	6,340
VST Natural Products Limited	Cucumber	Andhra Pradesh	Karimnagar	4,500	3,200
			Mehboob Nagar	5,200	4,500
			Medak	4,100	3,400
			Nalgonda	4,800	4,200
			Ranga Reddy	5,400	5,000

Source : Based on primary survey in 1998-99.

Thirdly, although there is no legal framework on contract farming in both Punjab and Andhra Pradesh, there has been no violation of contracts in Andhra Pradesh from either side, while in Punjab the violation of contract was reported from both sides. However, legalization of contract farming may help in protecting

the interests of both the parties and create healthy relationship between the company and the contract farmers.

Fourthly, as an assured market for the farm produce motivates a farmer to enter into a contract with a company, similar market prospects should exist for the processed products of the company. Ultimately, it is the success of the company's product in national and/or international market, which decides whether contract farming for any particular crop or commodity would sustain.

The government has also to create a conducive policy environment, which encourages national and international companies to promote contract farming, by creating an appropriate legal, political and administrative system as well as the necessary infrastructure. In addition, the government needs to ensure that contract farming, which tends to promote monoculture does not grow beyond proportion to destroy biodiversity and agricultural ecology. Although no such risks are visible so far in the two cases studied, it may be necessary to provide necessary guidelines for land-use planning in each region in order to prevent such eventualities in future. Besides, as Pandiyan (1996) and Reddy (1997) have pointed out, large scale corporate farming bears the potential danger of dispossessing many poor farmers of land through either purchase or lease.

Conclusions

It has been argued that land reform has not outlived its relevance. Tenancy reforms undertaken since Independence have yielded some positive, but not spectacular results. Particularly, the occupancy tenants in Karnataka and '*bargadars'* in West Bengal have significantly improved their land productivity and income in recent years. Also, productivity difference between owner-operated land and sharecropped land in West Bengal and those between occupancy tenants and traditional owners have disappeared as a result of tenancy reform. It is also not certain whether legalization of tenancy would increase the access of the poor to land by motivating the large farmers to lease out land and take up non-farm entrepreneurships, in the absence of adequate infrastructure and policy support. Besides, market-led development would tend to promote reverse tenancy which will alienate the marginal farmers from land, without providing any alternative source of employment. Therefore, liberalization of leasing

should be allowed only within ceiling limits for improving the poor peoples' access to leased land. While contract farming arrangements would be helpful in providing necessary forward and backward linkages to agriculture as well as to agro-processing industries, there should be efforts to enable the small farmers to benefit from contract farming. In fact, it is the small farmers who need credit and technology support more through contract farming. Similarly, relaxation of ceiling laws may not necessarily promote diversified agricultural growth. As a matter of fact, removal of technological and infrastructure constraints are of more crucial importance.

References

Appu, P. S. 1995. Land reforms: need for reorientation of policies. *Kurukshetra,* Annual Number, October 1-5.

Banerjee, A. and M. Ghatak. 1995. *The economics of tenancy reform.* Harvard University (mimeo).

Bhaumik, S. K. 1993. *Tenancy relations and agrarian development.* New Delhi: Sage Publications Ltd.

Braverman, A. and J. E. Stiglitz. 1982. Sharecropping and interlinking of agrarian markets. *American Economic Review* 72(4): 695-715.

Cheung, S. N. 1969. *Theory of share tenancy*. U.S.A.: Chicago University Press.

GOWB. 1990/2000. *Economic Review.* Kolkata. Government of West Bengal.

Haque, T. 1996. *Sustainability of small holder agriculture.* New Delhi: Concept Publication Company.

Haque, T. 2001. *Impact of tenancy reforms on productivity improvement and socio-economic status of poor tenants.* Policy Paper 13, New Delhi: NCAP.

Iyer, G. K. 1997. *Tenancy reform: the field perspective in land reform in India.* New Delhi: Sage Publications Ltd.

Marshall, Alfred. 1956. *Principles of economics*. London: Macmillon.

Newberry, D. M. G. 1974. Crop sharing tenancy in agriculture. *American Economic Review* 64(5): 1060-1080.

Pandiyan, A. 1996. Land alleviation in Tirunelveli district. *Economic and Political Weekly* 31(51): 3291-3294.

Pani, Narinder. 1997. *Towards decentralised agrarian reform in land reforms in India.* New Delhi: Sage Publications Ltd.

Parthasarathy, G. 1997. *Changing agrarian structure and directions for land reforms in Andhra Pradesh.* Paper presented at the national seminar held at NIRD, Hyderabad, December 16-18.

Rao, V. M. 1992. Land reform experiences. *Economic and Political Weekly* June 27: 34.

Reddy, D. N. 1997. Economic reforms, entry of corporate sector and the small farmer economy. In *Economic liberalization and the small farmer*, ed. Y. V. K. Rao. New Delhi: AIKSA and International Labour Organization.

Saxena, N. C. 1997. *Policy relating to sharecropping and leasing.* New Delhi: Ministry of Rural Development (mimeo).

Walker, T. S. and J. Ryan. 1990. *Village and household economics in India.* U.S.A.: John Hopkins University Press.

Webster, Neil. 1992. *Panchayat Raj and the decentralization of development planning in Sonar Bengla.* New Delhi: Sage Publications Ltd.

15

Some Dimensions of the Efficacy of Rural Financial Institutions

D. P. Khankhoje

Introduction

Development of rural areas continues to remain a matter of serious global concern. Addressing the needs and aspirations of millions of downtrodden of the world community, particularly that concentrated in the villages of developing nations, probably has been the most challenging task. The issue has received enormous amount of attention during the last five decades. Efforts have been made to tackle this multi-faceted and complex issue on a variety of dimensions. This experience has unfolded new vistas of varied nature and necessitated fresh rounds of relooks from time to time at the processes, approaches and strategies adopted in tackling the intricate phenomenon of rural development.

Rural banking systems in different countries have been primarily instrumental in channelizing finances worth billions of dollars to the villages. These continue to be one of the major players in rural development. Their functioning has constantly affected the millions of rural poor. Therefore, activities of rural financial institutions (RFIs) have attracted specific attention and their 'efficacy' has assumed critical significance.

It is quite interesting to note a broad pattern concerning RFIs of developing countries. Basically, the origin lies in the following assumptions: (i) Farmers are poor, (ii) farm credit needs creed, (iii) rural development should be promoted by government, and (iv) rural development needs supply leading finance as a pre-requisite. This thinking has led to the formulation of policy with emphasis on cheap supply of rural credit (subsidization through low interest rates on loans and other modalities). Since such a policy does not meet the rigor of commercial criteria of normal banking organizations, specialized RFIs were established in

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

many of the third world nations. Since these RFIs were required to provide cheap credit, they had to be on the lookout for avenues to mobilize resources at cheaper costs. This has often resulted into (i) heavy dependence of RFIs on treasury or external support on soft terms, (ii) separation of rural savings from rural credit, and (iii) limited access of RFI to market for funds. These RFIs were, in a way, alienated from the mainstream banking activities. Also, channelizing of their credit flow and credit rationing practices followed the political criteria. These drawbacks culminated into deterioration of loan portfolio and the consequential debacle on other business parameters which, in turn, impaired the working of RFIs. Needless to state, this caused a serious damage to the image of RFIs as a financial organism.

The World Bank has identified the following constraints in the working of RFIs (BMZ 1997):

- The RFI suffered from inflexibility of objectives within an inappropriate policy and legal framework and lack of institutional autonomy;
- Subsidized or regulated interest rates on loans have blocked the emergence of new credit markets;
- Target group access to credit has been severely restricted and loans at concessional rates have mostly gone to larger enterprises;
- Domestic resources mobilization and national financial market integration were seriously neglected;
- The accumulation of disclosed and undisclosed losses due to defaults, inadequate risk management and excessive inflation has eroded the capital base;
- Government-owned RFIs have acted as administrative agencies in channelizing funds from donors/central banks/government;
- Personal loans for operational efficiency have been absent;
- Due to lack of autonomy, loans have been unprofitably allocated or misused; and
- Monitoring and evaluation by donors/funding agencies have been inadequate.

Paradigm Shift

The obvious failure of conventional development bank model led for search of an alternative approach which would aim at giving poor an access to essential

financial services through the means of promoting financial self-help. The failure has also induced the World Bank and other multi-lateral institutions (including donors) to shift to a systems approach, combining reforms in the financial sector with strategies for the development of a market-oriented policy framework. The requirements for a successful financial sector warrant mobilizing financial resources through savings promotion and creating access to credit (Adams et al. 1984; Bisley and Coate 1991; and Bisley 1994). There is enough evidence to prove that the disadvantaged population groups have a much greater capacity for savings, investment, and loan repayment than assumed previously (Siebel and Shreshtha 1988; Bakar 1996: Klitgaard 1996; Bouman and Hospes 1994; Ghatge 1992; and Kropp and Quinones 1992). Through the promotion of financial self help, their productive capacity can be enhanced and their standard of living improved further. Considerable research has been undertaken on this aspect (Siebel 1989; Quinones 1992; Bennett et al. 1996; Herath, 1994; and Rutherford 1998).

The approach calls for a shift from the old 'directed credit paradigm' (DCP) to the new 'financial market paradigm' (FMP) (Adams 1996). Treating financial markets as apparatus to help allocate resources more efficiently between surplus and deficit units of the economy, viewing rural poor as commercial clients (and not beneficiaries), doing away with the idea of "subsidy," considering savings as a source to provide most of the loanable funds (and not the funds from government and donors), and evaluating performance of financial institutions, are some of the salient features of FMP. Responsibility of the state would be to provide an environment which is conducive to the development of rural financial markets (e.g. facilitating macro economic reforms, enabling RFIs to provide both deposit and lending services, etc.). The emphasis is laid on the following aspects:

- Credit worthiness of clients and relatively low cost of its identification
- Multiple banking services
- Risk management (risk evaluation, client selection, portfolio diversification and management)
- Real rates of interest on loans
- Interest rates deregulation
- Dispensing with the 'subsidy'
- Apply accounting practices that take into account inflation
- Treating the poorest as a commercially bankable proposition
- Emphasis on promotion of rural savings
- Establishing the practice of savings linked credit
- Encouraging group activities

Efficacy of RFIs

Financial performance (cost, spread and profitability) and key outreach indicators considered appropriate for judging the success of RFIs are summarized below (Yaron 1992; Meyer 1985; and Chaves and Gonzalez Vega 1996):

- Clientele
- Staff
- Loan outreach
- Savings outreach
- Terms and conditions of loans
- Action on defaulting borrowers
- Interest on deposits advances
- Loan collections
- Techniques used for selection of borrowers and prompt repayment
- Incentives to staff and borrowers
- Major non-financial services

The term "efficacy" has not been in common use in the context of evaluation of RFIs. Empirical evidences on the performance of RFIs or their 'success and failures' are available today. These can be bifurcated into two categories. First, those which evaluate RFIs from the viewpoint of their outreach, self-sustainability, viability, etc. In short, the strength of RFIs as business and commercial organizations is analyzed (Yaron 1992; and Khandker et al. 1996). The second category constitutes mainly the shape of impact studies on RFIs at the grassroots level. The number of borrower households, operational area of bank branches, villages financed, etc. are covered to measure the impact which is taken as an indicator of the performance (Pitt and Khandker 1996; Rahman 1987; Khandker and Chowdhury 1996; Zellar et al. 1995; and Sharma 1994). For the purpose of this paper "efficacy" has been perceived as a combined function of efficiency and effectiveness of RFI. *Efficiency* of RFIs is perceived as a phenomenon that relates to internal aspects of their working. *Effectiveness* of RFIs is concerned with the aspects and environment external to their functioning. Efficiency in a way is a pre-condition for RFIs to be effective and effectiveness pre-supposes a certain level of efficiency. In other words, RFIs can not be efficient without being effective and *vice versa*. Though the two are inter-related closely, various aspects making RFIs efficient and effective, are clearly distinguishable. The level of the efficiency is determined by various dimensions connected with internal working of RFIs, whereas the effectiveness is decided by a set of dimensions, producing impact of RFIs on the external environment. Performance of the RFIs on these dimensions relating to efficiency and effectiveness together determines *sustainability* of RFIs.

The three levels of this element of sustainability are, viz. (i) RFI level, (ii) individual borrower level, and (iii) societal level, together influence and decide efficacy of RFIs in the long-run.

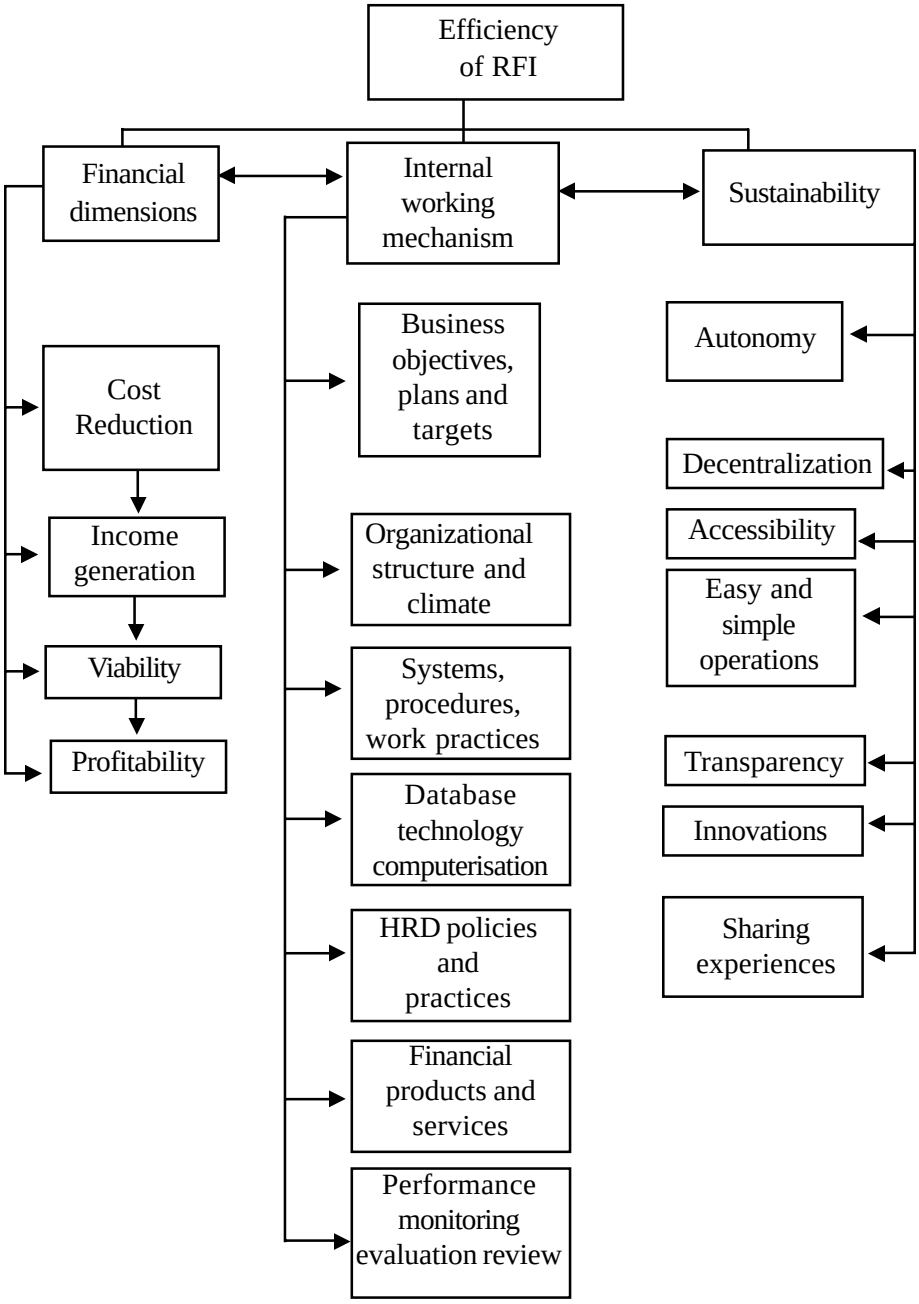
'Efficacy' of RFI could be viewed from two perspectives: (i) the long-term, and (ii) the short-term. Mission and goal of the RFIs reflect on the former, and a short-term perspective is a part of the long-term horizon. Consistency in the short-term objectives and long-term perspectives is absolutely essential for 'efficacy' of an RFI on a sustainable basis.

'Efficacy', again, is a relative term and contains some element of subjectivity, particularly with regard to certain qualitative parameters. The level of 'efficacy' would vary from RFI to RFI, particularly during the short run, depending on the present level of functioning and 'efficacy' positioning. To illustrate, RFI which is operating at near insolvency level would look forward to a situation of coming out of the woods and this would be the test of its 'efficacy', whereas another RFI which is doing reasonably well, would like to consolidate its position and this would spell out its 'efficacy' path. In other words, no standard or prototype formula can be prescribed to measure the 'efficacy' of RFIs.

Efficiency of RFIs

Efficiency of RFIs, as mentioned earlier, is a function of their internal operations. There are certain key areas which influence and determine smooth working of any business organization. Likewise, each key area consists of certain norms on the basis of which performance of an organization/institution is determined. RFIs, obviously, are not an exception to this phenomenon. Certain features which are critical in deciding about the efficiency of RFIs have been depicted in Figure 1. It can be seen that three basic features determining the efficiency of RFIs are: (i) Financial dimension, (ii) internal working mechanism, and (iii) sustainability. Financial dimension which consists of viability and profitability of RFIs (through cost reduction, cost saving and income generation measures), is of paramount significance and has been amply emphasized in the literature (Agrawal et al. 1997; Bernasek and Stanfield 1997; Gurgand et al. 1996; Hashim 1995; and Kaladhar 1996). Since a financially weak RFI cannot remain efficient, particularly in the medium- to long-run, it is imperative that any step taken to improve the internal working mechanism and sustainability must save as costs and generate income. The internal working mechanism (second

Figure 1. Increasing efficiency of RFIs



basic feature depicted in Figure 1) consists of various functions of corporate activity which are equally relevant and applicable to RFIs. These need to be attended properly and reviewed periodically. This would develop sound working mechanism, contributing significantly to the third basic feature of the efficiency, *viz.* sustainability. The sustainability of RFIs, apart from its relationship with internal working mechanism, is visualized as a function of (i) autonomy, (ii) decentralization, (iii) accessibility, (iv) simple operation, (v) transparency, (vi) innovation, and (vii) sharing of experiences. Better the performance of any RFI on these parameters, stronger it would be on the sustainability front. These features of the sustainability are litmus test for the efficiency of a RFI. In other words, financial discipline with an eye on the viability and profitability, and the sustainability through the seven parameters referred above have direct relationship with the different dimensions of the internal working mechanism. An interplay of this relationship is crucial for increasing the efficiency of RFIs.

Effectiveness of RFIs

As mentioned earlier, effectiveness of RFIs relates to their performance in terms of fulfillment of their goals and objectives through proper delineation of defined roles and functions. This effectiveness has several facets and this section proposes to cover some of them.

An important parameter of the effectiveness is fulfillment of the expectations by the RFIs. These expectations emanate from several quarters such as the society at large, policy makers, goals and targets of organization, top management, network of branches, and customers at the grass root level. Quite often these expectations are not spelt out clearly and objectively. Making a comparison between the expectations and performance as an indicator of the effectiveness is difficult. In particular, the expectations of the society and the customers are difficult to spell clearly because of their socio-economic diversity. It is, however, possible to specify them with reference to the national and corporate levels. The idea is that one should identify quantifiable indicators of the effectiveness. Some of these are given below:

Table 1. Measuring the effectiveness of RFIs

National level expectation parameters	RFI (corporate and branch) level parameters
• Reduction in donor's role	• Promotion of coordination with other constituents in the delivery system, mainly development departments of the government and other financial institutions
• Greater reliance on the savings and own funds	• Improvement in access to ancillary services, especially for input supply and marketing
• Greater autonomy/free from political interference	• Improvement in linkages with supportive services such as crop insurance, extension services, credit guarantee facilities, etc.
• Meeting the target/goal in respect of - Outreach - Coverage of weaker sections - Gender aspect - Employment generation - Diversifying into non-farm sector - Arresting exploitation of rural poor	• Improvement in the relationship with non-governmental organizations (NGOs) to facilitate the process of credit delivery and repayment
• Reduction in dependence of clients on informal sources of finance	• Linkages with other institutions experimenting new techniques of production and working for their dissemination
• Forging effective linkage between informal sector and formal sector (wherever and whenever feasible)	• Promotion of savings
• Reduction in regional disparities	• Increase in outreach

Table 1. Contd..

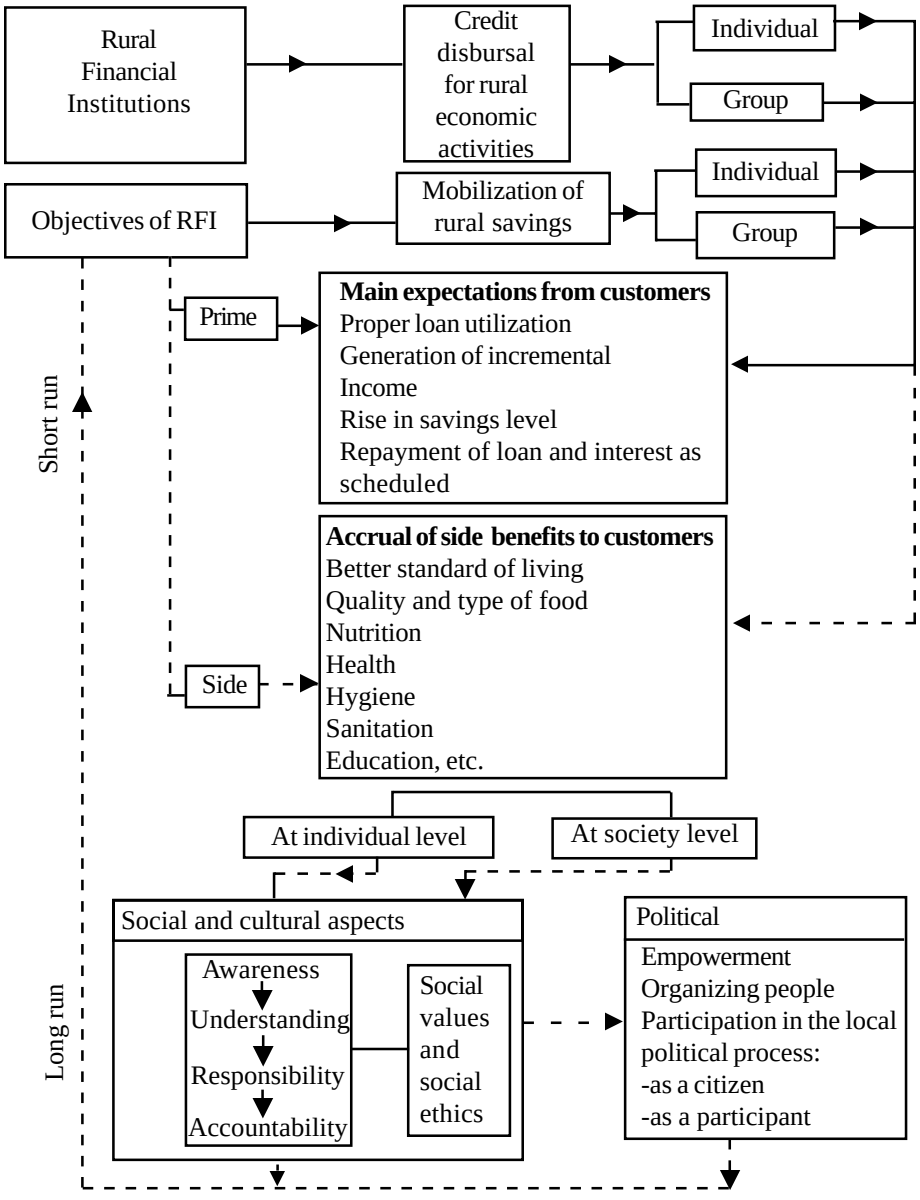
• Promotion of entrepreneurial initiative	• Emphasis on borrowers' training entrepreneurial and skill improvement training
• Increase in productivity levels, in both farm and non-farm sectors	• Mobilization of customers
• Decrease in dependence on 'subsidization to customers'	• Encouragement to people's participation
	• Easier access of banking facilities to the rural masses
	• Reduction in transaction cost to the borrowers (e.g. through formation and linkage of self-help groups)
	• Promotion of innovative financial products
	• Fine-tuning the banking services according to area/location and type of client groups

The parameters of effectiveness listed in Table 1 are indicative in nature, and their application may vary from country to country, RFI to RFI and location specificity of the branches of RFI. As mentioned earlier, the effectiveness is a relative term and unless quantification of these parameters is made, making judgement about the effectiveness would be rather difficult and also hazardous.

Should the effectiveness of RFIs be assessed on the basis of performance on the norms relating to rural banking activities, or should the RFIs go much beyond and make their contributions to the long-term goal of sustainable rural development? As per the present practice, RFIs strive to achieve their goals and objectives through disbursal of credit and mobilization of rural savings through individual and group-level activities. By and large, proper utilization of loans,

generation of incremental income, rise in savings level and timely repayment of loan and interest are the main expectations of RFIs from the customers, which, in turn, meet their primary goals and objectives. In the process, the objective of improving the standard of living of the customers (quality and type of food, nutrition, health, hygiene, sanitation, education, etc.) is also achieved occasionally. The present level of thinking on the effectiveness of RFIs is primarily confined to these aspects only. Perceptible improvements in quality of life (as shown in Figure 2) would, step by step, enhance social and cultural awareness and understanding, which in turn, would inculcate social accountability. These aspects collectively would lead to betterment of social values and greater realization of social ethics. These traits would ultimately result into greater political awareness, empowerment of people for their legitimate rights, and participation in the political process, both as a citizen and a participant. Changes of this nature could be viewed as indications of the 'Sustainable Rural Development'. The question now arises, whether the effectiveness of RFIs should be judged on the basis of their prime responsibility of providing financial services to the rural poor, or could the basis be extended much beyond it to encompass wider aspects of sustainable rural development'? Admittedly, RFIs as a constituent of formal financial system, should facilitate and promote the savings and the productive endeavor of their target customers through the process of financial intermediation and these should not have a jurisdiction over social, cultural and political dimensions of the sustainable rural development. At the same time, the RFIs should channelize and streamline their main activities in such a manner that these contribute significantly to the sustainable rural development. In this context, other constituents in the delivery system, viz. various government departments responsible for promotion of economic and social welfare, NGOs, etc. have a pivotal role to play, and a close collaboration between them is necessary. This is not something unfamiliar to RFIs as they have to develop and maintain linkages with government departments concerned with economic activities in rural areas, particularly to ensure complementarity between credit and non-credit inputs. Such coordination needs to be extended vigorously and systematically to a wider network of other government departments working on the social aspects. There are examples from the developing nations where social welfare and economic development activities at the grass roots level were combined into an operational strategy. As an illustration, four such models and their precise focus is discussed in the next section.

Figure 2. Effectiveness of RFI



Note: Arrows with solid line indicate current status, while those with dotted line indicate the desirable situation.

Models from the Developing Nations

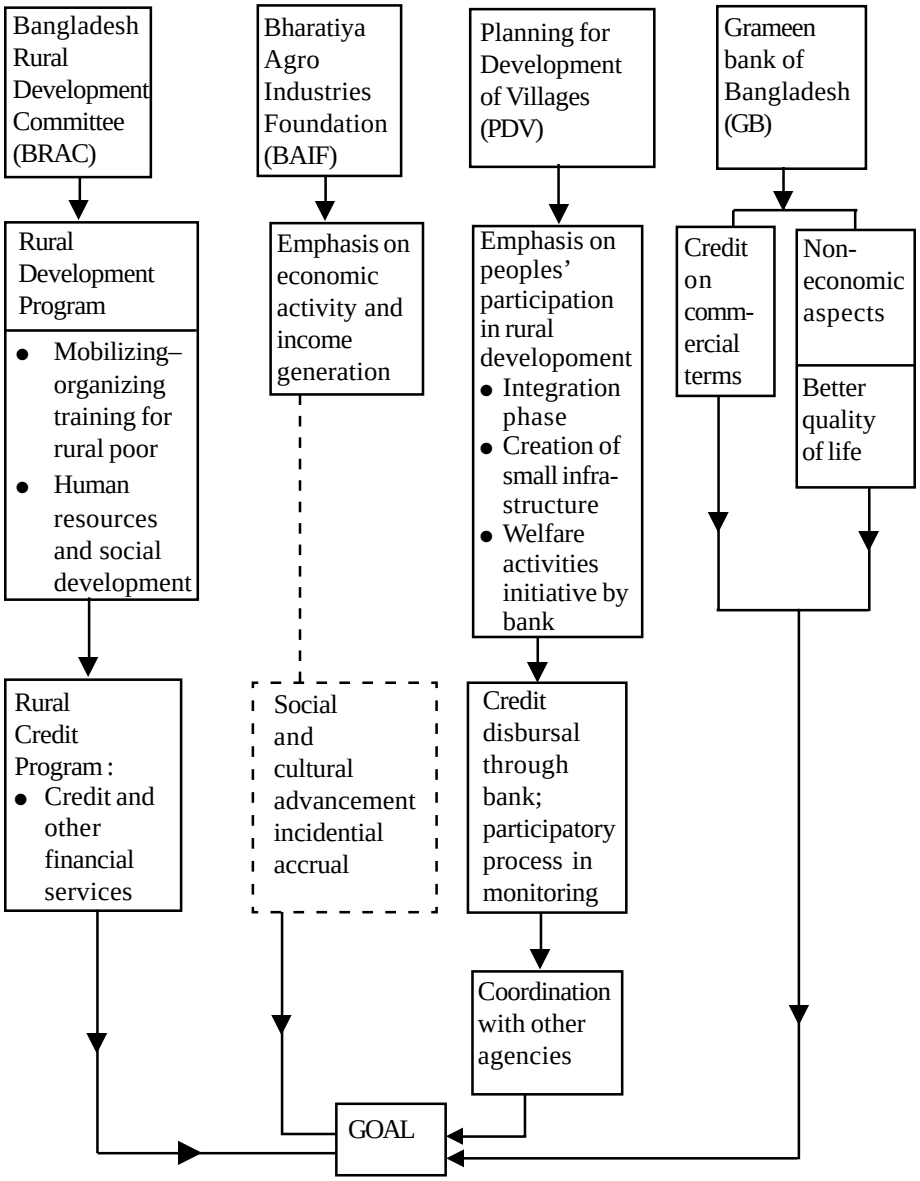
Four models — two each from Bangladesh and India, are discussed in this section (Figure 3), which depict different approaches for combining credit/ financial services with social welfare. The Bangladesh Rural Advancement Committee (BRAC) has placed emphasis on the social aspects of rural development before embarking upon credit/financial services. The Grameen Bank of Bangladesh has given simultaneous attention to broader aspects of rural development and 'credit' and 'savings'. The Bhartiya Agro-Industries Foundation (BAIF) has focused on economic upliftment of rural poor through provisions of credit. The Planning for Development of Villages (PDV) places attention on peoples' participation in rural development and linking it to credit activity. A brief description on the focus of these four institutions is given below.

Bangladesh Rural Advancement Committee (BRAC)

Established in 1972, BRAC has its focus on integrated community development programme. Strategy adopted by BRAC comprise four major activities: (i) Rural Development Program (RDP) for forming village organizations for the poor and raising general awareness, credit provision, health, education and other social interventions through them; (ii) *Rural Credit Project (RCP)* to evolve a self-sustaining bank for village organizations which are four year old; (iii) Health Program for women and children with a focus on preventive healthcare measures and assistance to government rural health system; and (iv) *Non-formal Primary Education* for children who have never gone to school (Lovell 1992).

The RDP assists the poor to reduce their economic dependency on state and avoid exploitative forces by improving their health, education, sanitation and income earning potential. It is implemented for four years, successfully, before an RCP is taken up. The BRAC is fully aware that poverty cannot be alleviated unless the poor becomes economically self-sustainable. Reaching the rural poor, particularly rural women, through RDP and RCP is one of the major achievements of BRAC. In BRAC, the poor sees a source of their empowerment, a plan to receive credit and an accessible bank for savings. Therefore, viability of this organization is more tenuous than any other organization, which makes available

Figure 3. Models relevant to efficacy of RFIs



Note: Arrows with solid line indicate current status, while those with dotted line indicate the desirable situation.

only credit. Loan recovery rate is consistently above 90 per cent. It is estimated that RDP and RCP together would attain the sustainability by the year 2010 (Khandker et al. 1996). However, it may be difficult to achieve full self-sustainability in the short run.

The Grameen Bank

A widely discussed RFI in the world today is the *Grameen Bank of Bangladesh* which was started as an experiment, and was initially financed by one of the nationalized commercial banks. With prime motive of taking banking to the common man, the Bank concentrated on financing the lowest strata of the society, mainly through creation of opportunities for self-employment. It is a classic example of introducing and institutionalizing a non-traditional banking system in rural areas to provide credit facilities under special terms and conditions (e.g. loans extended without collateral) (Yaron 1992). Emphasis was on the group concept. Focus on the poor women as a target group, strong central management, well-defined organizational structure, extensive staff training, staff-dedication, borrowers' education, transparency in loan administration, intense banker-borrower relationship, compulsory element of 'savings' by customers, close monitoring and supervision, non-compromization on commercial banking, etc. have been some of the factors responsible for the success of the Grameen Bank. Social development is an integral part of the credit programs (most of the sixteen principles focus on social objectives of health, education, etc.). This institution has successfully demonstrated that while credit is the primary need, development work cannot be artificially separated into economic and social activities. The linkage between development work and social reforms is evident from the high rate of savings and use of those savings for collective welfare and social security schemes.

Bhartiya Agro-Industries Foundation (BAIF)

Working in tribal areas of western India, BAIF's primary emphasis is on improving the economic condition of the poor and upgrading the quality of their life. BAIF's basic philosophy is, "Once the poor become green (economically better-off), other things will automatically follow" (Bhatt 1989). Therefore, it

does not get involved with other issues like conscientization and mobilization against corruption, oppression, injustice, etc.

Salient features of the BAIF's approach are: Identification of main and supplementary economic activities, planning and providing backward and forward linkages, providing or facilitating social development activity, and facilitating flow of benefits of other schemes (Khankhoje and Mankidy 1997). In order to implement this approach, BAIF develops strategies to harmonize land, water, cattle, trees and other natural resources on one hand, and the rural poor on the other. Application of science and technology and efficient management of economic activities undertaken for the rural poor are noteworthy features of BAIF's functioning.

Planning for Development of Villages

The National Institute of Bank Management (NIBM) initiated this experiment in 1984 at the selected rural branches of commercial banks. The project aimed at increasing the contribution of financial services towards poverty alleviation and rural development. The banks' field officers organized people through interaction with the village community. Initially, developing contacts with the key persons in villages, participation in their social functions and events, and interaction on the issues of their interest were taken up. Organizing meetings of all the villagers (village development assembly, i.e. VDA) to discuss their problems, prospects and process of development and importance of peoples' participation therein were also attempted. This was followed by formation of the Village Development Councils (VDCs) consisting of 10-12 members representing the village community and capable of implementing the Peoples' Action Plan (PAP). Preparation of PAP by VDA, covering the assessment of credit needs and social and other support services, ensured peoples' participation under the project. The members of VDC were provided training on credit planning, credit discipline and support/social services. Implementation of PAP by VDC involved three aspects: (i) micro credit (identification of prospective borrowers, recommending them to bank after appraisal, follow up for sanction of loans and its utilization, and ensuring timely repayment of loans); (ii) support services for economic activities (follow up with concerned government departments, arranging for guidance camps on rural activities, construction of small check dams on streams/

riverlets, tree plantations, etc.); and (iii) social services/infrastructure (awareness camps on safe drinking water, nutrition, child education, healthcare services, organizing social functions, construction of social meeting place, approach roads, drainage system, etc.). Benefits accruing from this approach in terms of 'credit plus' were:

(a) Externalizing loan appraisal, borrower's identification, supervision over credit, repayment responsibility leading to reduction in transaction cost of the financing bank;

(b) Improvizing profitability through higher business with increased recycling of funds, lower risks and long-term relationship with clients; and

(c) Developing confidence among the banks about the rural poor as customers.

Common features of the models

There are certain common features that emerged from these four models. These are significant from the viewpoint of efficacy of RFI, and are listed below:

- Emphasis on c*redit plus*- quality of rural life
- Focus on women as a client group
- Emphasis on savings
- Close contact and intense interaction with villagers
- Emphasis on formation of groups of the rural poor
- High degree of transparency in operations
- Close monitoring of loan utilization- strict control and supervision
- Excellent loan repayment performance
- Heavy stress on training of staff and education of borrowers
- High motivation level of the staff
- Emphasis on high level of rigor and discipline on the part of villagers
- Provision of standby funding arrangements for emergent needs of the rural poor.

Summary

The role and functions of RFIs are quite crucial in the context of rural development in the third world countries. Their ability to serve the rural

communities, to a large extent, depends on their efficacy, which is a combined function of their efficiency and effectiveness. The efficiency relates to internal functioning of RFIs with constant eye on the financial viability and sustainability. The effectiveness of RFIs could be viewed in terms of their impact on the external environment. Expectations (of nation, society, customers, RFI) from RFIs and the extent of their fulfillment could be one of the yardsticks for ascertaining the efficacy of RFIs. Studies conducted on this aspect indicate the need of attention to viability and sustainability of RFIs and their impact on customers. Although RFIs, as constituents of formal financial system, do not have any jurisdiction over social, cultural and political dimensions of sustainable rural development, these should channelize their main activities in such a manner as to contribute significantly to the overall objective of sustainable rural development. There are examples from the developing countries indicating that this could be possible through integration of economic and social dimensions into an operational strategy. Keeping long-term thinking along these lines is desirable to improve efficacy of RFIs.

References

Adams, D. W., H. M. Douglous and J. D. Von Pischke. 1984. *Undermining rural development with cheap credit.* Boulder, Colorado: Westview Press.

Adams, D. W. 1996. Colliding paradigm. In *Rural financial markets: research in progress.* No. 7 Rome: FAO.

Agrawal, K. P., V. Panchmukhi and K. J. S. Satyasai. 1997. Gearing rural credit for twentyfirst century. *Economic and Political Weekly* 32(42): 2717-2728.

Bakar, Md. Abu. 1996. Experiences of some special credit programs in Bangladesh: targetting women, *Bank Parikrama* 23(3&4): 41-64.

Bennett, Lynn, M. Goldberg and P. Hunte. 1996. Ownership and sustainability: lessons on group-based financial services from south Asia. *Journal of International Development* 8(2): 271-288.

Bernasek, A. and J. R. Stanfield. 1997. The Grameen Bank as progressive institutional adjustment. *Journal of Economic Issues* 31(2): 359-366.

Bhatt, Anil. 1989. *Rehabilitation approach to rural poor.* Pune: National Institute of Bank Management (Mimeo).

Bilsley, Tomothy J. 1994. How do market failures justify market interventions in rural credit markets? *The World Bank Research Observer* 9(1): 27-47.

Bisley, Tomothy J. and Stephen Coate. 1991. *Group lending repayment incentives and social collateral.* RPDS Discussion Paper 152. Woodrow Wilson School, Princeton University, Princeton, N.J. (Processed).

BMZ. 1997. Policy paper on financial systems development. *Asia Pacific Rural Finance* (special issue): pp. 13-23.

Bouman, F. and O. Hospes. (eds). 1994. *The reconstruction of financial landscape in developing countries.* Boulder: Westview Press.

Chaves, Rodrigo and Claudio Gonzalez-Vega. 1996. *The design of successful rural financial intermediaries: evidence from Indonesia.* Economics and Social Occasional Paper No. 2069. Ohio State University.

FAO. 1991. *Fifth technical consultation on the scheme for agricultural credit development.* Rome: FAO.

Ghatge, P. 1992. *Informal finance: some findings from Asia.* Manila: Oxford University Press.

Gurgand, Marc, Glenn Pederson and Jacob Yaron. 1996. Rural financial institutions in Sub-Saharan Africa: their outreach and sustainability. *Savings and Development* 20(2): 133-169.

Hashim, Ibrahim Bin. 1995. Reinventing rural banking. *National Bank News Review* 11(2): 30-39.

Herath, Ganani. 1994. Rural credit markets and institutional reform in developing countries: potentials and problems. *Savings and Development* 18(2): 169-191.

Kaladhar, K. 1996. Redesigning financial services for rural poor: retooling rural financial institutions? *Economic and Political Weekly* 31(39): A117-122.

Khandker, Shahidur R. and H. Chowdhury Osman. 1996. *Targetted credit programs and rural poverty in Bangladesh*. Discussion Paper 336. Washington, D.C.: The World Bank.

Khandker, Shahidur R. and Khalily Baqui. 1996. *The Bangladesh rural advancement committee's credit programs- performance and sustainability.* Discussion Paper 324. Washington, D.C.: The World Bank.

Khankhoje, D. P. and J. Mankidy. 1997. *Impact of leadership on effectiveness of non-governmental organization: an assessment of four projects in India.* Paper presented at 26th Annual Conference of ARNOVA, Indiana University, Indianapolis, December 4-6, 1997.

Klitgaard, Robert. 1996. Improving incentives in rural financial institutions. *International Journal of Development Banking* 14(2): 59-65.

Kropp, E. and B. R. Quinones (eds). 1992. *Financial system development in support of peoples' economy.* Bangkok: APRACA.

Lovell, C. H. 1992. *Breaking the cycle of poverty: the BRAC strategy.* West Hartford, CO: Kumarian Press.

Meyer, Richard L. 1985. *Deposit mobilization for rural lending*. Third Technical Consultation on the Scheme for Agricultural Credit Development. Rome: FAO.

Pitt, Mark M. and R. Shahidur Khandker. 1996. *Household and intra-household impact of the Grameen Bank and similar targetted programs in Bangladesh.* Discussion Paper 320. Washington, D.C.: The World Bank.

Quinones, B. R. (ed). 1992. *Group lending approach to rural finance in Asian countries*. Bangkok: APRACA.

Rahman, Atiur. 1987. *Impact of Grameen Bank intervention on the rural power structure.* Dhaka: Bangladesh Institute of Development Studies.

Rutherford, Stuart. 1988. The saving of the poor: improved financial services in Bangladesh. *Journal of International Development* 10(2): 1-15.

Seibel, H. D. 1989. Finance with the poor by the poor, for the poor: financial technologies for the informal sector with case studies from Indonesia. *Social Strategies* 3(2): 3-48.

Seibel, Hans Dieter and Bishnu P. Shreshtha. 1988. Dhikuti: the small businessman's informal self-help bank in Nepal. *Savings and Development* 12(2): 183-200.

Sharma, M. 1994. *The impact of rural financial institutions on subsistence consumption: an empirical study based on household data from Nepal.* Washington D.C.: International Food Policy Research Institute.

Yaron, Jacob. 1992. *Successful rural finance institutions.* Discussion Paper 150. Washington, D.C.: The World Bank.

Zeller, M., A. Ahmed and M. Sharma. 1995. *Credit for the rural poor: country case of Bangladesh.* Washington, D.C.: International Food Policy Research Institute.

16

Microfinance in India: Progress and Perspectives

K. J. S. Satyasai[1]

Introduction

Microfinance is the provision of a broad range of financial services such as deposits, loans, payment services, money transfers and insurance to poor and low income households and their micro-enterprises. According to the Task Force on 'Supportive Policy and Regulatory Framework for Microfinance' (NABARD 1999), microfinance is "provision of thrift, credit and other financial services and products of very small amounts to the poor in rural, semi-urban or urban areas for enabling them to raise their income levels and improve living standards." Thus, microfinance is broadly synonymous to rural finance as practised in India. Except that, of late, semi-formal institutions such as non-governmental organizations (NGOs) and non-banking financial companies (NBFCs) have entered the rural credit business, bringing in a new (rather renewed) approach of lending to groups of people popularly known as Self-Help Groups (SHGs). It is this type of lending involving SHGs which is referred to as microfinance in the modern parlance. This paper deals with the microfinance in this connotation. The need, evolution, spread, impact on clients, future prospects and potential of microfinance are discussed in this paper.

Need

The traditional rural credit system in India has not succeeded well, notwithstanding its long existence and numerous innovations/interventions, in

[1] The views expressed in the paper are those of the author in his individual capacity and other usual disclaimers apply. Suggestions received from Dr A. S. Patil, NABARD, Mumbai, and discussant Dr J. P. Mishra and other participants at the Seminar are gratefully acknowledged.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

reaching the needy sections of the society. Even by the year 1991, as revealed by All India Debt and Investment Survey (GOI 1998), dependence of rural households on informal sources of finance for cash debt was to the tune of 37.4 per cent. Ironically, the level of dependence on informal agencies continued at the same level between 1981-91 — a decade that has seen impressive expansion of network of credit institutions. Further, most of the credit institutions are in perpetual loss or inconsequential profits so that their sustainability in the rural credit business is at stake. The casualty has been the small borrower as the statistics on small borrowal accounts of Scheduled Commercial Banks (SCBs) reveal[2]. Thus, there seems to be a big vacuum so far as flow of credit to small borrowers comprising marginal and small farmers, as also artisans and village craftsmen, are concerned. Women, agricultural laborers and oral tenants have already been excluded from the beginning from the purview of institutional credit system, as they cannot offer the necessary collateral the banks demand for extending the credit. These disadvantaged sections are either excluded or exploited through usury by non-institutional agencies such as agricultural moneylenders, landlords, traders/commission agents, friends/relatives, etc. that have been operating in the rural areas since long. Thus, there are certain categories of rural inhabitants having only aspirations to prosper without the necessary access to credit. In fact, an efficient and viable credit delivery system catering to a large section of the poor is still a distant dream. This situation has led to the introduction of SHGs in the country by some NGOs in the mid-1980s. What started as an experiment has gained momentum in recent years. The movement received institutional back up with the linking of SHGs with banks. And SHG-Bank linkage has become synonymous with microfinance.

[2] The number of small borrowal accounts (SBA) has been falling over time. According to Banking Statistical Returns of RBI, proportion of small borrowal accounts with outstanding of Rs 25,000 or less (of late, the accounts with outstanding of up to Rs 2 lakh are classified as SBA) declined from 95 per cent as on 31 March 1990 to 82 per cent by the end of March 1999. The proportion of amount outstanding declined from 23 per cent to 10 per cent during the same period. During 1997-99, the number of SBA under agriculture declined from Rs 213.14 lakh to Rs 177.94 lakh. The RBI survey has revealed that (i) 84 per cent of number and 75 per cent of amount of SBA accounted by rural and semi-urban areas, and (ii) agriculture and allied activities had a share of about 40 per cent of SBA both in number and amount.

Evolution

Way back in 1987, National Bank for Agriculture and Rural Development (NABARD) provided Rs 10 lakh as grant assistance to Mysore Resettlement and Development Agency (MYRADA) to be used as seed money for its Credit Management Groups (CMGs). This successful experiment was the precursor to the launching of the pilot project in 1992 for linking 500 SHGs with banks (NABARD 1995). In February 1992, the project was made operational throughout the country. Thus, NABARD's initiative brought in an additional constituent in the rural financial sector (Nair 2000), i.e. NGOs, voluntary organizations and NBFCs who have been promoting the self-help concept.

SHGs are characterized by their small size, usually limited to less than 20 members per group. Homogeneity in terms of socio-economic conditions and levels of living form the basis for the group formation. Periodic meetings, on a weekly or fortnightly basis, inculcating the habit of thrift, generating a common fund through contributing regular saving from the members, lending to its members, availing credit support from financial institutions with collateral substitute, etc., are some of the salient features of the group functioning. The process of group formation takes six months to one year and the management of these groups vests with the representatives selected from the group members.

Broadly the four different models of SHG-Bank linkage have emerged over the past few years and are as under:

Model I: Bank-SHG-members (without NGO intervention)

In this model, the bank itself acts as an institution to promote SHGs. It takes initiatives in forming the groups, nurturing them over a period of time, opening their savings bank accounts and then providing credit to them after satisfying itself about their maturity to absorb credit.

Model II: Bank-SHG-facilitating agency-members

In this model, groups are formed by facilitating agencies like NGOs, government agencies or other community-based organizations. The groups are nurtured and trained by these agencies. The bank opens savings bank accounts and then provides credit directly to the SHGs after observing their operations

and maturity to absorb credit. While the bank provides loans to the groups directly, the facilitating agencies continue their interactions with the SHGs. Most linkage experiences begin with this model with NGOs or other agencies playing the role of facilitators. In a variation of this model, even SHGs act as non-financial intermediaries.

Model III: Bank-NGO(as financial intermediary)/ MFI-SHG- members

Due to various reasons, banks in some areas are not in a position to even finance SHGs promoted and nurtured by other agencies. In such cases, the NGOs act as both facilitators and micro-finance intermediaries (MFIs). Firstly, they promote the groups, nurture and train them and then approach banks for bulk loans for on-lending to the SHGs. Under this model, NGOs have also been found to federate the SHGs and gradually equip the SHG federations to take on this role. Here also, in a variant of this model, SHGs themselves act as financial intermediaries between banks and individual members.

Model IV: Cooperative-SHG-members

In addition to the above models, a fourth model is suggested wherein co-operatives at primary level (PACS) can lend to SHGs which would further lend to members (Bandyopadhyay n.d.). The basic premise is that SHGs are the abstract forms of the co-operative principles and ideas, i.e. they are co-operatives within co-operatives. This model is basically implied in the Model I. One practical problem that arises in case of linking SHGs with co-operatives is that there could be discrimination between the members of PACS and SHGs in the matter of share capital contribution and collateral security requirements.

Progress of the Program

The program registered a significant growth in terms of both coverage and outreach of credit to the poor. Beginning with a modest number of 255 SHGs in 1992/93, a total of 94,645 SHGs were refinanced and linked with banks by March 2000. This number jumped to 213,213 by March 2001. This has brought around an estimated 4.5 million families within the fold of the formal banking

sector. Banks have claimed refinance from the National Bank against financing of 140,198 groups (including 21,630 groups refinanced more than once) during 2000/01. The cumulative disbursement of bank loans was Rs 4,808 million with refinance assistance of Rs 4,007 million (Table 1). By the end of March 2001, the outreach of the program is extended to 27 states and union territories (UTs) covering 382 districts with the participation of 750 NGOs, 41 commercial bank branches, 166 regional rural banks (RRBs) and 111 co-operatives. The size of the loan per SHG is much lower. However, the target households to be covered by SHGs also have very low credit needs mostly for consumption needs.

Table 1. Progress in SHG linkage programme

(Rs million)

	Cumulative up to the year			During the year			Bank
Year	SHGs linked[#] (No.)	Bank loan	Refinance assistance (RA)	SHGs linked[#] (No.)	Bank loan	Refin-ance assistance	loan/SHG (Rs)
1992/93	255	2.9	2.7	255	2.9	2.7	11,373
1993/94	620	6.5	4.6	365	3.6	1.9	9,863
1994/95	2,122	24.4	23	1,502	17.9	18.4	11,917
1995/96	4,757	60.6	51.6	2,635	36.2	28.6	13,738
1996/97	8,598	118.4	106.5	3,841	57.8	54.9	15,048
1997/98	14,317	237.6	213.9	5,719	119.2	107.4	20,843
1998/99	32,995	570.7	520.6	18,678	333.1	306.7	17,834
1999/00	94,645	1,929.7	1,501.3	61,650	1359.0	980.7	22,044
2000/01	213,213	4,808.7	4,007.2	118,568	2,879.0	2,505.9	20,535[@]
Annual compound growth rate (per cent)				114.4	139.7	142.0	10.5

[@] Computed taking into account 21,630 SHGs formed earlier but receiving repeat refinance during the current year. Such adjustment was not needed for earlier years, as the magnitude of repeat refinance was not significant.

[#] No. of SHGs indicated pertains to those refinance linked in all these tables.

Source: NABARD (2001).

Nevertheless, the coverage is limited mostly to the southern region where around 73 per cent concentration of SHGs is found (Table 2). The central (9 per cent), eastern (8 per cent) and western (6 per cent) regions rank next to

Table 2. Year-wise and region-wise share of cumulative number of SHGs linked with the banks

(per cent)

Region	March 1997	March 1998	March 1999	March 2000	March 2001
Northern	4	3	3	2	3
North-Eastern	<1	<1	<1	<1	<1
Western	7	10	10	8	6
Eastern	13	13	10	9	8
Central	12	11	11	13	9
Southern	63	62	65	67	73

Source: NABARD (2001).

the south, in the same order, in respect of their share in the groups linked with the banks.

Inter-state differences also manifest in a significant way (Table 3). In the southern region, Andhra Pradesh dominates the scene with the highest share in linkage, while it is less than 6 per cent in Kerala. Likewise, Maharashtra in the western region, Uttar Pradesh in the central region, and Orissa in the eastern region dominate, with the highest proportion of SHGs linked in the region.

State-wise pattern of SHGs linked per lakh of rural households shows that the density of SHGs is more in states with higher level of infrastructure (correlation coefficient being 0.41). A priori, one may expect that SHG density would be positively correlated with the number of families below poverty line. Data, however, show that there is no correlation (0.09) between these two. Main constraint faced in spreading SHGs is non-availability of effective NGOs to promote SHGs. State patronage in promoting SHGs in states like Andhra Pradesh, is also missing in many states.

Among the various models of linkage, the one involving NGO as a facilitator is the dominant model accounting for 76 per cent of SHGs and 77 per cent of the bank loan. Next is the model with NGO as financial intermediary. Direct linkage to banks without facilitator and intervention of NGO is limited to only 13 per cent of the groups (Table 4). It is interesting to observe that SHGs under Model I account for 15 per cent of the bank loan. At the same time, SHGs

Table 3. State-wise particulars about number of SHGs linked, banking and other infrastructure and extent of poverty

Region/state	No. of SHGs linked, March 2000	Share (per - cent)	Bank loan (Rs million) March 2000	Share (per- cent)	Bank loan/ SHG (Rs 000) March 2000	Rank	SHGs/ one lakh rural households March 2000	Rank	Index of infra- structure (All India =100) 1999/00	Rank	Bank branches/ lakh population March 2000	Rank	Per cent BPL families in total 1999	Rank
Himachal Pradesh	402	0.4	12.2	0.6	30	8	47	14	114	7	13.1	2	27.6	21
Rajasthan	1236	1.3	45.6	2.4	37	7	22	19	87	19	6.3	15	31	20
Haryana	121	0.1	6.6	0.3	54	3	6	22	133	6	7.5	12	24.3	23
Punjab	20	0	1.1	0.1	53	4	1	28	172	2	10.7	3	40	13
Jammu & Kashmir	55	0.1	0.6	0	10	23	6	23	92	17	8.7	7	25.3	22
Assam	60	0.1	0.7	0	11	21	2	25	104	12	5.1	22	60	7
Meghalaya	118	0.1	2.9	0.1	24	12	44	15	78	24	9.1	6	65.5	6
Tripura	5	0	0.3	0	64	1	1	27	93	16	5.2	21	73.7	2
Sikkim	1	0	0	0	10	23	1	26	83	22	8.5	8	80.8	1
Manipur	5	0	0.2	0	40	6	2	24	84	21	3.9	24	67.5	3
Gujarat	2843	3	42.1	2.2	15	19	59	8	105	11	7.7	11	35.5	16
Maharashtra	4959	5.2	93	4.8	19	16	54	12	107	9	6.8	13	35.1	17
Goa	19	0	0.9	0	49	5	14	20	172	3	25.6	1	17	24
Orissa	4039	4.3	34.4	1.8	9	27	78	7	101	15	6.1	17	65.5	5
Bihar	1353	1.4	17.9	0.9	13	20	11	21	91	18	5	23	49.6	9
West Bengal	3249	3.4	25.8	1.3	8	28	36	16	102	14	5.5	19	44.4	11
UT of A&N Islands	23	0	0.7	0	29	9	54	11	78	23	8	9	43.9	12
Madhya Pradesh	2266	2.4	41	2.1	18	17	25	18	87	20	5.7	18	55.8	8
Uttar Pradesh	10556	11.2	92.2	4.8	9	26	59	9	112	8	5.4	20	36.9	15
Andhra Pradesh	37966	40.1	865.8	44.9	23	14	368	1	104	13	6.5	14	39.9	14
Karnataka	8759	9.3	223	11.6	25	11	158	4	106	10	9.1	5	34	18
Kerala	4826	5.1	95.5	5	20	15	118	6	162	4	10.2	4	32	19
Tamil Nadu	11596	12.3	317	16.4	27	10	137	5	146	5	7.8	10	66.3	4
UT of Pondicherry	168	0.2	10.5	0.5	63	2	276	2	252	1	6.2	16	47.4	10
Grand Total	94645	100	1929.8	100	20		85		100		6.7		44.3	
Standard deviation					17.74		91.18		40.38		4.30		17.03	
Coefficient of variation (per cent)				88.69		107.27		40.50		64.17		38.43		
Correlation coefficient									0.41		-0.09		-0.09	

Source: NABARD (2000) and CMIE (2000).

under Model III account for only 8 per cent of the bank loan. The average loan per SHG under Model I and Model II was Rs 22,600 and Rs 20,867 respectively, whereas only Rs 15,243 was disbursed under Model III. This trend may be because of the insistence of the banks on higher savings due to security considerations.

Table 4. Model-wise linkage of SHGs as on March 2001

Model	Number of SHGs	Bank loan	
		Total loan (Rs million)	Loan per SHG (Rs)
Direct (Model I)	30,739	694.71 (13)	22,600 (15)
NGO as facilitator (Model II)	1,78,248	3,719.96 (76)	20,867 (77)
NGO as intermediary (Model III)	25,856	394.12 (11)	15,243 (8)
Total	2,34,843	4,808.79 (100)	20,535 (100)

Note: Figures in parentheses indicate percentage to the total.

Source: NABARD (2001).

Table 5. Distribution of SHGs as per participating banks as on March 2001

Bank Category	Number of SHGs	Bank loan	
		Total loan (Rs million)	Loan per SHG (Rs)
Commercial banks	1,24,246 (53)	2,958.69 (62)	23,813
RRBs	97,824 (42)	1,599.57 (33)	16,352
Co-operatives	12,773 (5)	250.53 (5)	19,614
Total	2,34,843 (100)	4,808.79 (100)	20,535

Note: Figures in parentheses indicate percentage to the total.

Source: NABARD (2001).

The share of commercial banks, RRBs and co-operatives in total number of SHGs linked was 53 per cent, 42 per cent and 5 per cent, respectively (Table 5). Among commercial banks, the Andhra Bank linked the highest number of SHGs (17,358) followed by the State Bank of India (17,105) and the State Bank of Hyderabad (6,273). The other banks having a significant share in the program were Indian Overseas Bank, Indian Bank, Canara Bank, Bank of India, Bank of Baroda, Syndicate bank, Union Bank of India, Vysya Bank, Bank of Madura, Karnataka Bank, Global Trust Bank, and South Indian Bank. Bank of Madura also had the credit of taking on the role of the promoting institutions in a big way. Among RRBs, Sri Visakha Grameen Bank of Andhra Pradesh linked 7,339 groups followed by Nagarjuna Grameen Bank (4,802) in Andhra Pradesh, Pandiyan Grameen Bank in Tamil Nadu (4,155), and Manjira Grameena Bank (2,189) in Andhra Pradesh. Among co-operatives, District Cooperative Banks (DCCBs) in Hooghly (West Bengal), Bidar (Karnataka) and Krishna DCCB (Andhra Pradesh) have been the leaders in credit linkage. In many states, suitable amendments to the Cooperative Societies Act have been incorporated enabling SHGs to become members of PACS and avail of loans.

Impact of Microfinance

Impact of microfinance can be visualized at two levels: (i) the living standards of the clients (both social and economic aspects), and (ii) the cost of transaction for participant credit agency as well as borrowers.

Impact on living standards

A study conducted by NABARD during 1997 in Tamil Nadu revealed that the SHG-Bank Linkage Program was successful in triggering off the development of the rural poor, though on a modest scale. This was achieved by shifting the loaning pattern from consumption towards production purposes, leading to generation of income, savings and also empowerment of women (Puhazhendhi 2000). Another study from Andhra Pradesh concluded that the SHGs showed positive impact on member households in respect of building self-confidence, economic and social development, skill formation and social empowerment of members compared to other programs. The study further concluded that there

is a strong case for giving a 'big push' to the linkage program in view of its superiority over other methods of reaching the poor in many aspects (Rao 2000). The most outstanding impact of the linkage program is the socio-economic empowerment of the poor, particularly the rural women (Nanda 1998).

A recent impact evaluation study (Puhazhendhi and Satyasai 2000) has compared the socio-economic conditions of 560 member households from 223 SHGs located in 11 states before and after (spanning over an average of 3-year period) their association with these groups. A positive impact has been observed on economic as well as social aspects of the members such as assets, income, access to credit, savings, self-confidence and behavioral patterns. The average value of assets per household, including livestock and consumer durables, etc. has registered an increase of 72.3 per cent from the pre-to post-SHG situation. About 58.6 per cent of the sample households have registered an increase in assets. There has been three-fold increase, from Rs 460 to Rs 1,444, in savings per household. The average borrowings per year per household has doubled from Rs 4,282 during the pre-SHG situation to Rs 8,341 during the post-SHG situation. Almost 50 per cent of the borrowing in the pre-SHG period was for consumption, while after group formation, the borrowing for consumption was only about 25 per cent with as much as 70 per cent going for income generation purposes. The annual interest rates converged to 12-24 per cent. The overall repayment percentage improved from 84 to 94 per cent between the two periods with an impressive improvement in the repayment of loans from banks, by 29 percentage points. The average net income per household recorded about 33 per cent increase. The involvement in the group significantly contributed in improving the self-confidence of the members. The feeling of self-worth and communication with others improved after association with the SHGs. The members have become relatively more assertive in confronting with social evils and problem situations. As a result, perhaps, there was a fall in the incidence of family violence. In terms of various parameters for which impact was assessed, the linkage models involving NGO as either facilitator or financial intermediary, performed better compared to the direct model. The groups in existence for 3 years or more recorded higher impact.

The composite index of different social and economic parameters, constructed á *la* Singh and Chand (2000), rose from 40 to 65 between the pre- and post-SHG situation, recording an increase of 25 percentage points (Table 6). The index of economic indicators has increased from 40 to 52 and

that of social indicators from 40 to 74 during the same period. Thus, the impact of microfinance was relatively more pronounced on the social aspects than on the economic aspects. As the age of a group increased, the increment in the index also increased.

Table 6. Distribution of households according to the index of standard of living

(per cent)

Index range	Social Index		Economic Index		Overall Index	
	Pre-SHG	Post-SHG	Pre-SHG	Post-SHG	Pre-SHG	Post-SHG
Upto 20	19.5	1.0	17.8	3.5	8.5	0.2
20 – 40	34.7	3.9	41.9	30.1	46.1	5.2
40 – 60	28.5	18.1	29.2	34.4	35.1	26.6
60 – 80	13.1	29.9	9.3	24.3	9.3	53.9
80 – 100	4.2	47.2	1.9	7.7	1.0	14.1
Average value of the index	40	74	40	52	40	65

Impact on transaction costs of the credit agency/mFI and borrowers

The existing Rural Financial Institutions (RFIs) are shying away from financing small borrowers on account of high transaction and risk costs in dealing with large number of small accounts. It is often recommended that giving bulk loans to SHGs/NGOs acting as financial intermediaries for on-lending to small borrowers would reduce transaction as well as risk costs because of decrease in the number of accounts. Puhazhendhi (1995, 2000), Srinivasan (2000), Rao (2000), Jindal (2000), Gain et al. (2000) and Malhotra and Chauhan (2000) have estimated such transaction costs under different scenarios. The general conclusion that follows is that there is reduction in the transaction cost to the tune of Rs 100 per account for the bank, resulting in improvement in the profitability of the bank. These studies, however, suffer from certain methodological and other problems. Firstly, these studies implicitly assume the ultimate objective in rural banking is to reduce the transaction costs of the lender, and therefore, view the cost advantages of the microfinance innovations from lender's point of view. But the cherished objective has been to provide access to credit to the ultimate borrower at minimum cost to the lender as well as borrower, or in other words,

to minimize the cost of delivering credit to the ultimate borrower. Transaction costs to lenders (banks) can be reduced by transferring the banking functions of the lenders, including risk bearing, to an intermediary such as an NGO (even trader or commission agent). But such transfer raises some important questions: What are the costs to such intermediary for performing these transferred functions? How do they pass on these costs to the ultimate borrowers? What will be the extent of rent seeking by them? Of the two, i.e. banks and intermediaries, which has the comparative advantage in costs vis-à-vis effectiveness in reaching the borrower[3] ? Will the transfer not reduce the banks to mere wholesalers/re-financiers?[4] The second limitation is that lending through SHGs has additional costs of forming, nurturing and capacity building of the groups. These costs are not included in the transaction costs of the lender in these studies[5].

These issues notwithstanding, *prima facie*, there are apparent and impressive gains for the borrowers from the linkage between banks and NGOs. In view of reduction in number of visits to the bank branch and documentation charges, the cost of borrowing for the borrower is likely to decline. The transaction cost to the borrowers, for example, declined from 16.8 per cent in the case of direct borrowing to 1 per cent if borrowed through Self-Employed Women's Association (SEWA) (Gain et al. 2000). The transaction cost to the borrower under the Grameen Project of Oriental Bank of Commerce was reported to be negligible compared to 3.5 per cent under normal lending (Malhotra and Chauhan

[3] Srinivasan (2000) has provided highly informative account of comparative costs of forming and nurturing the SHGs by banks and NGOs, and has concluded that banks are cost-effective in forming and nurturing SHGs of comparable performance.

[4] Transfer of banking functions to NGOs would rather replace the existing institutional arrangements instead of augmenting them. In fact, the growing demand for rural credit can be met by stepping up credit by supplementing and not substituting the existing arrangements.

[5] The cost of forming and nurturing groups can be substantial, especially for maiden groups in a village in initial years. It is estimated to be as much as Rs 7,000 per group by Harper et al. (1998). The explanatory note to Annexure 17.2 in Srinivasan (2000) that reads as, 'The surplus generated by the group is sufficient to pay for the branch manager's costs in group formation and nurturing from the second year' gives an impression that these costs have to be loaded on to the groups. This raises the issue of sharing these costs by the groups, banks and NGOs.

2000). Cost of making repayments was apparently not taken into account, which was seen to be as much as 73 per cent of the total cost to the borrower in the study by Gain et al. (2000).

The Task Ahead

The SHG experiment has given encouraging results and evoked lot of interest in all concerned circles, so much so that the Swarna Jayanthi Gram Swarojgar Yojana (SGSY) is modelled on the 'group' approach. Naturally, it is being attempted successfully to scale up the experiment. In the Union Budget 2001, it was proposed that one lakh additional groups would be formed during the current year. Accordingly, NABARD has set for itself the Corporate Mission to reach microfinance services to about 20 million poor households by the year 2008. This still leaves the gigantic task[6] of providing access to the needy incomplete, as there are about 60 million such households, as on today.

Promoting microfinance is often taken synonymous with promoting SHGs. Scaling up SHGs in number is only one facet of microfinance, and it alone may not attain the ultimate objective of reaching the needy, as imparting the spirit of microfinance among all formal rural credit agencies would do. Further, as feared in some quarters (Nair 2001), unless a larger perspective is framed within the concept of poverty alleviation, microfinance interventions will end up adding another appendage to the existing system.

Scaling up the microfinance should concentrate on two facets: Firstly, scaling up SHGs in number, and secondly the most important one, spreading spirit of the microfinance among the existing RFIs having a vast network of rural branches. In this process, the following important features of the microfinance in the modern connotation should be kept in view:

(i) It is of the borrowers, by the borrowers and for the borrowers.
(ii) Savings is followed as first principle and thrift habit is inculcated to the members before they borrow. This helps them understand the value of borrowed money.
(iii) Regular meetings are insisted where member involvement and education/ awareness are taken care of.

[6] It is all the more gigantic, as the progress is considered slow and inadequate considering the potential and magnitude of the task (Harper 2000).

(iv) Women form the focal point of the movement.
(v) It is built on the trust, and flexibility rather than security, legal safeguards, etc. It is person (family)-oriented and not activity-centerd.
(vi) Group approach provides the strength as it reinforces confidence, positive comparison, mutual check, peer pressure, etc.[7]
(vii) Frequent repayment in small amount relieves the pain involved in repaying the loan in large sums at a time and helps to maintain continuous interaction between borrower and lender. In the traditional system of repayment, large-sized instalments are fixed at six monthly or annual intervals. In the case of agricultural loans, however, borrower household may be encouraged to take up a simultaneous enterprise that can counter the half-yearly/annual bunching of income.
(viii) Convenience banking facilities should be available at the doorsteps of the borrower at the time convenient to him.
(ix) Rotation of leadership in SHGs every year may help minimize the power politics and develop each member into a leader ultimately.

Mosley (2000) has isolated four best practices in the microfinance experiments world over as: (i) levying market (full cost) interest rate, (ii) mobile banking and ensuring intensive repayment, (iii) ensuring availability of savings and insurance products, and (iv) provision of incentives to repay.

These features may have to be implanted onto the formal credit agencies, especially co-operatives, which are mutilated version of SHGs. Small groups can be formed within PACS, and each PACS can act as a federation of SHGs. But the possible pace of expansion of the microfinance program over space and possibility of extending it across formal rural financial institutions, viz. PACS and RRBs are to be explored (Gulati and Bathla 2000). Efforts of NGOs can be streamlined to supplement the current system rather than substituting it. Simple passing on the responsibilities of banking sector to NGOs may not add to the overall advantage as institutionalizing the rated NGOs into rural banking as independent agencies would do.

[7] Though no correlation has been found between the group approach and the success of the programs (Mosely 2000; and Nair 2001), importance of the groups, especially on caste lines, in the rural societies in tuning the individual's social, political and economic behavior cannot be ignored. Here, homogeneity, especially in terms of common suffering from poverty, can be the effective binding force.

References

Bandyopadhyay, Ashok (n.d.). Poverty alleviation: self help group-cooperatives within cooperative – 4th Model. Kolkata: West Bengal State Cooperative Bank (Mimeo).

CMIE. 2000. *Profiles of districts.* Mumbai: Centre for Monitoring Indian Economy.

Gain, T. S. Raji, R. Malhotra and N. S. Dheulekar. 2000. Bank of Baroda and SEWA partnership for reaching the women entrepreneurs. In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company. pp. 219-232.

Government of India. 1998. *Debt and investment survey, household borrowings and repayments during 1.7.91 to 30.6.92.* Report No. 431. New Delhi: National Sample Survey.

Gulati, Ashok and Seema Bathla. 2000. *Institutional credit to Indian agriculture: defaults and policy options.* NABARD Chair Unit. Delhi: Institute of Economic Growth.

Harper, Malcolm. 2000. Why are commercial banks not entering the microfinance market? In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company.

Harper, Malcolm, E. Esipisu, A. Mohanty and D. S. K. Rao. 1998. *The new middlewomen: profitable banking through on-lending groups.* New Delhi: Oxford and IBH and London: IT Publications.

Jindal, Krishan. 2000. Successful efforts in microfinance: a case study of South Malabar Grameen Bank. In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company. p. 208-218.

Malhotra, R. and D. S. Chauhan 2000. Banking with the poor: innovations by Oriental Bank of Commerce. In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company. p. 233-252.

Mosley, Paul. 2000. The microfinance experience of developing countries: lessons for banks in India. In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company Ltd. pp. 15-46.

NABARD. 1995. *Study of credit management groups.* Mumbai: National Bank for Agriculture and Rural Development**.**

NABARD. 1999. *Task force on supportive policy and regulatory framework for microfinance.* Mumbai: National Bank for Agriculture and Rural Development**.**

NABARD. 2000. *NABARD and microfinance: 1999/2000*. Mumbai: National Bank for Agriculture and Rural Development.

NABARD. 2001. *NABARD and microfinance: 2000-01*. Mumbai: National Bank for Agriculture and Rural Development.

Nair, T. S. 2000. Rural financial intermediation and commercial banks: review of recent trends. *Economic and Political Weekly* 36: 299-305.

Nanda, Y. C. 1998. Linking banks and self-help groups in India and the role of NGOs: lessons learned and future perspectives. *Asia-Pacific Rural Finance*: 23-31.

Puhazhendhi, V. 1995. *Transaction costs of lending to rural poor: non-governmental organizations and self-help groups of the poor as intermediaries for banks in India*. Australia: The Foundation for Development Co-operation.

Puhazhendhi, V. 2000. *Evaluation study of self-help groups in Tamil Nadu.* Mumbai: National Bank for Agriculture and Rural Development.

Puhazhendhi, V. and K. J. S. Satyasai. 2000. *Microfinance for people: an impact evaluation.* Mumbai: National Bank for Agriculture and Rural Development.

Rao, D. S. K. 2000. Promotion of SHGs by banks: a case study of Cauvery Grameena Bank. In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company. pp.184-194.

Singh, Padam and Rattan Chand. 2000. Quality of life approach for identification of poor. *Journal of Rural Development 19(1): 27-68.*

Srinivasan, Girija. 2000. Financial to social capital: role of banks. In *Microfinance: emerging challenges*. Kishanjit Basu and Krishan Jindal (eds). New Delhi: Tata McGraw-Hill Publishing Company. pp. 253-270.

Discussant's Note

V. M. Rao

1. Agrarian institutions are basis to the institutions supporting agriculture, and therefore, concern on the waning interest in land reforms is legitimate. As a component in development strategy, land reforms are designed to play multiple roles with focus on eradication of poverty. I am confirming my comments to the role they can play in adding thrust to the processes of technological change in agriculture which is the theme of this seminar.
2. The adoption and assimilation of new technologies by farmers depend on some critical requirements. Viable farm size, security of tenancy tenure, fair returns to farmers' labor and other owned resources, access to credit and modern inputs and dependable marketing facilities would be among the important determinants of the farmers' attitude towards new technologies. Our strategy so far has been to combine land reforms— ceilings, regulation/ abolition of tenancy, fair reforms of tenancy for the tenant, consolidation of holdings, requirement of self-cultivation— with research and extension, cooperativization and reforms in credit and marketing. This package had a good impact in a few areas and pockets where agriculture has been dynamic, but large parts of Indian agriculture benefited only partially or not at all. Dr Haque's discussion of the success of land reforms in West Bengal and Karnataka is very revealing. But, it has also the implications that such instances have been a few. I believe that the cases of suicide by farmers are indicator of local environments being unfriendly, if not hostile, to the remunerative but risky enterprises and farmers are suffering as a consequence. Sadly, one suicide may serve to dissuade a score from adopting new technologies and crops.
3. This suggests that land reforms would retain their relevance and importance in the emerging policy regime for agriculture reflecting the new paradigm

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

of liberalization and globalization. Dr Haque has provided many clues to the pressing need to rethink land reforms as a part of a package to promote rapid technological change in liberalizing agriculture without harming the poor. As he has persuasively argued, what is needed is a new style of land reforms consistent with processes like spread of contract farming, corporate farming and reverse tenancy which are likely to gather momentum in the coming years.

4. Without going into details, I enumerate the aspects of land reforms which would deserve priority attention in the new policy regime:
   - **Legislation.** Land reforms are notorious for litigation, causing long delays, and injustice to the poor in implementation. We should learn from the past experiences to prepare better and quickly implementable laws.
   - **Targetting.** In implementing land reforms, particular attention would have to be paid to areas and social groups whose need for land reforms is pressing. The agricultural growth and development so far have given rise to sharp differentiations within Indian agriculture. These will have to be borne in mind while prioritizing and focusing implementation of land reforms.
   - **Packaging with other components.** The precise content of land reforms – permitting tenancy, relaxation of ceiling limits in specific cases – needs to be decided in the light of institutional innovations in other areas like credit, marketing and input supply.
   - **Indirect support to the poor.** The presence of a large and extremely vulnerable sections of population like small and marginal farmers and agricultural laborers makes it difficult to regulate transactions like tenancy contract between them and the rural elite. Measures like employment guarantee programs and public distribution system would be essential to stabilize the position of the poor and to protect them from exploitative practices.
   - **Political mobilization.** The lower strata in rural communities are gaining in political awareness all over India. In some of the hard core poverty areas like Bihar, the scheduled castes are reported to be in a position to resist to some extent in coercion and violence practised over a long past by the rural elite.

It is important to encourage such processes as they prepare the ground for effective implementation of land reforms.

5. **Essential prerequisites.** Database and information system: It is necessary to take note of the serious weaknesses in the availability of data on land-related aspects. While devices like remote sensing provide a wealth of information on the physical aspects such as presence of forests, extent and degree of degradation, etc., the institutional aspects like distribution of holding, and extent and types of tenancy, remain inadequately documented in the principal sources of data like village records and the National Sample Surveys. It would be desirable to use the newer data gathering techniques like participatory rural appraisal studies to improve information on institutional aspects of land, including transaction in land market.

   - *Personnel.* An important requirement of effective implementation of land reforms is development of personnel at the grass-root level with adequate support from the poor and vulnerable parts of rural communities. These development personnel need to be adequately trained and sensitized.
   - *Panchayati Raj institutions (PRIs).* The fundamental institutional change needed in rural communities to provide an environment favorable for reforms and development is to have functional PRIs. Without the strong foundation provided by PRIs, it would be frustrating to promote growth, modernization and equity in the rural society. Measures like land reforms would find it difficult to strike roots in the present state of institutional vacuum at the grassroots level.

Discussant's Note

J. P. Mishra

Achieving a rapid growth in agricultural lending has been one of the main strategies of the Government of India for agricultural development, ever since Independence. This strategy was reinforced in 1969 with the nationalization of banks. Priority sector lending became the most important phrase among commercial banks. In 1975, a new dimension was added with the opening of the Regional Rural Banks (RRBs). Since then, priority sector lending got firmly entrenched in India's financial system. Agricultural lending by banks kept on increasing in a phenomenal manner. However, this phenomenon received a jolt in 1990/91 when the Narsimham Committee recommended the financial sector reforms in banks. Adoption of prudential norms and profitability were strongly recommended by this Committee. The climate of agricultural lending had been vitiated by the Debt Relief Scheme of the Government in 1990. Willful defaulters got away with non-repayment of loans. Because of these developments, priority sector lending and particularly, agricultural lending lost its prominence in the banking circles. The tempo of agricultural lending receded in commercial banks.

In the above context, new innovations in agricultural lending were necessary. Micro-finance came quite handy. It is a model of lending which is convenient to all, i.e. banks, borrowers and the Government. The paper on micro-finance has introduced the topic in a fitting manner. He has elaborated the Self-Help Groups (SHGs) and Self-Help Group Promoting Institutions (SHPIs).

Micro-finance in rural India has been promoted by the National bank for Agricultural and Rural Development (NABARD) since 1987. During the last 14 years, there have been changes in the approach and consequently, three models, viz. (i) Bank-SHG-Members (without NGO intervention), (ii) Bank-SHG with NGO or other SHPI (as facilitating agency) – Members, and

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

(iii) Bank-NGO (as financial intermediary)/MFI-Members. He has thus provided conceptual clarity about the models presently in use in micro-finance in India.

The author has given an account of the progress made by the SHGs. He has elaborated on the credit provided through various types of organizations, viz. commercial banks, RRBs and cooperative banks. He has also brought out regional and inter-state variations in the progress made through micro-finance. He has discussed his paper under these two broad streams and these areas deserve to be further probed and analyzed.

Firstly, we may take a look at the performance of SHGs. The data regarding disbursement are striking. Per SHG disbursement is woefully small. All the SHGs (i.e. 94,645) combined together had disbursed only Rs. 1,929.7 millions by the end of year 2000. Per SHG disbursement works out to be Rs. 20,338, which is too small. It should be analyzed whether the amount provided to each member is adequate or not.

Further, disbursements by each type of linkage should also be analyzed. Three types of linkages have been mentioned in the paper, viz. (i) SHGs directly linked with the banks, (ii) SHGs facilitated by NGO, and (iii) SHGs with NGO as intermediaries. The SHGs directly assisted by the banks have disbursed larger amounts, than those facilitated by NGOs, and SHGs facilitated by NGOs have disbursed more than those assisted with intermediary NGOs. The disbursement per SHG directly assisted by the banks worked out to be the maximum (Rs 25,056) than those facilitated by NGOs (Rs 20,415) followed by intermediary NGOs (Rs 16,189).

The study has brought out that regional variation in micro-finance in rural India is quite pronounced. The southern region accounted for 67 per cent of the lending. In the North and North-Eastern parts, the activities of SHGs are on the lower side.

The above aspects of the study deserve to be further analyzed. The utility of micro-finance through SHGs is well established. In the present era of the financial sector reforms when the priority sector lending is the least preferred item among commercial banks, micro-finance will help the rural people in a significant manner. The author has done a good job. He would have still done better had he mentioned some of the recommendations of the Task Force on Supportive Policy and Regulatory Framework of Micro-finance set up by NABARD which submitted its recommendations in 1999.

17

Analytical Framework for Review of Agricultural Marketing Institutions

S. S. Acharya

Institutional framework for Indian agriculture needs critical review in terms of both rules of the game and organizational structure. This is more so for the marketing segment of the agricultural sector. This note outlines an analytical framework for such a review. The note has been divided into four parts. The first part introduces the concept of institution. Some aspects of institutional framework for the agricultural development in general and agricultural marketing in particular, are discussed in the second and third sections. Issues relating to the alternatives in institutional framework for the agricultural marketing are presented in the last section.

Understanding the Institutions

Institutions are generally understood as (a) rules of the game; and (b) organizations. Alternatively, institutions encompass (a) formal rules; (b) informal contracts relating to norms of behavior, conventions, and self-imposed codes of conduct; and (c) enforcement characteristics of (a) and (b).

Institutions help in building the capacity of individuals through collective action. But studies show that institutions, particularly enforcement characteristics, are sometimes discriminatory and reduce the scope for capacity building of the poor. This is so because hierarchy in power relations inhibits change in rules. Further, the linkage-dependent small institutions (like dairy cooperatives) have less freedom to design and pursue their own goal. Such an institutional framework may produce perverse incentive for rural poor to benefit from free market and trade. It is in this context that we need (i) institutional innovations to make the institutions redistributive in character (trade unions vs industrialists); and

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

(ii) both formal and informal institutions, but eventually these should become complementary to each other.

It needs to be recognized that both formal and informal institutions have strengths and weaknesses. For example, (a) formal institutions not rooted in local culture may not bring the desired results (why cooperatives in certain areas failed?); (b) large heterogeneity of members makes these institutional dysfunctional; and (c) informal institutions often do not try to renovate by shedding dysfunctional traditional practices in response to outside chnages.

Institutions (rules of game and organizations) can be discussed in the realm of:

(i) Government sector institutions engaged in policy formulation, identification of policy instruments and in their implementation;
(ii) Market sector: groups, associations (profit seeking); and
(iii) The third sector: non-profit seeking, voluntary or sponsored organizations.

The third sector has a distinct role and space in the context of government failure and market failure. The institutions and organizations in this sector can succeed if they resist becoming the agents of government or fee-charging private consultancy firms.

Institutional Changes for Agricultural Development

1) The changes in the institutional framework need to be examined in three broad areas:
   (i) Evolution, generation, perfection and transfer of technology – this includes institutional framework of agricultural research and extension initiatives/activities;
   (ii) Provision of input and services including credit; and
   (iii) Assurance of remunerative market environment.
2) Institutional framework for agricultural marketing should include the institutions both for inputs and outputs.
3) As the institutions include both rules of the game and organizations, agricultural marketing institutions can be grouped into: (a) government sponsored; (b) open market related; and (c) institutions in the third sector – informal, voluntary, participatory, mostly non-profit organisations like NGOs, cooperatives, self-help groups, cast *panchayats*, etc.

4) Government-sponsored institutions influence the performance of the market-related and the third sector institutions, which taken together determine the nature of market structure, conduct and performance, and hence, the efficiency of the marketing system.

The Institutional Framework for Agricultural Marketing

The institutional framework for agricultural marketing can be understood as consisting of following broad groups or sets:

1. Institutions aimed at regulating the market conduct, structure and hence, the performance (efficiency). In the Indian context, these include:
   (a) Regulation of primary agricultural produce markets; and
   (b) Legal and regulatory provisions relating to storage, transportation, packaging, processing, buying/selling and quality specifications. The specific institutions in this category are: State Agricultural Marketing Board (SAMB), State Department of Agricultural Marketing (SDAM), Agricultural Produce Marketing Committee (APMC), Directorate of Marketing and Inspection (DMI), Health Department, Civil Supplies Departments of the Central and State Governments, etc.
2. Institutions aimed at providing and maintaining marketing infrastructure include: (a) *Physical infrastructure.* Yards, roads, storage, cold storage, telecommunications, market information, packaging material; and (b) *Institutional infrastructure*. The institutions in this category are: SAMB, APMC, Public Works Department (PWD), Food Corporation of India (FCI), Central and State Warehousing Corporations and cooperatives.
3. Institutions involved in administered prices are: FCI, National Agricultural Marketing Federation (NAFED), Cotton Corporation of India (CCI), Jute Corporation of India (JCI), Commission for Agricultural Costs and Prices (CACP), State agencies, and Fair Price Shops (FPS).
4. Institutions entering the markets directly. The institutions in this category are some of the above plus commission agents, producers or consumer cooperatives and processors.
5. Institutions influencing foreign trade (imports/exports). The institutions in this category are lobbies or interest groups, Agricultural and Processed Food Export Development Agency (APEDA) and several others including

foreign agencies promoting their products in the country.

In the context of changes in the economic environment, owing to the liberalization, privatization and globalization initiatives, there is a need to review the role as well as rationale of many components of the agricultural marketing institutional framework evolved over the years.

Issues Relating to the Alternative Institutional Framework (Third Sector)

In the event of state and market failure, the most important issue is how to safeguard the welfare of small producers and poor consumers. The attention needs to be given to the reduction in the gross marketing margins (GMM). There are three main components of GMM: (i) statutory charges (6 to 12 per cent); (ii) net margins of intermediates (6-20 per cent); and (iii) real cost of performing marketing functions (68 to 88 per cent).

The reduction in real cost of marketing would require increasing the scale of operations and technological change in the marketing system. Certainly, small farmers with low marketed surplus cannot do it. The organized sector is, therefore, coming in a big way whose share is now around 6 per cent and it is predicted to go up to around 20 per cent by 2010.

In this context, there is a need for an institutional revolution to enable the producer organizations with professional management to emerge in the scene. We know that our experiences with cooperatives have been a mixed one. Can we think of farmers' corporations to emerge in production as well as processing and marketing of agricultural commodities?

Given the heterogeneity among the farming community, the individual's stake in the organization ought to be in proportion to his share in the business. Implications of this form of institutional set up in agricultural marketing need critical examination and serious debate.

18

Institutional Aspects of Agricultural Marketing in India

P. G. Chengappa

Agricultural marketing has assumed greater importance, especially in the context of economic liberalization and globalization. The thrust right from the 'grow more food campaign' through the Green Revolution period has been to increase agricultural production, posing the first generation problems of marketing. Commercial production, shifting cropping patterns, increasing domestic and international trade and growing market intervention have led to increased marketed surplus, resulting in the second generation problems. The increased surpluses together with higher demand for non-conventional commercial inputs have put greater pressure on the existing marketing system and have exposed the inadequacies. Today, marketing has become a serious constraint both in the sale of agricultural products, and supply of crucial inputs. Despite major market interventions and support by the Government, efficiency of the marketing system continues to be a matter of concern.

Government in developing countries is realizing the importance of the marketing institutions as a stimulating and dynamic force in agriculture. In India, through a series of marketing reforms, a number of institutions have been established from time to time to keep pace with the expanding and changing needs of agricultural sector. This paper reviews the institutional developments in agricultural marketing in the country and assesses their efficiency and adequacy in the present economic and agricultural scenario.

Establishment of the Regulated Markets

The idea of regulating markets for agricultural produce was first conceived towards the end of the 19th century when the first agricultural market at Karanja

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

was regulated in 1896 in the former Hyderabad State. Thereafter, a special law known as the "Cotton and Grain Market Law", was enacted in the year 1897 in the Berar region, then known as the Hyderabad Assigned District. The efforts made until 1915 in the direction of establishing additional regulated markets were mostly sporadic. Subsequently, based on the recommendations of the Indian Central Cotton Committee (1917) and Royal Commission on Agriculture (1928), various provinces and states enacted Acts for the establishment of the markets in the country.

Before Independence, market legislation was in force in Bombay (1927), Central Province (1932, 1935), Mysore (1939), Punjab (1941) and Patiala (1947). After starting the planning era, the Planning Commission emphasized the vital role played by the regulated markets and urged the states to enact suitable acts, keeping in view the fact that agriculture is a state subject in the constitution. As a result, there are now 25 Regulated Market Acts in vogue in the country covering most of the states. However, the states of Jammu and Kashmir, Sikkim, Arunachal Pradesh, Mizoram and Union Territories of Andaman and Nicobar, Dadar and Nagar Haveli and Lakshdweep are yet to enact such an act.

History of market regulation in India reveals that the establishment of regulated markets was not intended at creating an alternate marketing system, but to create the conditions for improving the efficiency of the private trade through free and fair competition. Thus, a regulated market is one that aims at eliminating unhealthy and unscrupulous practices, reducing marketing charges and providing facilities to producer-sellers in the market. The main aim, therefore, is to establish an orderly marketing system. In the changing scenario of agricultural production, an assessment of the performance of regulated markets has become imminent. It is necessary to discuss issues such as whether the specific objectives for which they were established, have been achieved. Whether the producers have been benefited? Whether the markets are competitive in their functioning? What changes are necessary to keep pace with the liberalization and globalization? Is there a need to amend the existing market regulation Act? An attempt has been made in this section to answer these questions.

Constitution of the regulated markets

The regulated markets all over the country function on democratic principles with control vested with the elected Agricultural Produce Market Committee

(APMC), represented by farmers, traders, representatives from marketing and processing co- operatives and warehouses and officials drawn from the marketing and other departments. The APMC consists of 15 to 17 members and is responsible for the enforcement of the rules and regulations framed under the APMC Act. However, a wide variation is seen in the composition of the APMC in different states.

According to Section 10 of the Karnataka Agricultural Produce Marketing (Regulation) [KAPM (R)] Act of 1966, the APMC consists of 15 members –11 elected by the agriculturists in the market area (one of them should be a woman) and two persons belonging to the schedule castes and schedule tribes. Besides, one member each shall be elected by the traders and co-operative agricultural processing societies carrying business within the market area. In addition, there shall be an officer not below the rank of the Secretary of the concerned APMC nominated by the Director of Agricultural Marketing. Further, according to Section 41 of the KAPM (R) Act, the Chairman and Vice-Chairman shall be from the members representing agricultural constituencies. Thus, the Act has ensured representation of all those concerned with the APMC. However, in many states such provisions do not exist, and the elections are not held regularly. In view of the devolution of powers to the *panchayats*, inclusion of their representative in APMC is relevant. Also, the secretary of APMC is an official appointed by the government who is responsible for the day-to-day functioning of the market. The pros and cons of making the secretary as member secretary of the APMC may be given a careful consideration.

Functioning of the Regulated Markets

Number and area covered by the regulated markets

At the time of Independence, there were only 250 regulated markets in the country, which increased to 6,836 by 1995. However, it is noteworthy that nearly 98 per cent of the wholesale assembly markets have been regulated in the country.

In most of the market regulation acts, there is a provision to establish one regulated market in each taluka. However, as seen from the number of markets, it is not simply happening in most of the states. For instance, in Mandya district

of Karnataka, which is known for its progressiveness in agriculture and generation of marketable surplus, there exists only three main markets for the whole district. The area covered by a regulated market varies from state to state. It is 902 sq km in Rajasthan, 833 sq km in Madhya Pradesh, 574 sq km in Gujarat, 484 sq km in Karnataka, 480 sq km in Andhra Pradesh, 171 sq km in Haryana and 76 sq km in Punjab. The National Commission on Agriculture (1976) had recommended establishment of one market at a radius of 5 km. Similarly, the Agricultural Production Team of the Ford Foundation (1951) also suggested that a market with a distance reached by bullock cart will help the farmers to get remunerative price for their products. Thus, the area covered by the regulated markets is too inadequate and there is a need to establish more number of markets. We could probably reach somewhere near these recommendations if nearly 26,930 rural markets are established in the country. In the process, amalgamation of markets to make them economically viable has to be kept in mind.

Coverage of agricultural commodities

The number of commodities notified for regulation varied from a minimum of three in Kerala to as many as 54 in Andhra Pradesh. In Karnataka, the commodities regulated are called notified commodities whose number varies from market to market. There are provisions for establishment of special commodity markets in most of the Acts. For example, according to the KAPM (R) Act 1966, commodity markets can be established for cattle, sheep, fish, fruits or any other commodity notified by the government (Section 96). However, so far, only one such market, viz. fruit and vegetable market has been established in Bangalore city.

The arrival of agricultural produce in the regulated markets is on the increase but it is not keeping pace with the growth in the marketed surplus. For example, foodgrains handled at the regulated markets in Karnataka formed 9 per cent of the total production in 1983/84 which increased to 24.05 per cent in 1987/88 and to 28 per cent in 1997/98. The marketed surplus for foodgrains is estimated at around 40 per cent of the production, indicating that a substantial part of trade takes place outside the purview of the regulation. Chand (1999) also observed growing tendency to sell produce through informal markets. However, there is no point in compelling the producers to bring their produce to the market yard.

Ideally, farmers should be attracted to transact their produce at the market yard by making the marketing system more convenient and efficient. There has been some kind of experimentation is the form of agent-less markets or *Apni Mandi*, which are controlled by farmers associations rather than by the market committees. It is time that we should assess performance of these models and if found efficient, replicate them for the benefit of farmers.

Role of commission agents

The hub of activities of a regulated market is the market yard that is a statutory area where sellers of notified commodities bring their produce for sale. According to the KAPM (R) Act, producers bring their produce to the premises of a commission agent who arranges for sale of the commodity under the supervision of the market committee. Even though, the commission agents are responsible for the display, sale, storage and payment immediately after sale, yet the farmers undergo a lot of problems in realizing their sale proceeds. Also, it has become a practice for the commission agents to collect the commission charges both from sellers and buyers, even though the producers are exempted from paying the same as per the regulated acts of most of the states. The commission agent perhaps gains more control through money lending operations. By offering loans, commission agents compel farmers to sell their produce through them only. In the process, the producers not only lose their bargaining power for a better price but are also made to pay exorbitant interest on loan. The recent introduction of pledge loan scheme by the regulated market committee in a few states will certainly help the farmers.

Infrastructural facilities at the regulated markets

Success of the market committee in implementation of the Act depends upon the proper location of the market yard and facilities provided for efficient conduct of market transactions. The provision of facilities such as market yard, office building, godowns, shops, water supply, weighing platform, farmer guest house, cattleshed, bank and cafeteria are mostly seen in the bigger regulated markets. The absence of these facilities is common in the smaller markets. The Indian Standards Institution (ISI) and Market Planning and Design Cell of the Directorate of Marketing and Inspection have standardized layout for the

regulated market. The absence of facilities for handling and location of markets away from the business centers have contributed greatly for trade taking place outside the regulated markets.

Thus, there is an urgent need to develop necessary facilities either from the resources of the market committee, borrowing funds from the market or government support. The provision of facilities will improve the physical efficiency greatly. Some market committees have adequate funds collected as market fee, license fee and rent on godowns, shops and canteen. For example, the amount stood at Rs 600 millions in Karnataka in 1998/99. However, there is no comprehensive long-term plan for market development, resulting in a slow growth and poor performance of the markets.

Competition at the regulated markets

Competition is the key element for assuring fair prices for the farmers' produce in the regulated markets. The empirical results concerning competitiveness of regulated markets have suggested that the performance varied not only from market to market but also from commodity to commodity (Sujata et al. 1989). Most of the studies have shown that the markets for foodgrains and commercial crops are fairly competitive, as compared to those for perishables (Lele 1971; Moore et al. 1973; Thakur et al. 1988; Subrahmanyam 1988; and Bhalla 1991). The studies have also shown that the terminal markets located in metropolitans and big cities have huge turnover and exert considerable influence on the price formation that has a bearing on the final price received by farmers in other states. The results also show that there exists high degree of market integration in the long run (Cummings et al. 1967; George 1973; Jasdanwala 1966; and Thakur 1974). Further, such markets provide price signaling to other markets, and therefore, it is necessary to identify them to develop by providing modern market technology. The management of such markets may have to be different from that of other regulated markets.

One of the main achievements of the market regulation is rationalization of market charges and control of unauthorized deductions from sale proceeds. However, instances of unfair practices (e.g. short weighment, higher charges for the services, etc.) and delay in the payments are still common. To overcome these problems, the collection of market fee from the purchasers (traders), provision of the services of weighman through the market committee and

payments through bank have been introduced in some markets. It is necessary to follow these practices uniformly in all the regulated markets. The possibility of keeping away the intermediaries from the producers has been practised in cocoon markets in Karnataka with the market committee rendering these services. Such attempts merit serious consideration for their replication.

Directorate of Agricultural Marketing and State Agricultural Marketing Board

Based on the recommendations of the Royal Commission on Agriculture and the Central Banking Enquiry Committee, a central Department of Agricultural Marketing was created in 1934. Later, it was named as the Directorate of Marketing and Inspection (DMI) in 1958. The DMI was a separate department under the Ministry of Rural Areas and Employment, but it was shifted to the Ministry of Agriculture recently. Agriculture being a state subject, most of the state governments have also created a separate directorate for agricultural marketing. This department is entrusted with the responsibility of implementing the provisions of the APMC Act.

The Directorate of Agricultural Marketing is attached to the Agricultural Secretariat in some states, while in others, it is attached to the Ministry of Rural Development or Co-operation. A uniform structure with the directorate forming a part of agriculture secretariat could be more meaningful to bring the production and marketing under a single entity.

There is also a provision for the establishment of State Agricultural Marketing Board in most of the Acts (e.g. Section 100 of KAPM (R) Act). These Boards came into existence to speed up the market development programs by acting as a central agency. In the states of Punjab and Harayana, the board is vested with the powers of market regulation, whereas in Tamil Nadu, Karnataka, Andhra Pradesh and Orissa, this is merely an advisory or promotional body. The board is very active in Maharashtra and has implemented many programs for the benefit of farmers. In Rajasthan, Uttar Pradesh and Madhya Pradesh, the board is performing the developmental function, and the department does the regulatory function. In this context, it is necessary to debate the form and function of the Agricultural Marketing Boards, keeping in view the ongoing changes in the marketing system of the country.

Regulation of Rural Markets

Rural markets have an important role to play as an institution of rural development. Income of many farmers, especially small and marginal farmers, is decided by the process prevailing in these markets. There are 26,930 rural markets in the country. A survey of these markets has indicated that about 25 per cent of agricultural production is being handled by the regulated markets and the remaining trade is confined to rural or village markets. Hiremath et al. (1987) reported that in northern Karnataka, a majority of small farmers (59 to 67 per cent) disposed their produce *(Jowar)* in rural markets, which accounted for 75 to 79 per cent of their marketed surplus. These markets, however, lack basic amenities and infrastructural facilities for handling the produce. Besides, the control of some rural markets is vested with charitable organizations, municipalities and *panchayats*. Rural markets in Karnataka are under the dual control of *panchayats* and APMCs, sharing the income on 3:1 basis. In some states (like Punjab), sale in the village is completely banned and all transactions should take place in the *Mandi* that are under the purview of the regulation.

Whether regulation of rural markets amounts to regulating the retail trade? If so, is it desirable, and what should be appropriate controlling authority? Also, whether all rural markets can be converted into sub-markets of the main markets for making them viable? These questions need in-depth analysis for making rural markets viable and efficient with greater access for small and marginal farmers. The possibility of involvement of the *zilla/taluk* committees or *panchayats* in the development and management of these markets should also be examined.

Future role

The regulated markets have been functioning in India for more than a century and have come to stay as an effective tool for assuring a fair deal to producer-sellers. The primary objective of regulating marketing is to prevent and eliminate malpractices. Though this is important, it must be recognized that this is essentially a policing function and not a marketing function (Dandekar 1994). All these years, the regulated markets have concentrated only on streamlining the selling and buying functions and to some extent, storage and grading. The other

marketing functions such as processing, market finance, packaging, transportation, market extension, market information and intelligence have not been given due attention. The emerging scenario of globalization coupled with high market competition, calls for performing these functions by the regulated markets if they have to survive. Without any collective effort by farmers to sell their produce on their own, the regulated model will continue to play a vital role in marketing of agricultural produce. However, there is a need to reform the regulated markets as farmers' markets and upgrade their capability to perform varied marketing functions to improve the marketing efficiency. To achieve these objectives, the market regulations should be made more flexible with less of government control and more of farmers' participation.

Co-operatives in Agricultural Marketing

Co-operative marketing was developed as an antidote to the treacheries that existed in our traditional marketing system. The co-operative marketing societies have been organized on a two-tier structure in all the states. The primary society, the Taluka Agricultural Produce Co-operative Marketing Society Ltd. (TAPCMS) operates at the *Mandi* or regulated market level, functioning both as trader and commission agent. These societies are federated at the state level as the State Co-operative Marketing Federation Ltd. (SCMF) and at the national level as the National Agricultural Co-operative Marketing Federation Ltd. (NAFED).

There are 6,872 primary marketing co-operatives (2,933 general and 3,939 specialized/commodity), 191 district/central level, 51 (including 22 specialized) state level co-operatives marketing federations. The NAFED and the Tribal Cooperative Federation (TRIFED) are two national-level apex co-operatives involved in the marketing of agricultural produce. In addition, some Primary Agricultural Co-operative Societies (PACSs), Large Multipurpose Cooperative Societies (LAMPSs) (2,734) and Farmer Service Societies (FSSs) (1858) are also engaged in agricultural marketing. Activities of these societies comprise outright purchase, procurement on behalf of the Government for the Food Corporation of India (FCI) or State Civil Supplies Corporation, processing, supply of agricultural requisites, distribution of consumer goods, and providing services such as storage, transportation and grading. It is observed that nearly one-third

of these co-operatives are not performing purchase and sale of agricultural produce, but are concentrating on distribution of inputs and essential commodities. A study in Karnataka (Chengappa and Sashidhara 1999) indicated that the share of agricultural commodities handled by these co-operatives in their business was low (16 per cent) when compared to agricultural requisites (23 per cent) and consumer goods (61 per cent). It is distressing to note that the number of societies engaged in sale of produce of their members is on the decline. This kind of shift in the composition of trade from agricultural produce to consumer goods is not a healthy sign in the interest of producer members. Further, the quantity handled by these co-operatives on ownership basis was too meager, and most of them acted as commission agents, facilitating transaction between member producers and traders.

The credit and pledge loan facilities extended by the marketing co-operatives are too little, indicating their failure to prevent distress sales by farmers. The capital base of these societies is weak and they largely depend upon heavy borrowings. This shows that the marketing co-operatives can achieve only limited turnover in their business. The business performance of these co-operatives indicates that nearly 40 per cent of them have incurred loss and their number is increasing over the years.

To improve the functioning of these co-operatives, the All India Rural Credit Survey Committee (1951) made a significant recommendation of linking credit with marketing. However, it is observed that hardly 13 per cent of the PACSs are engaged in such activities (Chengappa and Sashidhara 1999). The Dantwala Committee (1964) reviewed the whole system and suggested switching over to a two-tier co-operative system instead of the three-tier system, and undertaking supply function in addition to agricultural marketing and distribution.

Thus, it is amply clear that marketing co-operatives have contributed very little as an alternate channel in marketing the produce of member farmers. There is a need to redesign these co-operatives to meet the emerging challenges, especially in the context of new economic environment. In this context, the following suggestions are worth considering:

The marketing co-operatives should practice “member first” model rather than “value first” model. These co-operatives should primarily concentrate in performing various marketing functions such as assembling, grading, pooling, processing, storage, financing, transportation, packaging, competitive selling and

even export of agricultural commodities rather than merely performing the "agent" function. This will help in realizing value addition and economies of scale, thereby maximizing return to producer members.

The production scenario with commercialization of agriculture would necessitate more of market finance, which is hardly met by the institutional sources. The provision of credit on the basis of pledge loan would go a long way in realizing remunerative prices by farmers.

There is a substantial wastage/loss of agricultural produce at farm level because of poor post-harvest management. The improved technology has to be applied in the field at post-harvest level to prevent losses and doing value addition. This would entail establishing cold chains consisting of pre-cooling units, refrigerated transport, establishment of cold storage at production as well as consuming centers, etc., especially for perishables, such as fruits and vegetables. This is particularly important for the globalization of agriculture and improving access to rapidly expanding international markets for agri-horti exports. The marketing co-operatives in Maharashtra have demonstrated this. NAFED is also doing export to the extent of Rs 3.3 billion (1993/94). However, most of it is in the form of canalized exports. In the liberalized era, the scope for canalized exports is limited. Marketing co-operatives have now to compete with private exporters.

Due to the de-licensing policy, co-operatives have lost the advantage of government preference hitherto enjoyed by them, and the private sector is emerging in a big way. The debt-equity ratio has been raised to 50:50 for co-operative spinning mills, making it difficult for them to raise the funds. The co-operatives have been depending for equity on the National Co-operative Development Council (NCDC) and state governments. These sources are also facing resource crunch, making the position of co-operatives still more difficult.

The basic structure of co-operatives is being subjected to a change so as to facilitate them to raise funds for their business, and efficient performance. In this direction, the formation of "co-operative companies" has been mooted initially by amending the Multistate Co-operative Societies Act. If this is effected, co-operatives, especially the large sized co-operatives engaged in marketing such as the Central Arecanut Co-operative Marketing and Processing Co-operative (CAMPCO), will be able to do the business efficiently on corporate lines, as they will have the required freedom and opportunity to perform. Under this

model, the co-operatives will have the option to register as a co-operative or as a co-operative company. This would provide the much needed autonomy to the co-operatives with less government control.

Warehouses

The warehousing for agricultural commodities is mainly undertaken by public sector agencies, such as the Central Warehousing Corporation (CWC), the State Warehousing Corporation (SWC) and FCI. Besides, co-operatives also provide the warehousing facilities to its members. The installed capacity of FCI stood at 18.6 million tonnes, CWC at 6.4 million tonnes, and SWC 1.0 million tonnes in 1991. It was envisaged to enhance the storage capacity of co-operatives to 8.0 million tonnes by the end of the IX Plan under the scheme of National Grid of Rural Godowns. Thus, the total installed capacity of warehouses would be 34 million tonnes. Besides, there are 3,253 cold storages, with an installed capacity of about 8.7 million tonnes (1995/96). However, the concept of warehousing has not caught up with farmers. It is found that the input manufacturers and traders make use of warehousing facilities more than that by farmers. The warehouse receipt, which is a negotiable instrument, can be pledged by the farmers to avail loan up to 75 per cent of the value of the commodity. However, most farmers are not aware of the services provided by the warehouses. Hence, there is a need to educate farmers on the benefits of warehousing. The central government has taken steps to provide greater role for the private sector in (by de-licensing) storage of agricultural commodities by repealing the Cold Storage Order of 1964. This is a step in the right direction, and some private cold storages have already emerged in certain states. However, the growth of private cold storages to create a "cold chain" for linking production and consumption centers is yet to emerge.

In the central budget of 1999/2000, a credit-linked subsidy scheme for the construction of cold storages for perishable commodities was announced. So far, the National Bank for Agriculture and Rural Development (NABARD) and NCDC have provided Rs 1610 million as credit for creation of additional capacity of 0.97 million tonnes. A subsidy of Rs 780 million has been provided during 2000/01 for setting of cold storages. The scheme is also extended to cover rural godowns in the recent budget (2001/02). The loan of long-term nature would be

available to individuals, co-operatives and others. In addition, it is also proposed that the NABARD would reduce its interest rate for funding storage of crop products from 10 per cent to 8.5 per cent, so that it will benefit small farmers by avoiding distress sales of their produce.

Commodity Boards and Corporations

The commodity boards and corporations are essentially producer-oriented organizations performing broad range of functions, starting from production to marketing, including export of specific crop produces. To organize commercial production and marketing of selected commodities, such as coffee, tea, rubber, cotton, tobacco and spices, the Government of India constituted the commodity committees from time to time which were later converted into boards and corporations. The approach of these institutions is commodity-specific with emphasis on the promotion of exports. These boards are basically classified into trading and non-trading boards. Many boards have dispensed with trading functions because of inherent problems faced by them like other public sector organizations. For example, the Coffee Board — an organization performing monopoly trading functions since its inception in 1942 — was forced by the growers to divest its marketing functions mainly due to inefficiency in its operations. Since then, the Board has concentrated on research and development. Most commodity boards in our country such as the Tea Board and the Spices Board, carry out promotional activities. Others, such as the Rubber Board and the Tobacco Board, are only regulatory in nature.

The economic liberalization has raised apprehensions regarding the functioning and existence of these boards. Unless they change and adapt by way of redefining their new role, their survival will be jeopardized. In the process, some boards may have to be phased out and others revamped to meet the emerging challenges.

Commodity Exchanges

Commercialization of agriculture has necessitated linking the domestic markets with the global market. This has made it imperative to have formal

commodity contracts to spread the risks among various market players. Commodity exchanges for futures trading narrows the marketing, storage and processing margins, thereby benefiting both growers and consumers. Many studies have shown that future trading also smoothens operation of different marketing functions by reducing risks, thereby increasing the marketing efficiency to the benefit of all. The future markets also complement the working of spot markets. Currently, futures trading is permitted in 10 commodities. The Kabra Committee (GOI 1994) has suggested the extension of futures trading in 17 other commodities. There is a definite case for introducing future trading in other commodities, provided they fulfil the requisite conditions.

Farmers Associations

The farmers associations are similar to those of co-operatives but are not under the purview of co-operative laws. There are a number of problems in marketing under the umbrella of co-operative legislation. These farmers associations are registered organizations enjoying a lot of flexibility in the enrolment of members, raising funds, and carrying out the chartered activities following plural management process. There is less scope for government intervention in their functioning. The accounts of associations are audited by any charted accountant and not by the co-operative audit department. The experience of the Maharashtra Grape Growers' Association selling grapes under the banner of MAHAGRAPES has achieved great success with active participation of the members. This model is being copied in other states like Karnataka and Andhra Pradesh. If right type of incentives are provided, farmers associations will succeed in a big way because of the cohesiveness in the group. In the wake of the withdrawal of the state from the scene, the producers associations are considered to be an alternative to the public sector undertakings engaged in agri-business.

Contract Farming

The contract system of agricultural production and marketing is emerging in a big way with the corporate sector entering into agri-business

activities. The companies involved in the processing and export trade face lot of problems in resourcing the raw material. They are unable to practise captive farming since there are lot of restrictions, e.g. land ceiling. The labor problem also discourages them to go for large-scale cultivation. To overcome these problems, these firms resort to 'contract farming', wherein they supply the planting material and provide the required credit and extension support to ensure organized supply of standard quality material. The firm procures the produce at a pre-determined price. It is beneficial to farmers as they are assured of both price and sale of their produce. They also get the required inputs and technical know-how from the firms.

The system of contract farming was first introduced by the seed companies. The experiences of Pepsi and Hindustan Lever in Punjab and Gherkin and baby corn production in Bangalore by a few companies, have indicated that both the contracting parties have been largely benefited. Although there are problems relating to violation of the contract by farmers and corporates not paying the agreed price and rejecting material due to low quality, the model appears to be successful with vast scope for its replication.

Other Initiatives

Non-governmental organizations (NGOs). NGOs have close contact with farming community and are well aware of their problems. In the recent times, some NGOs have entered into marketing of farm produce, especially organic food. The Eco-net, an NGO in Karnataka, is directly involved in the marketing of organically produced foodgrains, fruits and vegetables. NGOs can be encouraged in other states to help the farmers in marketing their produce in a better way.

Ryot bazar/apna mandi (farmers' market). The concept of farmers' market was advocated by Johl (1989), and the Punjab Agricultural Marketing Board started it as "*Apna Mandi*." Now on experimental basis, *ryot bazars* or *apna mandis* are being set up in some states so that farmers can sell their produce directly to consumers. Conceptually, the system appears ideal due to the absence of middlemen. The experiences in Andhra Pradesh and Tamil Nadu are quite encouraging and more markets are being setup mainly for the benefit of small

and marginal farmers. However, it has some limitations, especially when the marketable surpluses are large.

Conclusions

India has a long history of regulating the agricultural markets. The regulated market model is in vogue for more than a century and this model will continue for many more years. So far, the efforts have been to regulate the trading practices, especially buying and selling and to some extent, standardization and grading. In the liberalized era, the paradigm of agricultural marketing is changing and hence the emphasis should be on the performance of all marketing functions. The competitiveness of the agricultural markets can be sharpened by providing required infrastructure, price transmission and policy support.

The rural markets have remained outside the purview of the regulation and as such, lack basic marketing amenities. There is a need to develop these markets and link them with the wholesale and terminal markets. In the process, the role of the *panchayat raj* institutions should also be examined.

It is revealed that the dimensions and magnitude of agricultural marketing institutions are changing. Co-operative marketing has been successful partially and can be impressed further, provided a favorable environment is created through a change in the co-operative policy. New marketing institutions, such as farmers' associations, NGOs and *ryot bazars*, emerging in certain pockets, are yet to make a visible dent. Contract marketing and futures trading in selected commodities have been advocated to link the domestic and international markets. By and large, it is clear that there is lack of farmers' participation in the management and regulation of market institutions. The government support has been counter-productive and restrictive in true decentralized functioning of these institutions.

Considering the persistent financial crunch faced by the government, one cannot foresee an increase in public investment for the development of market infrastructure. Therefore, the government should come out with a comprehensive policy framework to encourage private investment under the systems of 'build, own and operate' (BOO), 'build, own, operate and transfer' (BOOT), etc. for the development of rural marketing infrastructure.

References

Bhalla, G. S. 1991. Some issues in agricultural marketing in India. *Indian Journal of Agricultural Marketing* 5(2): 127-137.

Chand, Ramesh. 1999. Agricultural marketing: issues and challenges (Rapporteur's Report). *Indian Journal of Agricultural Economics* 54(1): 46-47.

Chengappa, P. G. and B. M. Sashidhara. 1999. Performance of agricultural marketing co-operatives in Karnataka. Bangalore: University of Agricultural Sciences (mimeo).

Cummings, Jr. and W. Ralph. 1967. *Pricing efficiency in the Indian wheat market*. Delhi: lmplex.

Dandekar, V. M. 1994. *The Indian economy 1947-92*, Vol. l: *Agriculture*. New Delhi: Sage Publication.

George, Blyn. 1973. Price series correlation as a measure of market integration. *Indian Journal of Agricultural Economics* 27(2): 56-59.

GoI. 1994. *Report of the committee on forward markets.* Delhi: Government of India.

Hiremath, K. C., L. B. Hugar and S. T. Patil. 1987. *Economic efficiency of rural marketing system in northern Karnataka- a study of Jowar.* Paper presented at the national seminar on Dimensions of Rural Marketing held at IDS, Mysore.

Johl, S. S. 1989. Role of market clearance in promoting diversified agricultural growth in India. *Indian Journal of Agricultural Marketing* 3(2): 89-90.

Jasdanwala, Z. 1966. *Marketing efficiency in Indian agriculture.* Bombay: Allied Publishers.

Lele, U. 1971. *Foodgrain marketing in India: private performance and public policy.* Ithaca, New York: Cornell University.

Moore, J. R., S. S. Johl and A. M. Khusro. 1973. *Indian foodgrain marketing.* Delhi: Prentice Hall of India, Pvt. Ltd.

Subrahmanyam, K. V. 1988. Marketing of horticultural crops in Karnataka: present status and future requirements. *Indian Journal of Agricultural Marketing* 2(l): 16-30.

Sujatha, M., P. G. Chengappa and P. C. Ravi. 1989. Performance of market intermediaries in a regulated market - a case study. *Indian Journal of Agricultural Marketing* 3(l): 1-10.

Thakur, J. S. 1974. Pricing efficiency of the Indian apple market. *Indian Journal of Agricultural Economics* 29(4): 61-74.

Thakur, O. S., S. K. Chauhan and K. D. Sharma. l988. Efficiency and weakness of regulated markets. *Indian Journal of Agricultural Marketing* 12(l): 48-59.

19

Agricultural Marketing and Trade in India: An Institutional Perspective[1]

Ramesh Chand

Institutional intervention of some kind in agricultural marketing and trade in India has a long history. The strongest intervention began in the mid-1960s, which has been very closely associated with the adoption and spread of the new agricultural technology. Massive food shortages and near famine-like conditions in some parts of the country due to successive poor harvests resulted into dependence on food aid and costly food imports. This compelled the government to follow the policy of self-sufficiency in food production. This coincided with the advent of the high yielding varieties of wheat and rice, which later came to be known as the 'green revolution'. Adoption of these new varieties involved use of modern inputs and investments on the part of the farmers. For this, it was necessary to create adequate incentives through favorable price environment for the farmers. To achieve this objective, two new institutions, namely the Agricultural Prices Commission (APC) and the Food Corporation of India (FCI) were created which have been dominating India's food administration ever since their establishment (Broca 1999). Subsequently, the government intervention has been expanded in terms of coverage of commodities, institutions and regulatory measures. This paper reviews various kinds of institutional interventions in agricultural marketing and trade since the mid-1960s, which marks the beginning of technological revolution in Indian agriculture. It also discusses the institutional change needed to maximize gains from technological change in the context of liberalization of economic environment.

[1] This paper draws heavily from the references listed at the end, particularly the work of Dr S S Acharya.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

Administered Prices

To encourage the adoption of new technology, stable and remunerative prices constitute the foremost factor. The Government of India has set up APC in 1965 to advise the government on a regular basis for evolving a balanced and integrated price structure. While formulating such a policy, the Commission was required to keep in view (a) the need to provide incentive to the producers for adopting the new technology and maximizing production, and (b) likely effect of the price policy on cost of living, level of wages and industrial cost structure. This policy was very effective in encouraging adoption of new technology in the areas well endowed with irrigation, and helped in raising the production of wheat and rice. This made the situation on foodgrain front comfortable, as a sort of balance between demand and supply which was in sight by 1980 (Acharya 2001).

With the easing of pressure on foodgrain production, it was appropriate to follow the policy that leads to balanced allocation of resources towards various enterprises. Thus, terms of reference of the APC were changed in 1980 to shift emphasis from maximizing the production to developing a production pattern consistent with overall need of the economy. The Commission was also renamed as the Commission for Agricultural Costs and Prices (CACP), mainly to satisfy the demand from farmer groups that the Commission should fully account for the cost of production while making recommendations on support/procurement prices.

Looking at the achievement of the policy of administered prices in relation to the target set for it, following conclusion seems evident. The price policy has been very successful in providing incentive for adoption of new technology of rice and wheat as set out initially, but it failed to induce changes in production pattern consistent with overall needs of the economy. This happened as both the price policy and technological change remained biased towards rice and wheat. A simple indicator of this is that while the country is now having buffer stock exceeding one-third of total output of rice and wheat, it is deficit in edible oil to the extent of more than 40 per cent and in pulses to the extent of 6-10 per cent.

Policy instrument and commodity coverage

The most significant instrument of agricultural price policy has been assurance of minimum support price (MSP) which serves as a surety to farmers.

If the market price falls below the MSP or the guaranteed level, the government is under obligation to procure the produce offered for sale at the guaranteed price. Commodities covered under the MSP system are: paddy (rice), wheat, sorghum, pearl millet, finger millet, maize, ragi, barley, chick pea, pigeon pea, moong, urad, rapeseed and mustard, toria, groundnut, sunflower, soybean, sesamum, nigerseed, cotton, jute, copra and tobacco, while sugarcane is covered under the statutory minimum price (SMP) system. It is illegal for anybody to purchase the commodity at a price less than the MSP when the commodity is covered under the system of (SMP). Apart from major commodities, support price has been extended to some other commodities like onion, ginger, potato, castor seed, and some fruits in a few states under the market intervention scheme.

It is pertinent here to mention that mere announcement of MSP or SMP does not automatically guarantee that market price would not fall below MSP or SMP. According to various *Reports of the Commission for Agricultural Costs and Prices*, there are instances of market prices ruling below MSP in some markets for certain crops where government procurement agencies were absent to procure the produce. The experience shows that institutional intervention in ensuring the guaranteed price is effective only in those regions and crops where government or public sector agencies procure the produce in a big way. For instance, official agencies procure wheat and paddy in Punjab and Haryana on a large scale, and if the price of maize or sunflower in these states falls below the MSP, there is hardly any procurement by the official agencies. Similarly, if wheat price in the market say in West Bengal or Bihar, falls below the MSP, there is no intervention by the official agencies. The purpose of these illustrations is to bring home the point that MSP without an effective procurement mechanism does not guarantee that prices would not fall below the floor set by the government.

Implementation of MSP shows that rice and wheat are the main beneficiaries of the policy while cotton, at large and edible oilseeds and pulses, in some pockets, have also benefited from the policy. In recent years, there have been frequent reports from the states of Orissa, Madhya Pradesh and Bihar about distress sale of rice and maize below the MSP. These states, besides being late adopter of new technology and food deficit at aggregate state level, have several growth pockets with surplus foodgrains. These pockets are in the first stage of green revolution and agricultural development, when the private trade and market institutions are not in place to provide incentive to encourage

adoption of new technology and hence, accelerate output growth. Agriculture growth would get a serious setback in such areas if institutional support in the form of guaranteed price is not provided.

One of the serious criticisms of the price support policy has been that it has mainly benefited rice and wheat and, even in these crops, it has favored the regions which were early adopter of the new technology. There is a need to discuss how MSP can be made effective in various commodities and in major producing regions. As it is not feasible to ensure that prices would not fall below MSP in any commodity, can we devise some criteria as to what crops should be covered under MSP? It is suggested that the crops which can be considered as price leader or the crops for which technological breakthrough is imminent ought to be covered under the MSP, and other candidates for support price could be the crops grown in high risk environment (Vyas 2000). Vyas further adds that in all these cases, MSP should be treated as a transient measure, *i.e.* until we are able to have a viable crop insurance scheme and/or forward trading arrangements.

Due to changes taking place in consumption basket of food, there is a lot of emphasis to develop technologies that promote diversification of agriculture sector. Can we think of price interventions that encourage agricultural diversification? There is also a need to discuss criteria on which MSP should be based in the changing context. The popular perception is that MSP is determined based on cost of production. When the emphasis of production is shifting from food security to market-led production, is it justified to base MSP on the cost of production. Further, there are concerns relating to definition of the cost of production on which MSP should be based. Some of the cost concepts like "Cost C3" are such that the price based on those is said to represent "guaranteed profitable price" rather than "minimum support price".

Direct Price and Market Interventions

According to Acharya (2001), direct market intervention refers to direct entry of public agencies in market with a view to influence market structure, conduct and performance. Some of the forms of direct market intervention currently in vogue in India are: (i) maintenance of stock of rice and wheat, (ii) distribution of cereals and sugar at prices lower than market

prices, and (iii) open market operations (procurement and sale) by the public agencies.

To ensure implementation of the guaranteed price or MSP, stabilize prices and feed the public distribution system (PDS), government procures large quantities of foodgrains through FCI and other official agencies from market at the procurement price, which is invariably same as the MSP. This blurring of MSP and procurement price has come under severe criticism. It is argued that in order to procure the required quantities for PDS and buffer stock, such market conditions are created wherein prices are artificially forced down to the level of procurement prices by the measures like putting stock limit, denial of credit, not making available railway wagons to private sector for transport of foodgrains and restrictions on movement of commodities (Johl 1995). The second consequence of this is that government is forced to buy whatever produce comes in the market, irrespective of its requirements. Thus, the government has to carry excessive stock which is again sold back after some time through free sale in the market. In this process, the government has to bear the losses due to quantity and quality deterioration and inefficient handling and transportation of the produce by the public agencies. It is thus argued that the procurement price and MSP should be different. Under this kind of dispensation, the government should announce MSP which covers only the variable cost plus a small margin and protect farmer against seasonal price slumps due to gluts. The procurement of foodgrains required by government should be done at open market price determined by supply and demand in a distortion free environment. This would have the advantage of buying only the needed quantity, whereas, currently the government has been buying whatever is offered for sale (Mahendra Dev 1997).

Foodgrains procured by the public agencies are sold either through the PDS or in open market. This system has attracted lot of criticism in the recent years, mainly on the ground of efficiency and heavy losses being incurred by the public agencies (Gulati et al. 2000; and World Bank 1999). The procurement, distribution, and buffer stocking programs of the government are reported to have had negative impact on private foodgrain marketing, undercutting its potential contribution to food security in the long run. This has also discouraged modernization of marketing, resulting into losses and inefficiencies. It is proposed that the government should use regulatory mechanism only when price movements are outside the desired price band representing width between the

ceiling and floor price, which permits reasonable marketing margin for profitable public sector operations (World Bank 1999). The Expenditure Reforms Commission (ERC) set up by the government, also recommended that the state governments and private trade should be encouraged to enter into procurement, trade and export of foodgrains through an assurance of continuity of policy over the next 15 years (GOI 2001). There are indications that the government is in agreement with the suggestions of the World Bank study and ERC and necessary changes in the policy to encourage private sector participation in foodgrains trade are on the anvil.

How this shift from public sector dominance in foodgrain trade to private sector would affect farm-level prices and price stability? What is the appropriate price band beyond which government should intervene in the market? What are the implications of this band for consumers? These questions need to be discussed to understand the implications of proposed changes in the government interventions in grain trade.

Estimates of price band prepared for a study show that the existing structure of statutory charges/taxes, and transport and other costs, retail price for wheat should be higher than the farm harvest price by 53 per cent in the surplus states and by about 100 per cent in the deficit states to attract the private trade (Table 1). Similarly, the band suggests that retail prices of rice should be 149 to 213 per cent higher than the farm harvest price of paddy to attract private trade (see Table 2). How would these increases affect consumers? Are there ways to reduce the price spread between producers and consumers?

According to the World Bank study (1999), there is a considerable scope to reduce the price spread by modernization of storage, handling, processing and other processes involved in foodgrains marketing. Two major items of price spread are: statutory charges and transport cost. It has been observed that the proportion of produce sold through the regulated markets is on decline and there is a growing tendency to sell produce through informal markets to avoid different charges and taxes of the regulated markets (Maheshwari 1998). This is also happening because of the declining credibility of the regulated markets to provide a competitive price to producer sellers.

Market charges and taxes vary from state to state. There is a need to rationalize these charges wherever these are excessive. It should be ensured that collections through such charges are spent for the development and conduct

Table 1. Month wise ratio of retail price based on band for wheat and farm harvest prices in Punjab during 2000-01

Farm harvest price of wheat Rs 582/quintal

State	April -June	July	August	Septem-ber	Octo-ber	Novem-ber	Decem-ber	Janu-ary	Febru-ary	March
Andhra Pradesh	1.86	1.90	1.92	1.94	1.96	1.98	2.00	2.02	2.04	2.06
Assam	1.98	2.02	2.04	2.06	2.08	2.10	2.12	2.14	2.16	2.18
Bihar	1.80	1.84	1.86	1.88	1.90	1.92	1.94	1.96	1.98	1.99
Gujarat	1.71	1.75	1.77	1.79	1.82	1.84	1.86	1.88	1.90	1.92
Haryana	1.36	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60
Himachal Pradesh	1.36	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60
Jammu & Kashmir	1.78	1.82	1.84	1.86	1.88	1.90	1.92	1.94	1.96	1.98
Karnataka	1.72	1.76	1.77	1.79	1.81	1.83	1.85	1.87	1.88	1.90
Kerala	1.85	1.89	1.91	1.93	1.95	1.97	1.99	2.00	2.02	2.04
Madhya Pradesh	1.55	1.59	1.60	1.62	1.64	1.66	1.68	1.70	1.72	1.74
Maharashtra	1.87	1.92	1.94	1.96	1.98	2.00	2.02	2.04	2.06	2.08
Orissa	1.58	1.62	1.64	1.65	1.67	1.69	1.71	1.73	1.75	1.77
Punjab	1.36	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60
Rajasthan	1.30	1.38	1.40	1.42	1.44	1.46	1.48	1.50	1.52	1.54
Tamil Nadu	1.81	1.85	1.87	1.89	1.91	1.93	1.94	1.96	1.98	2.00
Uttar Pradesh	1.55	1.38	1.40	1.41	1.43	1.45	1.47	1.49	1.51	1.53
West Bengal	1.69	1.73	1.74	1.76	1.78	1.80	1.82	1.83	1.85	1.87
Goa	2.05	2.09	2.12	2.14	2.16	2.18	2.20	2.22	2.24	2.26
Delhi	1.53	1.57	1.59	1.61	1.63	1.65	1.67	1.70	1.72	1.74

Source: Chand (2002a).

Table 2. Month wise ratio of retail price based on band for rice and farm harvest price of paddy in Punjab

Farm harvest price of paddy fine grade: Rs 520/quintal

State	October December	January	February	March	April	May	June	July	August	September
Andhra Pradesh	2.72	2.75	2.78	2.81	2.84	2.87	2.90	2.93	2.96	2.99
Assam	2.86	2.90	2.93	2.96	2.99	3.02	3.05	3.08	3.11	3.14
Bihar	2.53	2.56	2.59	2.62	2.65	2.68	2.71	2.74	2.77	2.80
Gujarat	2.60	2.63	2.66	2.69	2.73	2.76	2.79	2.82	2.86	2.89
Haryana	2.17	2.25	2.28	2.32	2.35	2.38	2.41	2.44	2.47	2.50
Himachal Pradesh	2.39	2.42	2.46	2.49	2.52	2.55	2.58	2.61	2.64	2.67
Jammu & Kashmir	2.65	2.68	2.71	2.74	2.77	2.80	2.83	2.87	2.90	2.93
Karnataka	2.52	2.55	2.57	2.60	2.63	2.66	2.69	2.72	2.74	2.77
Kerala	2.69	2.72	2.75	2.77	2.80	2.83	2.86	2.89	2.92	2.95
Madhya Pradesh	2.31	2.34	2.37	2.39	2.42	2.45	2.48	2.51	2.54	2.57
Maharashtra	2.52	2.55	2.58	2.61	2.64	2.67	2.70	2.73	2.76	2.79
Orissa	2.37	2.40	2.43	2.45	2.48	2.51	2.54	2.57	2.60	2.63
Punjab	2.17	2.25	2.28	2.32	2.35	2.38	2.41	2.44	2.47	2.50
Rajasthan	2.28	2.31	2.34	2.37	2.40	2.43	2.46	2.49	2.52	2.55
Tamil Nadu	2.79	2.82	2.85	2.88	2.91	2.94	2.97	3.00	3.03	3.07
Uttar Pradesh	2.10	2.17	2.20	2.24	2.27	2.30	2.33	2.36	2.39	2.42
West Bengal	1.96	2.04	2.06	2.09	2.12	2.15	2.18	2.20	2.23	2.26
Goa	2.70	2.73	2.76	2.79	2.82	2.85	2.88	2.91	2.94	2.97
Delhi	2.27	2.30	2.33	2.36	2.39	2.42	2.45	2.48	2.51	2.54

Source: Chand (2002a).

of markets rather than spending on facilities and high salaries for market staff and office bearers of the State Marketing Boards.

There are formal as well as informal restrictions on inter-state movement, stocking and trading of agricultural produce. Even when all the requirements are fulfilled, there are instances of harassment and rent seeking. The consequences of this are: slow movement of produce from surplus to deficit markets, low market integration, depressed price in producing areas and high prices in consuming areas.

Levy System

Under the provision of levy, millers are required to sell a part of rice and sugar milled by them to the government at a price derived from the procurement price. The levy on rice is as high as 75 per cent in the agriculturally progressive northern states. Millers often complain that after contributing as high as three-fourths of rice at a price which is often below the open market price, they are left with small produce to run their business. In reality, the levy component of rice is an important source of economic cost, food subsidy and inefficiency of FCI in rice marketing. What the millers actually do is that they retain best grade rice with them and supply inferior, broken and adulterated rice to FCI, which would sell at a very low price in open market. Except at a subsidized price under PDS, such stock would not be lifted by states for their consumers. Same is the case of custom milling of paddy. In the case of sugar, level of levy has already been reduced to 15 per cent and the government has indicated that it would go for a complete decontrol of sugar industry. This should improve efficiency and competitiveness of the Indian sugar industry.

Buffer Stock

India has been following a policy of maintaining buffer stock to meet the PDS requirement and to stabilize the prices in the wake of year-to-year fluctuations in production. Maintenance of buffer stock involves heavy cost on the public exchequer and suggestions have been made to explore other alternatives for price stabilization and food security. Some scholars find that the option of

variable levy is far superior than the buffer stock in stabilizing prices under liberalized trade (Jha and Srinivasan 1999). Whereas some studies find that imports turn out to be much costlier than what appears from international price when a country of India's size go for import of food commodity to meet its deficit (Chand 2000).

As per the recommendations of ERC, a national food security buffer stock of 10 million tonnes, comprising 4 million tonnes of wheat and 6 million tonnes of rice, should be maintained at all times. The Commission further recommends that objective of the procurement policy should be to maintain food security buffer of 10 million tonnes and availability of 21 million tonnes per annum for distribution through the PDS. This way total buffer stock should not be more than 21 million tonnes.

Such restrictions on buffer stock and proposal to reduce the role of FCI in procurement for the PDS might affect enforcement of MSP. In such situations, where should FCI concentrate its operations? Should it continue to procure needed quantity from the traditional regions from where it has been buying earlier, or should it shift focus to newly emerging growth pockets. This is a debatable issue but in relation to technology impact, one can suggest that FCI should focus in such regions where private trade and marketing infrastructure are weak and underdeveloped.

Public Distribution System

The Public Distribution System (PDS) is an integral part of food management policy of the government of India. It involves distribution of foodgrains through a countrywide network of fair price shops. Price stability for consumers in urban and food deficit areas was the focus of PDS in the early years. Of late, PDS has become a permanent feature of the strategy to control prices, reduce price fluctuations and achieve the objective of equity through supply of subsidized foodgrains to vulnerable and weaker sections of the society.

The PDS is run by the state governments, and the central government supplies foodgrains procured by FCI to various states for this purpose. In the recent years, level of procurement has far exceeded the offtake for PDS, resulting into accumulation of vast stocks with the government.

The PDS has attracted much criticism. It was alleged to have urban, regional and class bias. It was also found that the rich and the middle classes benefited more from the PDS. Also, the PDS is not a cost-effective way of income transfer to the poor as compared to other nutrition programs or wage employment programs (Guhan 1996; and Radhakrishna and Rao 1997). Available data suggest that many of the poor states (e.g. Bihar, Uttar Pradesh and Madhya Pradesh) choose to draw a much lower share of PDS than what they are entitled to (World Bank 1997). To overcome the problems relating to targeting and leakage, several changes have been initiated to make PDS serve the target population better.

State Trading and Parastatal Organizations

Several public sector agencies are involved in the marketing and procurement of agricultural produce. Prominent among them are: FCI, the Cotton Corporation of India (CCI), the Jute Corporation of India (JCI), the National Agricultural Co-operative and Marketing Federation (NAFED) and the National Dairy Development Board (NDDB). At the state level, the agencies involved in agricultural marketing and processing are: the State Agricultural Marketing Federation, Board, Corporation and other co-operative institutions. Some of them are: the Punjab State Agricultural Marketing Federation (MARKFED), the Punjab Sugarcane Marketing Federation (SUGARFED) and the Punjab Agro-Industry Corporation in Punjab, the Haryana State Agricultural Marketing Federation (HAFED) in Haryana, the Himachal Pradesh Horticultural Produce Marketing and Processing Corporation (HPMC) in Himachal Pradesh, Jammu and Kashmir Horticultural Produce Marketing and Processing Corporation (JKHPMC) in Jammu and Kashmir, and the Central Arecanut and Cocoa Marketing and Processing Cooperatives (CAMPCO) in Kerala and Karnataka.

Among all these agencies FCI has remained in the center stage of government intervention in agricultural marketing due to scale of its operation and its role in food security. Though this agency has played a significant role in ensuring guaranteed price and hence adoption of improved technology in the green revolution region, its cost of operation and efficiency have remained a subject of criticism and are seen as the main factors for mounting food subsidy in the country. Some studies find that FCI cannot be blamed for high cost of

foodgrain handling and distribution as economic cost of its operation turns out to be lower than in the private trade if latter pays same statutory charges and serve the same purpose which the former has been doing (Acharya 2001). Similarly, Swaminathan (1999) finds that the operational costs of FCI were justified and that this organization is vital for food security of the country. In contrast, some other studies conclude that there are several negative effects of the government's foodgrain marketing policy and operation of FCI which have been found to be increasingly costly and inefficient. Technical and managerial inefficiencies in the FCI operations are said to be responsible for its high functioning costs (World Bank 1999).

Though one can justify economic cost of FCI, this justification does not include implicit value of quality deterioration of produce at various levels. This happens due to purchase of lower than specified grade of produce, weight manipulations at the point of purchase and dispatch, excessive charges of the contractors, and adulteration and supply of poor quality stuff under levy and custom milling of rice. Deterioration in the value of produce resulting from such practices is the main source of leakage in the FCI operations and is not reflected in the cost or price calculations. The produce gets sold because it is offered to various states at a subsidized price and the difference between economic cost and issue price is shown as food subsidy. This way the inefficiency of FCI is concealed. One way to ascertain and quantify this kind of leakage is by comparing market value of PDS supply with ruling market price of FAQ produce. If the grains supplied through PDS can sell at the ruling market price, then there is no quality deterioration. If it sells at a price lower than the market price, the difference represents allowance for quality deterioration or leakage. The studies that justify operational cost of FCI, do not reckon this aspect. If such leakage is accounted for separately, food subsidy bill would go down significantly and we feel it is not difficult to check such leakages.

The inefficiency and high operational cost of FCI are often used to make the case for winding it up and to pave the way for greater participation of private sector. In this context it is worth mentioning that in the absence of public agencies, private trade in grains may turn out to be exploitative and what now goes as inefficiency of FCI would go as excessive profit of the private trade. Therefore, the public agencies should be retained and they should plan their operations in such a way so as to control exploitative tendencies of the private trade. However, the area of operation of the parastatals should be reduced and

their efficiency should be improved by modernization of their operations on scientific lines and by professionalization of their management.

Market Regulations

There are several government regulations like the Essential Commodities Act (1955), stock limit, credit control, etc. which were formulated to deal with scarcity situations and to curb activities of the hoarders. These regulations need to be modified to encourage participation of private players in agricultural trade. The idea is not to allow free ride to the private sector but to allow more room for market manoeuvring. Licensing provisions for different activities should also be liberalized to increase the number of market players. The government has indicated in the recent budget to review the Essential Commodities Act and to remove many restrictions on the free inter-state movement of agricultural produce and also on storage and stocking of such commodities. It is also proposed to reduce the number of commodities declared as essential under the said act and to bring their number down to the minimum required (GOI 2001a).

Based on a comprehensive study of the domestic market policies, Acharya (2001) proposed phasing out of the following market regulations: (a) Levy on rice and sugar mills, (b) Statutory rationing of foodgrains in Calcutta, (c) Monopsony procurement of raw cotton in Maharashtra, (d) System of state advised prices of sugarcane, (e) Imposition of stocking limit, and (f) Inter-state movement restrictions. As noted above, some reforms on these lines are on the anvil.

External Trade

Agricultural exports and imports in the country till the early 1990s were strictly regulated through the quantitative restrictions (QRs) like quotas and licenses or canalization through some trading organizations or combinations of them (Nayyar and Sen 1994). With the new trade policy initiated in 1991, three major changes were effected in export-import sector of agriculture. One, canalization of trade was abandoned and now the government does not determine the value or nature of the import or export, except export of onion and import of

cereals, pulses and edible oils. Two, most of the quantitative restrictions on agricultural trade flows were dismantled. Three, tariff rates on imports were also reduced. Agricultural trade has been further liberalized as per our commitment to the World Trade Organization (WTO), and quantitative restrictions on import and export of most of the commodities have already been removed, except in the case of cereal imports.

While QRs and canalization were very effective in insulating domestic prices from instability in international prices, the domestic prices are going to be affected by the movement in the international prices in a liberalized trade regime. How would this affect the prices received by the producers? Behavior of international agricultural prices is such that they become very high sometimes and go very low sometimes. These prices generally move on a cyclical path (Chand 2002b). A comparison of these prices with domestic prices shows that sometimes trade offers opportunity to sell at a very high rate and sometimes it forces the prices to go very low. Thus, unregulated trade would make domestic prices highly unstable, particularly if international prices have more volatility than domestic prices.

Compared to the international prices, the domestic price of rice, wheat, sugar and soybean oil have exhibited far lower instability during the last three decades while sorghum and maize have presented a mixed picture. This is remarkable because before 1970, the domestic prices were much more volatile than the international prices, except in the case of sugar (Table 3). Main reason for the domestic prices becoming more stable than the international prices after 1970 is the strong institutional interventions in the form of procurement, buffer stock, issue price, etc. It follows from our results that the government interventions have been quite effective in insulating the domestic prices from effect of instability in international prices. There is also a clear indication that unregulated and free trade would impart instability to domestic prices. As various studies show that price risk has negative impact on supply responsiveness of agriculture in developing agriculture, increase in price instability resulting from free trade would have an adverse impact on supply response and adoption of new technology. Therefore, there is a strong case to regulate international prices through appropriate tariff so that farmers face a stable price environment. Since under the WTO obligations temporary imports and price shocks can't be checked through QRs, there is a need to develop mechanism to regulate unwanted imports and exports. While domestic producers must compete with stable level of international prices, they need to be protected against volatility.

Ensuring a stable price environment would require imposing tariff on import as well as export whenever the international price goes below or above a certain band. Such a band can be determined based on the impact of international prices on the welfare of producers and consumers. For example, when international prices start rising, it would lead to more export and raise domestic prices, which is beneficial to producers but adverse to consumers. In such cases, upper band of international price can be taken as that beyond which adverse impact of export on consumers exceeds positive impact on producers. Similarly, when international prices go very low, it results in more imports, which are beneficial to consumers but have adverse impact on producers. In this case, lower band in international price can be taken as that below which adverse impact on producers outweighs positive impact on consumers leading to loss in net social welfare. Deviation in international prices outside this band needs to be appropriately tariffied to ensure that domestic producers and consumers are subjected to international price change in a specified range. To regulate export and import, this kind of mechanism is neither protectionist nor discriminatory against producer. In fact, WTO commitments do not prevent any country from adopting such a mechanism.

It could be seen from Table 4 that long run average price of wheat works out to be $ 148 per tonne, while long run price of fine and poor grade rice works out to be $ 286 and $ 199 per tonne, respectively. It also shows that after 1998 the prices of most of the agricultural commodities turned below the trend and this is the main reason for Indian market becoming attractive for imports. The present phase is only a part of the cyclical behavior of international prices and it does not characterize long-term trend of international prices. One way to provide protection against such instability is to impose variable tariffs, which restore current import prices to their long-term trend. This level of tariff can be taken as:

$$RVT_t = (LTIP - AIP_t)/AIP_t \; ; \quad \text{for } AIP < LTIP$$

Where, RVT_t is rate of variable tariff in time t, LTIP is long-term international price, and AIP_t is actual international price or price at which quantity is traded in period t.

Corresponding to the prices of year 2000, the required tariff to protect against volatility in international prices works out as under: Wheat: 34.8%; fine rice: 15.2%; broken rice: 42.0%; sugar: 52.2%; maize: 33.7%; sorghum: 28.5%; and soybean oil: 50.6%.

Table 3. Instability index of domestic and international prices of selected commodities, 1951-1999

Particular	1951-60	1961-70	1973-80	1981-90	1991-99
Wheat					
International price, $	5.63	6.49	28.72	13.5	15.83
International price, Rs	5.63	11.11	29.98	16.14	19.13
Domestic price, Rs	11.16	10.98	14.44	5.83	6.25
Rice					
International price, $	7.44	13.6	38.22	19.37	10.73
International price, Rs	7.44	19.19	39.66	20.94	15.16
Domestic price, Rs	11.1	8.21	13.19	5.27	4.15
Sorghum					
International price, $	9.32	6.01	20.45	15.43	15.11
International price, Rs	9.32	13.32	22.29	17.83	18.56
Domestic price, Rs	29.64	16.43	12.79	12.62	20.57
Maize					
International price, $	6.63	7.96	22.08	17.95	16.69
International price, Rs	6.63	14.47	24.05	20.59	19.1
Domestic price, Rs	17.87	20.43	23.97	10.45	20.43
Soybean					
International price, $	11.03	19.10	35.71	24.51	17.09
International price, Rs	11.03	25.16	37.56	26.74	19.55
Domestic price#, Rs	22.25	13.95	20.79	11.84	8.12
Sugar					
International price, $	22.01	52.24	60.76	37.29	17.96
International price, Rs	22.01	44.19	62.90	36.72	15.85
Domestic price, Rs	7.11	4.51	13.87	7.11	8.56
Exchange rate instability	0	13.76	3.97	4.28	9.85

Refers to price of edible oils.

Note: 1. International prices refer to: wheat US HRW Fob Gulf, rice 5% broken Fob Bangkok, sorghum US 2 Yellow Fob Gulf, maize US 2 yellow Fob Gulf, soybean Fob Dutch, and sugar ISA price Fob Carribean port.

2. Instability during the decade of 1970s is estimated for 1973 to 1980, as first two years witnessed sharp break in the price series.

Table 4. International prices of selected agricultural commodities during 1990s

Year	Rice Thai 5% Fob Bangkok	Rice Thai A1 Fob Bangkok	Wheat HRW US Gulf ports	Rapeseed/ mustard Oil Fob Dutch	Soybean oil Fob Dutch	Sorghum US2 Yellow Fob gulf	Maize US2 Yellow Fob gulf	Sugar Carribean Port
1991	294	198	129	454	479	105	108	198
1992	268	180	152	429	479	103	104	200
1993	237	161	141	480	479	99	102	221
1994	270	186	151	616	635	104	108	267
1995	321	268	178	625	566	119	124	293
1996	338	234	210	551	555	150	165	264
1997	302	214	162	565	565	110	117	251
1998	305	215	127	627	628	99	102	197
1999	274	192	117	427	423	84	85	143
Prel. 2000	248	140	109	342	342	82	82	
Long run average								
$/tonne	286	199	148	512	515	105	110	226
Rs./quintal#	13143	9145	6790	23534	23695	4849	5046	10394

At exchange rate of Jan. 2001, 1 US $= Rs 46

Timely imposition of tariff is as important as the tariff itself to check undesirable imports. Recent experience shows that such measures are taken when enough damage has already been done. A cell should be created in the Ministry of Commerce or Agriculture to constantly monitor the international prices and to suggest timely intervention to check adverse impact of their volatility on the domestic market. In the emerging era of free trade, the need to monitor and forecast the international prices and output is as important as is being done for the domestic prices and production of some crops in the country.

Beside tariffs, other mechanisms also need to be evolved to safeguard against the price volatility and to ensure smooth flow of export. One such mechanism could be setting up of an international price stabilization fund. When international prices are high and profitable for export, then export can be taxed to contribute to this fund. On the other hand, when international prices are low and not attractive for export, this fund could be used to provide export subsidy in the form of transport/freight or other means. To manage such funds country should encourage setting up of commodity boards as exist in several developed countries.

References

Acharya, S.S. 2001. Domestic agricultural marketing: policies, incentives and integration. In *Indian agricultural policy at the crossroads,* S.S. Acharya and D. P. Chaudhri (eds), Jaipur: Rawat Publications.

Broca, Sumiter. 1999. Food security, trade in foodgrains and trade liberalization: the case of India. Paper presented at the NCAER-IEG-World Bank Conference on *Reforms in the Agriculture Sector for Growth, Efficiency, Equity and Sustainability*, April 15-16, 1999, Delhi.

Chand, Ramesh. 1999. Liberalization of agricultural trade and net social welfare: a study of selected crops. *Economic and Political Weekly* 34(15): A153 – A160.

Chand, Ramesh. 2000. Trade liberalisation, agricultural prices and net social welfare in India. Keynote paper presented at the Third Asian Conference of Agricultural Economists, Jaipur, Oct. 18-20.

Chand, Ramesh. 2002. Government intervention in foodgrain markets in the new context. New Delhi: National Centre for Agricultural Economics and Policy Research (Mimeo).

Chand, Ramesh. 2002. *Trade liberalization, WTO and Indian agriculture*. New Delhi: Mittal Publications.

Government of India. 2001a. Budget speech of the Finance Minister, February 28, New Delhi.

Government of India. 2001b. *Economic Survey 2000-01*. New Delhi: Ministry of Finance.

Guhan, S. 1995. Social expenditure in the union budget, 1991-96. *Economic and Political Weekly* 30: (18-19), May 16-13.

Gulati, Ashok, S. Kahkonen and Pradeep Sharma. 2000. The Food Corporation of India: successes and failures in Indian marketing. In *Institutions, incentives and economic reforms in India*, Satu Kahkonen and Anthony Lanyi (eds). New Delhi: Sage Publications.

Jha, Shikha and P.V. Srinivasan. 1999. Food security through price stabilization: buffer stocks vs variable levies. *Economic and Political Weekly* 34(46 &47): 3299-3304.

Johl, S. S. 1995. Agriculture sector and new economic policy. *Indian Journal of Agricultural Economics* 50(3): 473-487.

Mahendera Dev, S. 1997. Subsidies and investments in Indian agriculture: issues and perspectives. Project No. 21, *Subsidies and Investments in Indian Agriculture*, Conference Papers. New Delhi: Rajiv Gandhi Institute for Contemporary Studies.

Maheshwari, Asha. 1998. Regulation of markets, growth of production and market arrivals – statewise analysis of rice. *Indian Journal of Agricultural Economics* 53(3): 351-358.

Nayyar, Deepak and Abhijit Sen. 1994. International trade and agricultural sector in India. In *Economic liberalization and Indian agriculture*, G.S. Bhalla (ed). New Delhi: Institute for Studies in Industrial Development.

Radhakrishna, R. and Subba Rao. 1995. *Targeting the public distribution system*. Washington, D.C.: World Bank (mimeo).

Swaminathan, Madhura. 1999.Understanding the costs of Food Corporation of India. *Economic and Political Weekly* 34(52): A121-A132.

Vyas, V. S. 2000. Agriculture: the second round of reforms. *Dantwala memorial lecture* delivered at the 83rd Annual Conference of the Indian Economic Association, Jammu.

World Bank. 1997. *India: achievements and challenges in reducing poverty*. Country study. Washington, D.C.: The World Bank

World Bank. 1999. *India foodgrain marketing policies: reforming to meet food security needs*, Vols. I & II, Report No. 18329-IN. Washington, D.C.

20

Institutional Aspects of Agro-Processing and Value Addition for Rural and Small Farmer Development in India: A Study of the Issues and Lessons[1]

Vasant P. Gandhi

Introduction

Agro-industries have been given high priority in India because of their significant potential for the economic development of the rural population and small farmers. The focus on village-based agro-industries was started by Mahatma Gandhi during India's freedom movement. Even today, the agro-industries are looked at for their important role in bringing value-addition to agricultural output, and increasing rural incomes and employment (Planning Commission 1996). However, a large number of difficulties and bottle-necks, such as raw materials, supply-chain, and market constraints, exist in their growth (Srivastava and Patel 1994; Goyal 1994; and CII-Mckinsey 1997). Is this priority on agro-industries well placed? What kind of institutional and organizational arrangements/models are appropriate for overcoming the problems of rural masses, and maximizing their contribution to the rural and small farmer development?

The freedom movement up to the 1940s under the leadership of Mahatma Gandhi included particular focus on encouragement of agro-based village industries. The objective was to enhance involvement of the masses of rural people in the development process, and the freedom movement, and to reduce their external dependence (Goyal 1994). The ideology was economic, social and political. Though, the model provided strong development linkage with the

[1] The paper is based in part on research by Vasant P Gandhi, Gauri Kumar and Robin Marsh on a related topic.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

rural people, it failed later because it became a blanket basis for the so-called nationalists to favor the less efficient techniques of production and oppose modern industry, and became incompatible with market preferences. The experience revealed the limitations of such an approach.

Between 1950 and 1980, the policy towards agro-industries was dominated by the thinking of the former Prime Minister, Jawahar Lal Nehru and his economic think-tank, led by Mahanalobis, who argued that India needed large capital goods industries for modernization and growth. The strategy relied on the large industries for the capital goods sector, but the consumer goods sector was primarily reserved for and assigned to small-scale, agro- and rural industries which require less capital and generate more employment. This was consistent with the need of the day and to reduce the demand on limited capital and savings and to expand the employment base. However, such small-scale agro-industries, because of poor technology, management and low capacity to invest, frequently failed to meet the expanding and changing market demand for quality goods emanating from the growing population.

From 1980s onwards, there have been efforts towards promotion of agro-industries in India with a stress on market demand, innovative technology and efficient management, particularly of the supply chain. Recently, there has been a substantial opening-out in government policy towards technology import and private foreign capital (Goyal 1994). This has led to the establishment of large modern units with innovative technology and marketing. However, this current trend towards large private agro-industrial units has a strong risk that the small farmers and the rural poor are being ignored, alienated and will not substantially benefit. This has weakened the development linkage to the small farmers and rural poor, for which agro-industries were being given priority. What policies and institutional models are appropriate under the present context is a major question for the future?

An ideal of the agro-industry serving as an anchor activity for rural development has been presented by Gaikwad (1986). A review of the literature (CEPAL/GTZ/FAO 1998; Glover and Kusterer 1990; and Rello and Morales 1999) shows that some case studies on contract farming arrangements with small farmers in Latin America might be appropriate to evaluate their usefulness under the Indian context. Glover and Kusterer (1990) found that contract farming could be a “change agent”, breaking exploitative and paternalistic relations with traditional rural elites. In cases of Latin America, and one each in Kenya and Canada, it was found that small farmers agreed to enter into contracts with

agro-processors when they offered, "the best available combination of income enhancement and risk reduction" to them (p 136). However, there is also a risk potential posed by contract farming arrangements dominated by large agro-industry firms, national or multi-national; they would squeeze out cottage and rural small industries that are important sources of local employment and livelihoods. The poorest rural population, typically landless farm laborers and marginal farmers, can benefit from contract farming through large increases in seasonal demand for hired workers by contract farmers. However, non-owning of land and exclusion from formal non-farm employment, because of education or socio-cultural barriers, the benefits of agro-industrialization to the poor get largely reduced.

What institutional and organizational models are appropriate for organizing agro-industries in India? Will they be able to address the existing structure, environment and problems of agro-industries? Will they be able to provide modern technology and marketing to agro-industries? Will they be able to meet the challenges of procurement from small producers and supply chain management faced by agro-industries? Will they be able to share the benefits with small farmers and rural poor?

This paper analyses the available data and reviews the literature on agro-industries in India to evaluate their importance, characteristics and constraints. Then, it evaluates some of the major institutional models on organizing of agro-industries that have been experimented with or proposed in India under the present context. The experiences gained and lessons learnt may be useful for future agro-industrial development in India as well as other developing countries.

Importance, Features and Constraints of the Agro-Industrial Sector in India

Analysis of data from the Annual Survey of Industries[2] shows that 46 per cent of all industrial units in India are agro-industries (Table 1), which is a very large

[2] The *Annual Survey of Industries* is conducted by the Central Statistical Organization of the Ministry of Planning. It covers registered factories employing more than 10 workers. Thus, non-registered factories and those employing less than 10 workers are not covered. Factories employing more than 100 workers are covered by a census, and the remaining are covered through a sample survey.

number. These agro-industries contribute about 22 per cent of the manufacturing value adding. Further, they provide as much as 43 per cent of employment in the manufacturing industry, which indicates their significant importance as employment provider. Their contribution to gross domestic product (GDP) is also significant. Thus, the priority to them is perhaps not misplaced from this point of view.

Agro-industries include many kinds of units, of which 37 per cent are in food and 63 per cent in non-food sectors (Table 1). The data on food industries show that 44 per cent of the food-related factories are in milling and grain-milling constitutes a large number in agro-food industries (Table 2). Edible oil constitutes 13 per cent, and sugar, another 10 per cent. However, 33 per cent of the factories are in other kinds of food industries, which include higher income elasticity and higher value foods. The distribution is, however, very different for the net value added. Here, 49 per cent of the net value added comes from other food industries, whereas only 7 per cent comes from the milling factories. Gandhi and Mani (1994) have shown a considerable variation in it and the need to focus on it for strategy. Even in employment, 43 per cent of the employment is in other food industries and only 20 per cent is in the milling industries. Thus, food industries other than milling, edible oil and sugar, are of considerable importance for the rural income and employment.

Table 1. Importance of the agro-industry sector in India: some features

Industries	Percentage share		
	No. of factories (1996/97)	Employment (1992/93)	New value added (1996-97)
Agro-based food industries	16.69	13.67	5.85
Agro-based non-food industries	29.09	29.23	15.74
Total agro-based industries	45.78	42.89	21.59
Other (non-agro) industries	54.22	57.11	78.41
All industries	100.00	100.00	100.00

Source: India, *Annual Survey of Industries*

What are the structural and financial characteristics of agro-industries in India? It has been found that only 13 per cent of the total industrial fixed capital is invested in agro-industries, as against 46 per cent share in employment (Table 3). This shows that agro-industries contribute a large share in the employment, but use only a small share of the scarce fixed capital resource. The share of payment to labor for the value addition is also higher at 48 per cent in agro-industries as compared to 35 per cent in other industries.

Agro-industries require relatively less fixed capital and more working capital as compared to other industries, as for example 57 per cent for food industries. Whereas agro-industries annually generate 51 per cent value added (income) over the fixed capital invested, other industries generate only 39 per cent value added (income). The agro-industries are able to generate employment for 14 persons against an investment of Rs 100,000, whereas other industries generate employment for only 3 persons for the same investment. This does not include the employment generated in agriculture through the backward linkage, which is much more. The agro-industries also absorb more input from other sectors, such as agriculture, as a percentage of the value of output, as compared to other industries. Many of these features indicate that agro-industries do deserve priority for development.

Table 2. Importance of selected food industries in the agro-food industry sector

Industries	Percentage share		
	No. of factories (1996/97)	Employment (1992/93)	New value added (1996-97)
Agro-based food industries	16.69	13.67	5.85
Grain-milling	44.38	20.30	7.05
Edible oils	13.11	7.74	21.48
Sugar	9.58	28.57	23.03
Other foods	32.93	43.40	48.45

Source: India, *Annual Survey of Industries*

Table 3. Some structural and financial features of agro-industries in India

Description of industry	Share of fixed capital (per cent) (1996/97)	Total persons employed per factory (1992/93)	Fixed capital per factory (Rs. Million) (1996-97)	Emoluments as % of net value added (1992/93)	Percentage of physical working capital to invested capital (1996/97)	New value added to fixed capital (1996/97)	Labor to fixed capital ratio (per Rs. Million (1992/93)	Materials consumed to value of output (1996/97)
Agro-based food industries	4.40	55.60	8.07	45.16	57.24	54.9	1.48	74.68
Agro-based non-food industries	13.15	70.82	13.82	49.13	32.20	49.5	1.42	55.57
Total agro-based industries	17.55	65.14	11.73	47.95	41.01	51.3	1.44	64.00
Other (non-agro) industries	82.45	79.96	46.50	35.31	23.39	39.4	0.30	51.34
All industries	100.00	72.85	30.58	38.21	27.22	41.3	0.45	55.03

Source : India. *Annual Survey of Industries*

India launched major economic reforms in the year 1991. What effect this had on agro-industries? Not enough data are available to evaluate this in detail but Table 4 provides an evaluation in terms of industry-group GDP growth rates in the pre- and post-reform periods (1984/85 to 1989/90, and 1990/91 to 1995/96) in constant prices. The results indicate that the growth rate in the food agro-industries remained at over 10 per cent in both the periods, indicating no significant effect of the reforms. In the non-food agro-industries, the growth rate has shown an acceleration from 3.7 per cent to 7.7 per cent, indicating a positive impact. For agro-industries as a whole, the growth rate has increased from 5.2 per cent to 8.3 per cent. Thus, on the whole, the impact seems to have been positive for agro-industries. On the other hand, other industries actually show a deceleration from 12 per cent to 7.2 per cent in the same period.

Table 4. Performance of agro-industries: A comparison in the pre-reform with post-reform periods

Industries	Growth rate of value added (GDP) by industry	
	1984/85 to 1989/90	1990/91 to 1995/96
Agro-based food industries	10.45	10.27
Agro-based non-food industries	3.70	7.70
Total agro-based industries	5.15	8.30
Other (non-agro) industries	12.00	7.20
All manufacturing industries	9.23	7.60
Agriculture	5.67	2.68

Source: India, Central Statistical Organization, *National Accounts Statistics*

In what type of agro-industries are the major opportunities for employment being created? Sufficient data are not available to evaluate this. Table 5 provides some results for food industries for the periods 1979/80 to 1988/89 and 1988/89 to 1993/94. The results indicate that employment is growing in dairy, fish canning and preservation, edible oils, chocolate feed, and cashew processing. On the whole, with some exceptions, a positive trend is evident for food agro-industry employment during the period of economic reforms. It may be mentioned that this does not include the employment generated through the backward linkage, which is much higher.

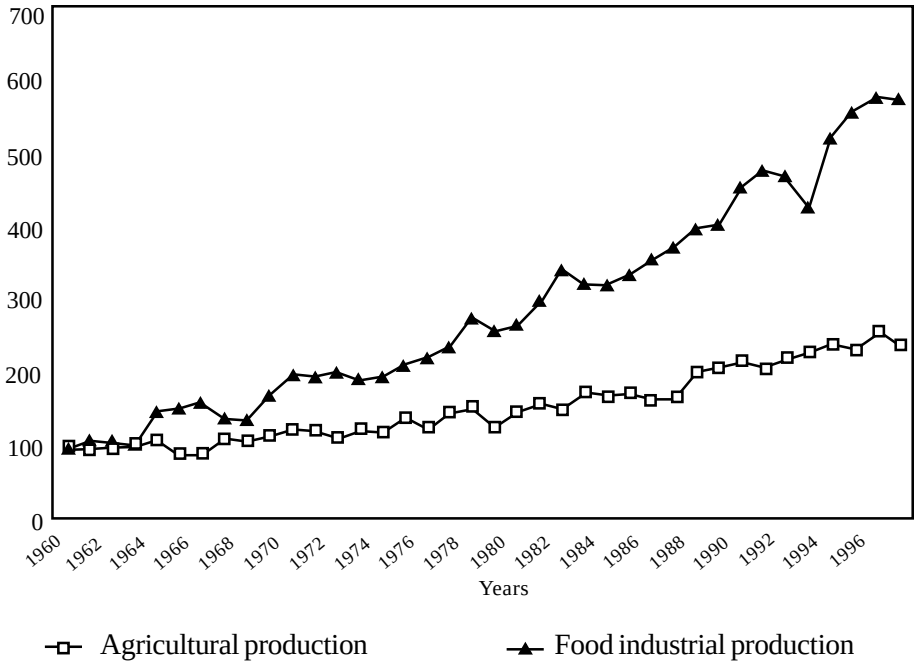
Table 5. Profile of increase in employment in agro-food industries

Sl. No.	Industry	Percentage change	
		1979/80 to 1988/89	1988/89 to 1993/94
1.	Meat	-21.62	8.47
2.	Dairy	47.33	39.41
3.	Fruit and veg. can/preservation	2.85	22.08
4.	Fish can/preservation	- 0.26	89.12
5.	Milling	33.10	15.93
6.	Bakery	35.53	1.00
7.	Sugar fine	-35.85	5.80
8.	Sugar indig.	-23.41	- 9.92
9.	Chocolate	81.62	65.43
10.	Hyd. Oils/vanaspati	4.36	17.28
11.	Edible oils	- 24.22	72.59
12.	Tea	- 21.22	5.07
13.	Coffee	36.91	- 40.68
14.	Cashew	- 42.60	106.44
15.	Animal feed	52.23	35.94
16.	Starch	- 7.08	18.00
17.	Other food products	- 0.91	-14.13

Source: India, *Annual Survey of Industries*

The FAIDA report of the Confederation of Indian Industry (CII) and Mckinsey and Company (1997) shows that there is a great potential for development of food processing and agro-industries in India. What have been the major constraints in the rapid development of agro-industries in India? Figure 1 shows a plot of the index of agro-food industry production (India, Ministry of Finance) as well as the index of agricultural production (India, Ministry of Agriculture) from 1960 to 1997 (both in real terms). A few observations can be made from this figure. The production of agro-food industry has outpaced agricultural production in the country. There are fluctuations in the growth of

Figure 1. Agro-food industry production and agricultural production in India



agro-food industry production, and there is a significant acceleration in the growth during the post-reform period of the 1990s.

Literature indicates that agro-industrial growth in India is affected substantially by the supply of raw materials as well as the growth in demand for the products of agro-industries (Srivastava and Patel 1994; and Boer and Pandey 1997). Raw material is a produce of agriculture and it can be represented by the index of agricultural production. The demand for products of agro-industries is affected substantially by income levels and so can be represented by either total income or per capita income. To study if these were indeed important determinants, the following simple models were formulated and tested:

$$FOODINDX = a + b_1 * AGRPROX + b_2 * GDPFC + e \quad (1)$$

$$FOODINDX = c + d_1 * AGRPROX + d_2 * NNPCAP + u \quad (2)$$

where:

FOODINDX = Index of production of food products industry

AGRPROX = Index of agricultural production

GDPFC = GDP at factor costs in constant prices
NNPCAP = Per capita net national product in constant prices
a, b, c ,d = Parameters
e, u = Error terms

These equations were estimated by the ordinary least squares method and the results are given in Table 6. The results indicate that agricultural production is a strong and significant determinant of food industry output, supporting the important role of raw materials supply. The results also show that GDP at factor costs as well as per capita NNP have a strong and significant relationship with the growth in agro-food industry.

Table 6. Regression estimates: Dependent variable FOODINDX

	Independent variables				
Constant	AGRPOX	GDPFC	NNPCAP	R^2	F-statistics
- 60.36	1.1708***	0.001201***		0.97	592.37
(-2.32)	(2.883)	(4.265)			
-211.86**	1.8279***		0.1231***	0.96	458.08
(-7.766)	(4.366)		(2.545)		

***, **, * : significant at 1, 5, 10 per cent level, respectively.

Apart from the quantity of raw materials, Srivastave and Patel (1994), Kejriwal (1989) and Gulati (1994) have indicated that the quality of raw materials is a major constraint. The available raw materials are often of sub-standard quality. Processing varieties are frequently not available and even the period of availability of the raw materials is very short. Gulati et al. (1994) have indicated that only about 0.5 per cent of the fruits and vegetables grown in India are commercially processed. It indicates a dire need for improvement in the entire food value chain in India. The problems of quantity and quality indicate that there is a need to improve the linkage between small farmers (which constitute a majority of raw material producers) and agro-industries. Effective and innovative institutional arrangements are called for to overcome these constraints.

Srivastava and Patel (1994) have indicated that another major constraint was the use of obsolete technology in processing. This results in low efficiency and poor quality of the output. Boer and Pandey (1997) have observed that one of the problems in improving technology was the small size of the average agro-processing unit. There is a clear need to integrate the processing units in order to get at larger scales of operation. However, Goyal (1994) has expressed fear that it often results in exploitation of small farmers.

Another major constraint reported by Srivastava and Patel (1994) was weak market linkages and small market size for many processed products, and not much is being done to develop these markets. Srivastava (1989) had earlier reported through nominal protection coefficient analysis that whereas tomato paste and canned mushrooms were export competitive, mango pulp and apple juice were not at that time.

Agro-industries also face difficulty in securing the necessary finance. The financial institutions are mainly geared to lending for the fixed capital requirements, but the agro-industries, as shown in the above analysis, have a large requirement of working capital. It is thus difficult for these industries to obtain credit and higher interest rates have to be paid (Srivastava and Patel 1994). Further, government policies typically consider processed and packaged goods as luxury items and as a result, they are heavily taxed. There are also special regulations and licensing requirements for several agro-industries, such as the Milk Product Order for dairy industry. These policies create disincentives for investment in higher value-added agro-processing. (Srivastava 1989; and Gulati et al.1994).

Agro-industry Models in India

The challenges poised by various problems and constraints in the establishments and functioning of agro-industries on the one hand, and the need for their growth to contribute to rural and small farmer development on the other, call for new and innovative approaches and models for their organization in India. Several models which have been tried in the past, need to be evaluated to provide lessons for what is required to be done in future in India as well as other parts of the developing world. Some of them, real as well as hypothetical, are discussed below.

Table 7. Net value added (NVA) over total input (TI) in food processing industries

Sl. No	Ind. Code	Industry	1979 Net value added (Rs lakhs)	1988 Net value added (Rs lakhs)	1993 Net value added (Rs lakhs)	1979 NVA/TI (%)	1988 NVA/TI (%)	1993 NVA/TI (%)
1.	200	Meat	350	922	2742	17.9	22.3	13.70
2.	201	Dairy	6144	21794	36570	9.8	9.2	5.76
3.	202	Fruits and veg. can/preservation	446	2038	9113	12.0	15.2	41.30
4.	203	Fish can/pres.	834	3945	18858	5.8	11.6	14.77
5.	204	Milling	8893	33239	69216	5.8	6.3	6.55
6.	205	Bakery	3230	11066	22541	22.0	22.7	20.42
7.	206	Sugar fine	15755	110218	233176	15.3	26.3	28.46
8.	207	Sugar indig.	1382	8538	14619	19.9	20.6	20.52
9.	209	Chocolate	381	1737	100553	20.4	21.3	40.91
10.	210	Hyd. oils/vanaspati	5606	11830	19682	8.4	5.7	5.87
11.	211	Edible oils	5445	14003	86113	4.5	5.3	8.51
12.	212	Tea	14169	36839	79	21.5	22.6	8.04
13.	213	Coffee	427	2775	88832	29.7	32.2	26.29
14.	214	Cashew	1979	6585	6959	24.9	36.6	42.99
15.	216	Animal feed	920	3233	1068	10.0	8.1	18.40
16.	217	Starch	1062	2251	8258	18.4	16.0	11.18
17.	219	Other food prod.	3799	12227	17626	18.8	19.8	21.14
		Total	70822	283240	646005	10.7	13.4	13.59

Source : Gandhi and Mani (1994), and India, *The Annual Survey of Industries*-various issues

Whatever may be the nature of the model, it is very important that it creates sufficient incentives and addresses other needs of the farmers to produce the required quantity and quality of agro materials. After production, the system should ensure that there is incentive to and commitment of the farmer to supply the produce to the agro-industry only. The required farm inputs and technology would need to be promoted and adequately provided, and the question of who would bear the cost is important. An effective small-farmer oriented procurement and supply system needs to be created which functions continuously and efficiently taking into account the nature of production and processing. Having a good processing technology to produce quality output is of paramount importance. Addressing the new and changing consumer demands and strength in marketing are also the key success factors. The enterprises need to have financial strength and performance ability and capability to attract capital for investment and growth. Overall, the issues of ownership, organization, management and control are crucial.

Cooperative organization model: AMUL

One agro-industry model which has been quite successful in certain types of agro-industries (such as dairying and edible oil) is the AMUL Co-operative Model also called the Anand Pattern Model. This model evolved out of a very successful dairy cooperative movement in the Kheda district of Gujarat state. This kind of organization now has a total national membership of 9 million, of which 21 per cent are landless and 66 per cent small and marginal farmers. In this model, the ownership of the agro-industry is with farmers under the cooperative principles. The cooperatives are organized in a three-tier structure, with primary cooperatives at the village level, a cooperative union at the district level, and a cooperative federation at the state level. Broadly, the village cooperatives take the responsibility for procurement of the produce from the farmers, the district union is responsible for its transport and processing, and the federation is responsible for its marketing and overall developmental work. The model is governed by a rotating board of farmer-elected representatives on cooperative principles, but is run by a professional management. The cooperative also undertakes extension and provision of veterinary and other services.

The model enjoys commitment and cost-efficiency in raw material supply which is a major advantage for agro-industries. It also brings substantial

contribution to small farmers and rural development. One major drawback is its dependence on good committed leadership, which often becomes largely political, detracting from both cooperation and good business. Further, antiquated laws governing cooperatives invite government interference and prevent use of financial markets for raising equity capital, thereby often constraining expansion and growth.

Government organization model: HPMC

In this model, the government or a government corporation plays the major role. One of the well known examples of this is the Himachal Pradesh Processing and Marketing Corporation (HPMC). The Corporation is fully owned by the government and, is managed by its staff. The Corporation sets up a network of infrastructure and processing facilities including produce collection centers, warehouses, cold storages, and processing plants. The produce is purchased from the farmers at pre-announced prices. It is then stored, processed and marketed nationally by the government corporation. The marketing of fresh produce is sometimes upto the wholesale level only. The HPMC has set up two collection centers, three warehouses and five cold storages in the state of Himachal Pradesh, principally for apples. It has also set up cold storages in the metropolitan cities of Delhi, Mumbai and Chennai.

Even though the HPMC was fairly successful at one time, reports indicate that it has not been able to sustain the high performance (Vaidya 1996). Lately, it has been neither able to attract enough farmer suppliers nor expand distribution beyond its own outlets. While government-owned agro-industries are well funded for investment in infrastructure and technology and have government support, they depend on bureaucrats for management whose business management orientation is often very limited. The bureaucrats are frequently transferred at the whims of the government, and are accountable primarily to their superiors and not to farmers or the consumers for their performance. Their commitment to procure from and develop small farmers on the one hand, and to meet the marketing challenges on the other, is generally very limited.

The private multinational "partnering" with farmers model: Pepsico

This model involves backward integration by a private company with strong marketing capabilities from already established strong brand products. The

model has been tried by Pepsi Foods (established in 1989) in India in the setting up of a tomato processing plant at Zahura in the Hoshiarpur district in Punjab. By 1994, 350 farmers over an area of 2,700 acres were covered and 650 tonnes of tomato were processed every day (Gulati et al. 1994). The plant covered a radius of 370 km for procurement of raw material.

In this model, contracts for production and procurement of tomatoes were made with small farmers, but these contracts were only verbal rather than legal. The company built relationships with them with a heavy commitment to extension work with the farmers. It provided experts and promoted the use of appropriate farm technology and varieties with the farmers, bringing to bear research and know-how available worldwide. Seedlings were provided to the farmers and the planting was scheduled and programmed using computers. The best and expensive technology of high standards was used in processing, and the company used its strong marketing capabilities and networks for marketing quality products.

This model involved not simply procurement or contract farming, but also developing a mutually beneficial partnership between the agro-industry and the farmers. The company's strong management and marketing capabilities are used to make the project successful. However, substantial costs were involved and financial losses of Rs 40 million per year were incurred during the first three years. This model can generate good benefits for small farmers, but it requires a long-term view and commitment from the company, substantial financial strength, and willingness by the agro-industry to absorb substantial start-up costs and initial losses.

Multinational-local firm partnership with corporate farming model: Delmonte

This model, proposed in the Gujarat state, pertains to a joint-venture between Delmonte, a multinational, and an Indian soft drink manufacturer. The objective is to manufacture different processed food products. It is envisaged that corporate farming will be undertaken by the company to obtain 25 to 30 per cent of the raw material requirement, and the rest would be obtained through contract farming. The identification and allotment of farm land is presently under consideration by the government of Gujarat. The model is still not implemented.

The major constraint of this model would be in the availability of land for corporate farming. The land laws in India presently permit only farmers to own agricultural land and this too is limited by land ceilings, given the history of

exploitation of farmers by landlords in the colonial period. The corporate farming will require formal employment of farm labor under its legal employment requirements. It is to be seen whether such farming will be cost-effective compared to the economies of cheap family labor available on family farms. Another issue is the sharing of ownership, control, management and returns between the multinational and the local firm, and the position of the farmer-supplier in the chain.

Government service center model: Khetardi

This model involves the use of a large wasteland site available to the government-owned Gujarat Agro-industry Corporation principally as a service centre for agro-industries. Cold-chain infrastructure will be set up and made available for use by private entrepreneurs, and a cargo complex for agro-products would also be set up at Ahmedabad airport. A wasteland site will get utilized and the government through its resources will invest to create potentially useful infrastructure to facilitate agro-industry development.

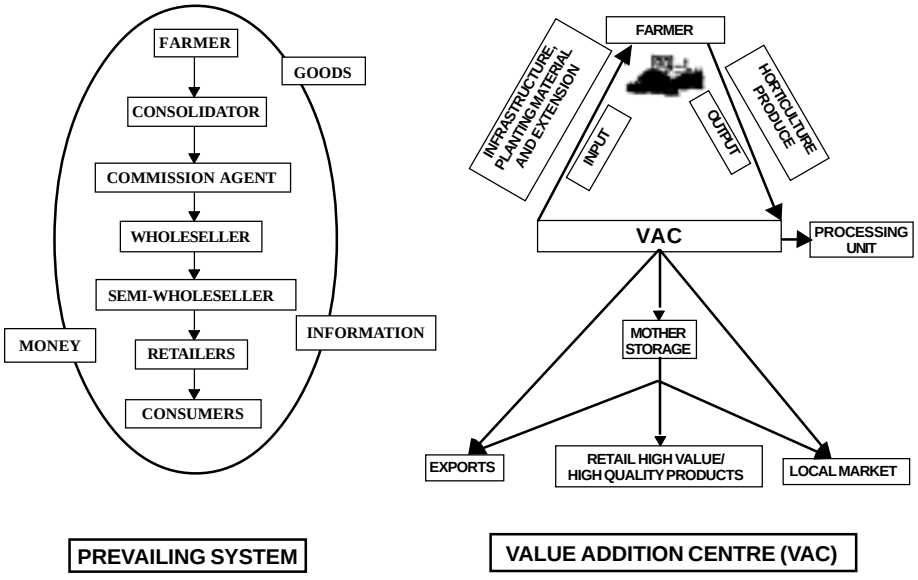
In this model, government provides infrastructure only. One concern would be the type of infrastructure provided, whether it would be of critical kind. Another concern is the capability of the government to manage its operation effectively and efficiently. The extent and ease of access to the infrastructure facilities to the private entrepreneurs, its capacity utilization and, whether this would be sufficient for agro-industry development are other concerns.

Value addition center model

The Gujarat Agro-industries Corporation has proposed a concept of the Value Addition Center (VAC). It has been conceived as a hub of activities for pre- and post-harvest management of agricultural produce (see Figure 2). It would function as an anchor activity for regional rural development, providing know-how, technology, inputs and market access to farmers. Further, VACs would serve as private-public sector "partnership nodes" around which different types of contract farming can be organized. A completely operational VAC would provide 'an integrated chain from farm to the market', reducing the number of intermediaries at several stages of the food value chain. The VACs will focus on the processing of higher value products for regional and export markets.

These would compete with the current trader network to access raw material by offering an integrated package of services and guarantees to the farmers and through building a long-term sustainable relationship. The VACs would entail substantial investments in R&D and infrastructure. But, the VAC is still a concept. Though it is attractive, the implementation problems in organizing would be clearly enormous.

Figure 2. Value addition centre concept



Assessment

If the development objective is to be served, small farmers must benefit from agro-industry, and the landless should benefit indirectly. However, this depends substantially on the nature of the organization and the commitment of the agro-industry to involve them as partners. It also depends on the bargaining power of small farmers within the model and the structure that are created. The cooperatives have often done better in bringing benefits to the rural poor, sometimes even with the assistance of non-governmental organizations (NGOs).

The contracts in contract farming are rarely enforceable in India, and remain moral. Therefore, in order to make contract farming successful, much depends on the development of long-term relationships between agro-industries and farmers through transparent contract terms, fair pricing, effective extension, and good marketing. This is possible even for private agro-industry firms as shown by the Pepsico model.

Conclusions and Implications

Agro-industries have been given high priority in the economic development of rural sector in India. Mahatma Gandhi's emphasis on developing village-based agro-industries in the movement for independence marked the beginning. Is the priority to agro-industries justified today? The study finds that agro-industries are a significant part of the manufacturing sector in India and contribute substantially to employment and income generation. Their contributions to development, however, would depend substantially on their benefits to rural and small farmer development. Agro-industries in India face many challenges for growth including raw material supply, obsolete technology, need for strength in marketing and financial support. For meeting these challenges and contributing to development, several organizational models have been tried in India. Their evaluation indicates significant strengths in the cooperative model and the multinational-farmers partnership model.

From the management point of view, one of the major challenges lies in organizing sustained production and procurement from a large number of small farmers. A partnering approach is more successful and sustainable. It can be followed either through forming cooperative organizations, or building confidence and trust through a meaningful and mutually beneficial long-term relationship. Processing and marketing challenges, however, require use of modern technology and professional management, and must be geared to the competitive and changing market for the success of the agro-industry.

There is a need for new indigenous models to emerge for the organization of agro-industries. Government models alone do not show a good record of performance. The Amul cooperative model is one promising model which brings benefits to small farmers and gives them control. However, it needs to overcome political, legal and managerial limitations. The Pepsico model involving cogent

backward integration by a private company to the farmers from a strong product market offers another alternative. However, it requires long-term commitment and financial strength. It is critical that alternative agro-industrial models are encouraged and provided strong government support, especially those models which contribute positively to value addition, rural employment, poverty alleviation and sustainable development. This would require pro-active policy and program initiatives.

References

Austin, James E. 1992. *Agro-industrial project analysis: critical design factors.* Baltimore: John Hopkins University Press, The World Bank.

Boer, Kito de and Amitab Pandey. 1997. India's sleeping giant: food. *The Makinsey Quarterly.*

CEPAL/GTZ/FAO. 1998. *Agroindustria y pequena Agricultura: vinculos Potencialidades y Oportunidades Comerciales.* Santiago de Chile - Naciones Unidas.

CII-Mckinsey & Co. 1997. *Modernizing the Indian food chain: Food & Agriculture Integrated Development Action Plan (FAIDA).* New Delhi: CII and Mckinsey & Co.

Gaikwad, V. R. 1986. Application of science and technology for integrated agricultural and rural development: a farm-industry linkage approach. In *Agro-processing: strategies for acceleration and exports*, U. K. Srivastava and S. Vathsala (eds). New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd. pp. 11-21.

Gandhi, Vasant P. and Gyanendra Mani. 1994. *Agro-processing for development and exports: the importance and pattern of value-addition from food processing*. Ahmedabad: Indian Institute of Management (Mimeo).

Glover, David and Ken Kusterer. 1990. *Small farmers, big business: contract farming and rural development.* New York: St. Martin's Press.

Goyal, S.K. 1994. Policies towards development of agro-industries in India. In *Economic liberalization and Indian agriculture*, G.S. Bhalla (ed.). New Delhi: Institute for Studies in Industrial Development. pp. 241-286.

Gulati, Ashok, Anil Sharma, Kailash Sharma, Shipra Das and Vandana Chhabra. 1994. *Export competitiveness of selected agricultural commodities.* New Delhi: National Council of Applied Economic Research.

India. Central Statistical Organization. *National Accounts Statistics.* 1995 & 1998. Ministry of Planning and Programme Implementation, New Delhi: Government of India.

India. Ministry of Agriculture. *Area and production of principal crops in India.* Various issues. New Delhi: Government of India.

India. Ministry of Finance. *Economic Survey.* Various issues. New Delhi: Government of India.

India. Ministry of Planning. *Annual Survey of Industries.* Various issues. New Delhi: Government of India.

Kejriwal, N. M. 1989. Performance and constraints in accelerating production and export of fruits and vegetables. In *Agro-processing: strategy for acceleration and exports*, U.K. Srivastava and S. Vathsal (eds). New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.

Planning Commission. 1996. *Approach Paper to the Ninth Five Year Plan (1997-2002).* New Delhi: Government of India.

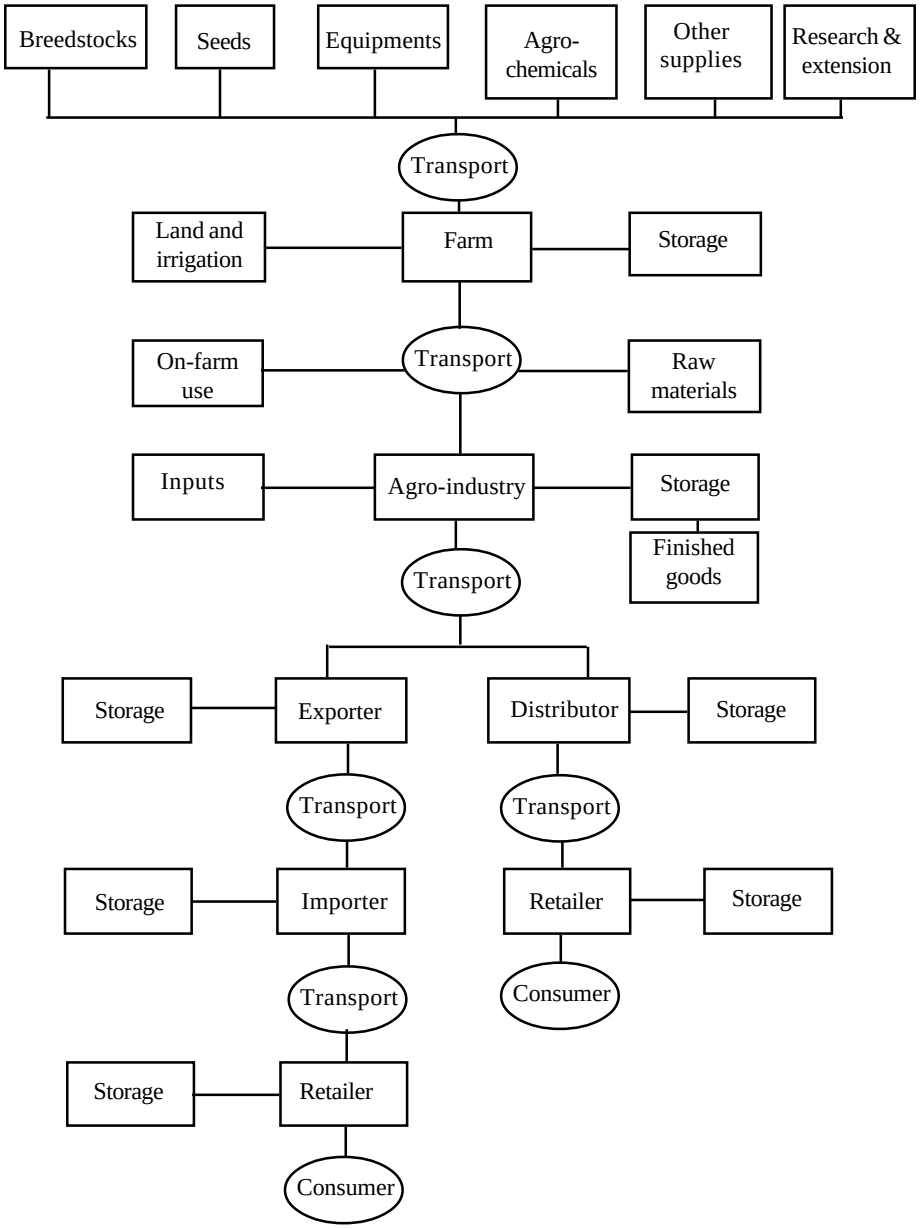
Rello, Fernando and Marcel Morales. 1999. *Eslabonamientos produtivos agricultura-agroindustria y su capacidad de generar empleo en Mexico.* FAI, Santiago de Chile.

Srivastava, U. K. 1989. Agro-processing industries: Potential, constraints and tasks ahead. *Indian Journal of Agricultural Economics* 44(3): 242-256.

Srivastava, U. K. and N. T. Patel. 1994. *Managing food processing industries in India*. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.

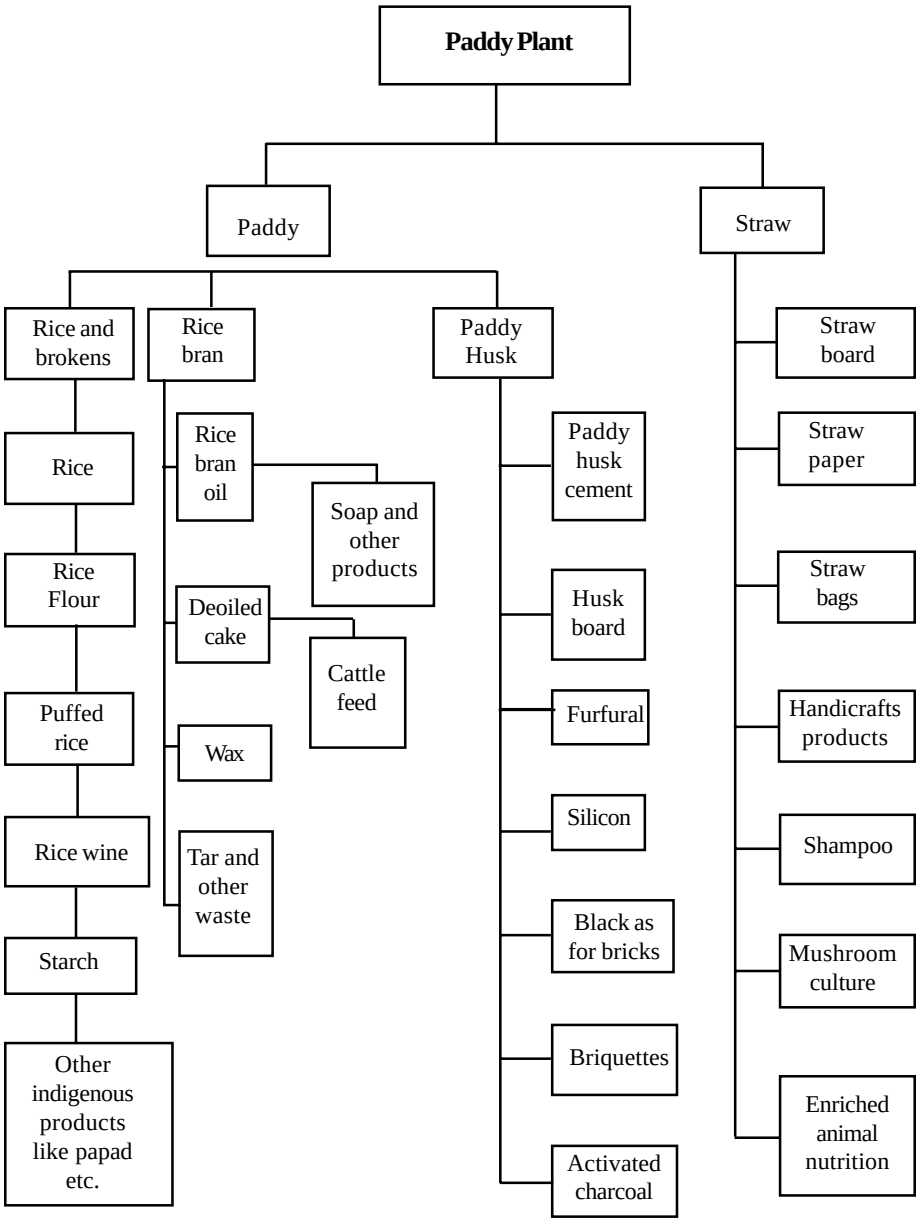
Vaidya, C. S. 1996. *Strategy for development of agriculture in Himachal Pradesh with reference to economic liberalization policy.* Shimla: Agro-Economic Research Centre, Himachal Pradesh University.

Appendix Figure 1. Flow chart of agro-industry



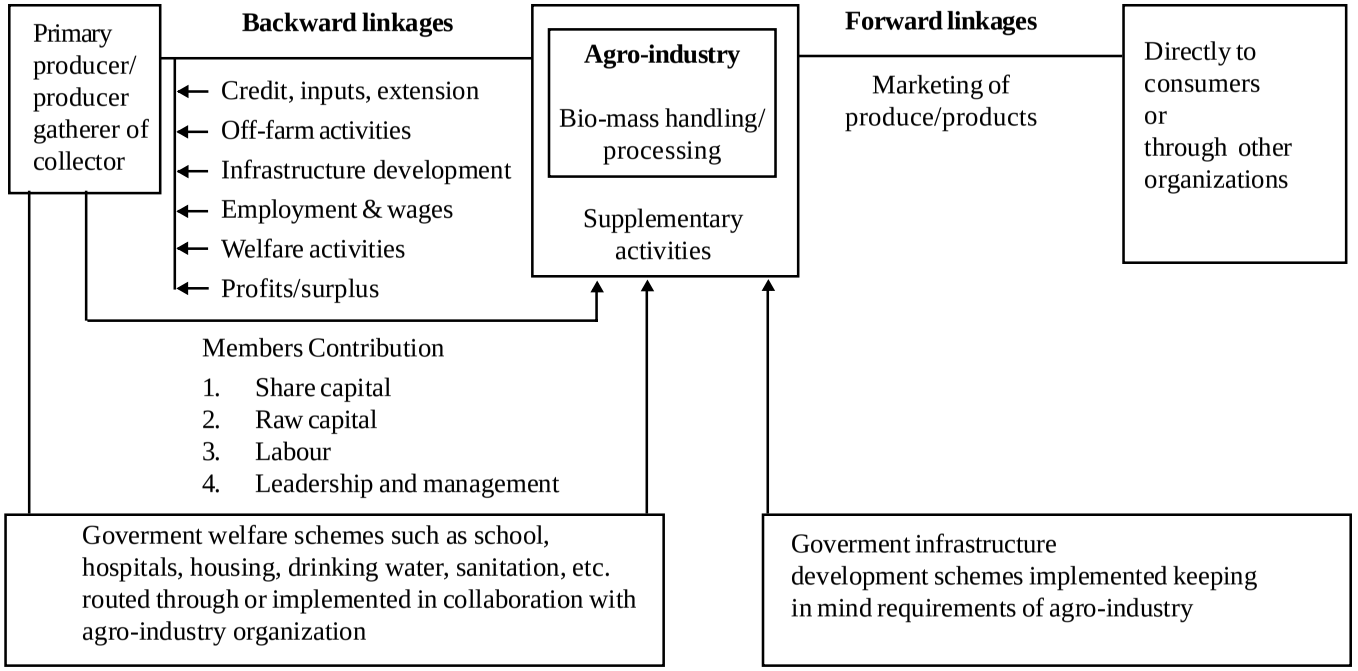
Source : Based on Austin (1992)

Appendix Figure 2. Paddy by-product system



Source : Based on Gaikwad (1989)

Appendix Figure 3. Integration of rural development through organization evolved around an agro-industry



Source: Based on Gaikwad (1986).

21

Institutional Arrangements for Linking Horticultural Production, Marketing and Processing

M. Sudha and T. M. Gajanana[1]

Despite a comparative advantage and self-sufficiency in the production of a number of agricultural crops, the predominance of pre-harvest contractor and commission agent as an important marketing channel continues till date in India. Institutional innovations integrating production with marketing and trade are yet to emerge, in spite of the expanding domestic markets for value-added products and incentives provided by the government for boosting the exports. In particular, the institutions which could integrate small farmers with domestic and international markets, with a focus on value addition, are non-existent. Therefore, much needs to be accomplished with respect to marketing and post-harvest handling of agricultural produce in India.

Direct interventions in agricultural markets by the government have been the important mechanisms for improving marketing efficiency. These interventions are through a number of agencies, which have evolved over a period of time. It started with the establishment of the first marketing society at Kumbakonam in 1913 under the provisions of the Cooperative Societies Act (1912). This was followed by the establishment of the National Agricultural Cooperative Marketing Federation (NAFED) in 1958 to provide price support through direct market interventions. Subsequently, the Commodity Boards and Agricultural Produce Marketing Committees (APMCs) were established in the 1960s. The Commodity Boards aimed to promote marketing of commercial/plantation crops, while the Marketing Committees were for regulating markets for other primary agricultural commodities. While the impact of these efforts has been mixed, efforts to improve the efficiency of agricultural marketing institutions are still pursued on a high priority. The weakest link has been the inability to integrate production with

[1] Senior authorship is shared.

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

marketing and processing for achieving the ultimate objective of improving access of small producers to expanding markets and trade.

This paper reviews the developments and performance of agricultural marketing institutions in India with a focus on horticultural sector. The mechanism to link production with consumption is also examined with the help of a few case studies.

Organizational Support: Evolution and Impact

A number of measures have been taken by the Government of India to promote horticultural sector in the country. The budget allocation was increased significantly from Rs 200 million in the VII Plan to Rs 10,000 million in the VIII Plan for the horticultural sector. Adoption of the liberalized seed/planting material import policy, reduction in import duties on greenhouse structures, delineation of the export processing zones (EPZs), complete exemption of import duty for export-oriented units (EOUs) and incentives for exports, etc. are among the important policy initiatives taken to boost this sector. The government also established the National Horticultural Board (NHB) in 1984 and the Agricultural and Processed Food Products Export Development Authority (APEDA) in 1986. An independent Ministry of Food Processing Industry (MoFPI) was created in 1988 under the central government. A special grant of Rs 975 million was made for export promotion during the VIII Plan (Kaul 1993). These initiatives speak volumes of the incentives provided during the post-liberalization period for this sector.

The underlying objective of any market intervention is to create an efficient alternate market channel so that the role of conventional, often inefficient, market intermediaries like the post-harvest contractors (PHCs) and commission agents[2] is reduced. Cooperatives are often considered to be one such alternative, and therefore, a number of cooperatives were established. Notable among these are: the Mother Dairy Scheme of the National Dairy Development Board (NDDB) (New Delhi), FRESH (Hyderabad, Andhra Pradesh), and the Horticultural Producers' Cooperative Marketing and Processing Society Ltd.

[2] Studies have pointed out that a majority of the producers still sell a substantial quantity of their fruits and vegetables through these intermediaries (see Subrahmanyam and Gajanana 2000).

(HOPCOMS) (Bangalore, Karnataka). These were established with direct or indirect support and participation from the government. In contrast, examples of successful producer cooperatives such as the Jalgaon Banana Marketing Cooperatives, and MAHAGRAPES have not been uncommon and have, in fact, proved the effectiveness of this form of institutional mechanism for marketing of perishable produce[3] . Three cooperative marketing societies, viz. HOPCOMS, FRESH, and the Kissan Cooperative Fruit (Banana) Sale Society (KISSAN) (Jalgaon, Maharashtra) are discussed in this section.

The effectiveness of cooperatives is largely influenced by their financial viability often measured in terms of profitability. Although financial performance of an institution is important, it may be too narrow for assessing the performance of an institution meant for social welfare. More significant measures should involve the factors such as pricing efficiency, regulatory framework and participation of stakeholders, besides their performance with respect to key financial indicators.

Comparison of the cooperative marketing societies

These cooperative societies, viz. HOPCOMS, FRESH and KISSAN, have striking similarity in their fundamental objectives, in spite of wide differences in their capital outlay, management structure and membership. The main purpose is to bridge the gap between producers and consumers and minimizing the role of the conventional market intermediaries such as PHCs and commission agents. Even more significant is the understanding of the role the society is expected to play. While HOPCOMS and FRESH, having a government governance pattern, fulfil the role of 'creation and sustaining a new network of marketing' to increase the efficiency, better price regulation, etc., KISSAN, in sharp contrast, primarily functions as a representative of the producer-members, aiming to provide better bargaining power to its members (Table 1). Therefore, one of the ways to assess the success of the co-operative societies is the degree to which they fulfil their basic objective. The indicators that could be used for measuring the same are as follows.

[3] A review of the performance of cooperative marketing societies has revealed that there have been more failures than successes. However, wherever the cooperatives are successful, the producers have been found to benefit by selling their produce through them (see Gajanana and Subrahmanyam 1993; and Subrahmanyam and Gajanana 2000).

Table 1. A comparison of three major cooperative societies

Sl.No	Particulars	HOPCOMS	FRESH	KISSAN
1	Type of society	Government run and consumer-oriented	Government run, producer and consumer-oriented	Producer-oriented cooperative
2	Intervention point	Creating an alternate marketing channel		To impart collective bargaining by acting as the representative of the producer-members
3	Management structure	Government dominated	Highly government dominated	Less government interference
4	Current status	Operational	Liquidated	Successfully functioning
5	Special features :			
	(i) Specialization/ diversification	Diversified operations with limited impact	Diversified operations, innovative, futuristic, over ambitious and hence not practical	Specialized operations with single commodity
	(ii) Linking credit with marketing	Linking of credit with marketing not followed due to the fear of non-recovery of loans	Linking is not followed due to fear of non-recovery of loans	Linking of credit with marketing effectively followed; highly practical and focussed
6	Lacunae	Not able to create the sense of belongingness among the members		Sense of belongingness has been much inculcated among the members
7	Scope for expansion	Feasible	Could have improved	Scope for expansion exists through a fede-tion of cooperatives ‘MAHABANANA’.
8	Price policy	Procurement price is fixed at a level slightly higher than the wholesale price	Previous day’s wholesale price is paid to members	Grade-based pricing is followed

Growth in membership and share capital. If growth in membership and share capital is any indication of a society's performance, HOPCOMS has exhibited a higher growth rate and therefore could be judged successful. A compound growth rate of 3.5 per cent per annum was estimated in the membership of HOPCOMS (in the late 1980s and the early 1990s), while increase in the share capital has been to the tune of 51 per cent per annum. In the case of FRESH, membership grew at a compound rate of 29 per cent but has become stagnant during the last three years. The growth of share capital was around 41 per cent. KISSAN exhibited a trend similar to that of HOPCOMS with regard to its membership growth, but had lower growth in the share capital (Table 2).

However, the fact that HOPCOMS registered a steady increase in the government's share in the share capital over the years, is an indication of the growing dependence of the society on the government for funds, which is not a desirable trend. FRESH also exhibited an increasing dependence on the government assistance. KISSAN, on the other hand, had adopted a policy of ploughing back at least one per cent of the sale proceeds into its capital base, thereby could gain self-sufficiency after some years. Therefore, growth in the membership or share capital *per se*, as a measure of performance, needs reconsideration. Contribution of the members to share capital and hence the growth of a society are more important.

Governance and management. The management hierarchy in HOPCOMS and FRESH has indicated a definite role for the government with at least two government officials holding key administrative positions in the society. In contrast, the role played by the government was minimum in the case of KISSAN. Closer links with the State Department could often pave the way for smooth functioning of the society. The fact that the change in leadership of HOPCOMS for a brief period led to an enormous unrest in the society, is an ample proof of this factor.

Procurement and marketing policies. Supply of produce to the society is an accepted practice for a number of societies. However, procurement of produce from fields is an important policy of all the three co-operative societies. The field procurement ranges from 35 to 85 per cent in HOPCOMS and FRESH, whereas the entire procurement of banana by KISSAN is from the field (Table 2). Due to seasonality of the produce and lack of availability of adequate quantities to meet the demand, very often these societies procure produce from market, despite high market price, causing a loss to the society.

Linking credit with marketing. KISSAN society advances interest-free loans to its members for the purchase of fertilizer and other inputs and links it with the sale of banana. It gives advances up to Rs 5/ bunch, spread over three months, i.e. Rs 2/bunch each in April and May, and Re 1/bunch in the month of June after supervision of orchards. While making payments, the society deducts 2 per cent commission, railway freight, wagon expenditure and the advance given to the members from the sale proceeds. Thus, as the advance is deducted from the sale proceeds, recovery has never been a problem for the society. This type of linking credit with marketing is worth emulating by HOPCOMS and FRESH, which do not advance loan to its members due to the fear of non-recovery (Subrahmanyam et al. 1994b).

Turnover, overheads and net profit. All the three societies have registered a phenomenal growth in their turnover (Table 2). However, the prudent policy of having minimal overheads of 2-3 per cent as against 12-23 per cent in case of HOPCOMS and FRESH (Subrahmanyam et al. 1994 a&b) helped KISSAN make profits over the years. It may be noted that the society has been making profit ever since its inception and the profit has always been around 1 per cent of the turnover. The profit so earned was used as reserve fund, building fund, price fluctuation fund, etc., which contributed to strengthening of the financial stakes of the society (Gajanana and Subrahmanyam 1996).

Table 2. Growth in the membership and share capital of three major cooperative societies, 1987-92

Particulars	HOPCOMS	FRESH	KISSAN
Membership growth (per cent)	3.5	29.32	3.81
Share capital growth (per cent)	51	41.41	7.43
Govt. contribution to share capital (per cent)	94	40	27
Share of field procurement (per cent)	84	40	100
Turnover (lakhs, Rs)	2105	86	241
Overheads as per cent of turnover	12-13	20-23	2-3
Net profit as per cent of turnover	Negligible	Consistent in loss	Consistent in profit (1 per cent)

Mode of sale and its impact. All the three societies follow the diversified mode of sale. These include the retail sales through their own outlets, sale through commission agents, bulk sale of produce, and sale of value-added products. The sale of value-added products should be cost-effective and in line with consumer preferences. For example, FRESH, sold value-added products in a plastic cover which was not preferred by consumers, resulting into huge losses (Sudha and Subrahmanyam 1996). In contrast, KISSAN benefited from distant market sales, due to larger volumes being transported at lower costs and also due to the ability to take advantage of higher price in the distant markets. Such a method of sale provided the collective bargaining power to the producers—a function cooperative society is expected to perform for the benefit of member-producers.

Incentive for participation. The true spirit of cooperation, i.e. the 'sense of belongingness' has mainly contributed to the success of KISSAN. This basic factor has been absent in the other two societies. Further, in the case of KISSAN, higher prices, bonus dividend, etc. were strong incentives for participating in the activities of the society. Thus, it may be inferred that participation and collective action are the two fundamental rules for success in institutional support, which are ensured by economic incentives. Invoking a sense of belongingness is yet another feature that needs to be strengthened in these ventures for improving their performance.

One of the most important setbacks in these types of institutional support has been their inability to achieve a forward integration in the process of marketing. They have not been able to integrate marketing with processing through forward linkage, which is quite feasible.[4] There have been several efforts to provide institutional support for agro-processing, but the efforts at integrating production, marketing and processing have not been very effective. The next section deals with the existing institutional support for agro-processing and the modalities for effective linking of production with marketing and processing.

[4] It was observed that when cooperatives fully integrate production, processing and marketing, they perform better than other institutions. This happens because the cooperatives with such integration adopt themselves faster in the changing market prices of outputs and inputs and policy environment (Gajanana 1993). Therefore, the Miric marketing society was able to give much higher price of oranges to producers by having forward linkage with KANCHAN, the processing cooperative in Darjeeling (Gupta and Gupta 1986).

Linking Production, Marketing and Processing

Status of fruits and vegetables processing

It is estimated that about 30 per cent of the production of fruits and vegetables is lost during post-harvest handling, and only about 1-2 per cent of the total production is processed in India, as against 30 per cent in Thailand, 70 per cent in the USA and Brazil, 78 per cent in Philippines, and 83 per cent in Malaysia (Kaul 1997; and IFP 2000). Non-availability of raw material in the desired quantity and of quality and wide fluctuations in production and prices are major constraints to agro-processing (Sami 1990; Subrahmanyam and Sudha 1993a; and Barua 1997). Another major constraint is lack of adequate agro-processing capacity, and this is largely attributed to the capital-intensive nature of the technology for agro-processing. Therefore, one of the main objectives of the MoFPI since its inception in the late 1980s was to create the capacity for agro-processing. As a result, the installed capacity has increased from 8.94 lakh tonnes in 1990 to 21 lakh tonnes in 1999 (Appendix I). Though it is a phenomenal increase, the increased capacity, however, was mainly in the small, cottage and home-scale sectors (Appendix II), which are characterized by limited capital base. It may be noted that even by the end of 1999, only 12 per cent of the units had a capacity of more than 250 tonnes per annum, but bulk of the production (over 55 per cent) was processed in these large-scale units. The contribution of the small-scale units was found to be minimal. Similar trend is being observed for the years, which is a matter of deep concern. Another feature needing attention is the fact that most of the technology used in the small-scale sector does not meet the standard requirements (Sinha and Sinha 1992). Further, a majority of the processing sector continues to remain under the purview of unorganized private sector (Table 3), thereby making it difficult to impose strict quality control norms (Anon 1997).

Incentives for processing of horticultural products

The MoFPI was mainly created to provide the required impetus to the processing sector and to provide an organizational structure to the sector. Institutional support for promoting agro-processing has also been provided by institutions like NHB and APEDA through schemes that provide short- and

Table 3. Sector-wise growth in FPO licenses

Sector/ Category	Year	Private	Co-operative	Public	Total
Large-scale	1976	140 (88)	4 (3)	14 (9)	158 (100)
	1983	205 (89)	8 (4)	17 (7)	230 (100)
Small-scale	1976	221 (88)	12 (5)	17 (7)	250 (100)
	1983	403 (92)	15 (3)	22 (5)	440 (100)
Cottage-scale	1976	249 (96)	5 (2)	4 (2)	258 (100)
	1983	433 (94)	16 (4)	9 (2)	458 (100)
Home-scale	1976	556 (95)	13 (2)	16 (3)	585 (100)
	1983	1119 (96)	17 (2)	22 (2)	1158 (100)

Note: Figures in parentheses are percentages of the total licenses.

long-term credits, grants-in-aid and subsidy (Table 4). A total of over Rs 263 crores was allocated exclusively for the promotion of post-harvest management of horticultural produce. NHB has been assigned the task of integrating different sectors involved in post-harvest management of horticultural crops. It is proposed to provide liberal financial assistance for infrastructure development. As could be seen from Table, the significant among these efforts are the schemes aiming to establish post-harvest infrastructure and cold chain facilities for food processing, establishment of food-processing industrial estates/food parks, expansion and modernization of food-processing industries and also strengthening backward linkages of food-processing industries.

The emphasis is mainly on initiating collective action, as it can be seen from the fact that co-operatives or non-governmental organizations are the main focal points. The reason for such an emphasis is the absence or declining number of agro-processing units in this sector. As seen from Table 3, irrespective of the category, agro-processing has been the sole domain of private sector rather than of public or co-operative sector. While the number of licenses issued by the Food Products Order (FPO) indicated increasing trend in the private sector, the same was either stagnant or decreasing in the public or co-operative sector. Cumbersome procedures and stringent rules for land procurement were the binding constraints for the collective efforts in this sector. Further, taxation policy of the government with regard to value-addition in food industry has often

Table 4. Incentive schemes for encouraging fruit and vegetable processing

Sl. No.	Schemes	Type of assistance by organization
1.	Infrastructure development	***MOFPI***. A grant of Rs 40 million is given to NGOs, PSUs, JVs, etc. for creation of common facilities like food parks/industrial estates. ***NHB.*** (a) Back ended capital subsidy on cold storage projects up to 5000 tonnes capacity subject to a ceiling of Rs 20 million to meet up to 25 per cent of the project cost. (b) Back ended subsidy up to 20 per cent of the total project cost (Rs 2.5million) for purchase of specialized transport, VHT units, crates/cartons/asceptic packaging materials. ***NCDC***. Up to 90 per cent of the cost of construction of cold storage in cooperative sector is financed. ***APEDA.*** Coop/PSUs/private organizations can avail financial assistance up to 25 per cent (< Rs 0.15 million) for purchase of specialized transport unit for horticulture and up to 50 per cent (Rs 0.5 million) for pre-cooling facilities, VHT/fumigation/screening machines for export, cold stores at ports, etc.
2.	Setting up of F&V processing unit/modernization	NGO/coop can get up to 50 per cent of capital cost of equipment (< Rs 2.5 million) in general, Rs 5.0 million in difficult areas.
3.	Mobile F&V processing unit	PSUs/NGOs/cooperative can avail a grant of Rs 4-6 million for difficult areas.
4.	Low cost preservation technology	NGOs/coop/JV/PSUs can avail grant/loan up to Rs 0.5 million for plant and equipment and actual cost of technology.

5.	R&D in processing industries	All R&D institutions can avail financial assistance for meeting the entire cost of setting up of quality control labs for all processed foods. ***APEDA.*** Exporters/producers' associations can avail up to 50 per cent of the cost subject to a ceiling of Rs 0.5 million per beneficiary for setting up/strengthening of quality control activities and labs up to Rs 0.2 million per beneficiary for specialized consultancy services for installing ISO 9000, HACCP, etc.
6.	Human resource development	NGOs/coop can get grant-in-aid for establishing food processing and training centres (FPTCs) to the extent of: (1) Rs 0.2 million as fixed grant and Rs 0.1 million as revolving seed capital to the Single Product Line Centre. (2) Rs 0.75 million as fixed grant and Rs 0.2 million as revolving seed capital for the Multi Product Line Centre.
7.	Generic advertisement on processed foods and market promotion	Grant to all agencies for implementing TQM like obtaining ISO 9000 and HACCP up to 50 per cent of the cost (up to Rs 10 million)
8.	Backward linkage	Contract farming for a period of 3 years with a minimum of 25 farmers. Assistance up to 5 per cent of the total purchase made by the processors from the contract farmers (up to Rs 1.0 million per year) for 3 years could be reimbursed.

Note : NGOs: non-governmental organizations; PSUs: public sector undertakings; JVs: joint ventures; NCDC: National Cooperative Development Council; VHT: Vapour heat treatment; HACCP: Hazard analysis and critical control points;
TQM: total quality management

been burdensome. Compared to other developing and developed countries, Indian food processing involve additional burden in the form of excise duties. Despite these constraints, there has been an increase in the volume as well as value of export earnings over the years[5], which is primarily attributed to a small percentage of large-scale units. Also, there has been some change in the product mix and source of the exports. The increased investment in food processing sector could be linked to the favorable policy framework, such as the delineation of the EPZs, concessional rates and ownership polices adopted by some of the state governments. [6]

Forward and backward linkages

The lack of integration of production, marketing and processing, or the producers with the processors could be attributed to a number of factors: (i) Low crop productivity, (ii) narrow crop-base for processing purposes, (iii) short growing season coupled with erratic procurement policies and prices, and (iv) faulty harvest and post-harvest handling, causing high losses. Only a few sporadic efforts have been successful so far in achieving such a linkage (George and Singh 1970; and Viswanathan and Satyasai 1997). The most common linkages are: (a) the contract farming wherein the linkage is based on procurement of the produce at a predetermined price; and (b) captive farming wherein the industry acquires land on lease for required raw material supply by producing it; or through farmers' co-operative, where farmers join to form a co-operative society linking production with marketing and processing (Sinha and Sinha 1992).

[5] The export of processed fruit and vegetable (F&V) products like dehydrated and preserved vegetables, fruit pulp, pickles and chutney, processed and dried mushrooms, fruit-based beverages, juice, squash, etc. has increased substantially both in quantity and value. The share of processed products in the total export of F&V is also increasing with the expansion of markets for these products. This is an indication that there exists enough potential for further increasing the export of the processed products.

[6] The cumulative investment by all financial institutions in the food industry has increased from Rs 65 billion in 1992/93 to Rs 185 billion by the end of 1997/98. The foreign direct investment (FDI) till December 1999 was Rs 91 billion. During the period from July 1991 to December 1999, 1,808 proposals worth Rs 83 billion have been received in F&V products category, including about 405 proposals for setting up 100 per cent EOU with an investment of Rs 50 billion (IFP 2000).

Notable examples of contract farming are: 'Kissan' in Karnataka, 'Pepsi' and 'HLL' in Punjab, 'VST Natural Products' in Andhra Pradesh and 'Gherkins' in Karnataka with different degrees of success (Singh 2000; Haque 2000; and Anonymous 1998 a&b).[7] Similar efforts by WIMCO with mango growers in Andhra Pradesh have not yet yielded positive results.[8] The gestation period and nature of crop involved in such contracts have a great bearing on the success of such contracts. Restrictive land tenure laws, cost of policing and economies of scale also restrict the success of these efforts in the long-term.

The second type of model of 'job work or custom hiring' entails linkage between the large-scale and small-scale units for the production of a semi-processed product and is very common. This model is seen in mango processing in Chitoor (Sudha and Subrahmanyam 1994), tomato processing in Bangalore, pineapple pulp production in Kerala, and pickling cucumber (gherkins) (Anonymous 1998 a&b). However, a complete linkage, i.e. linkage between producer and processor through co-operative effort is not very common.

Keeping in view the gap for initiating such co-operative efforts by farmers, some studies have been undertaken to provide modalities for arriving at forward contracts and linking production and processing. These studies have analyzed economics of establishing a small-scale processing unit producing semi-processed products such as tomato concentrate, mango pulp, or on-farm conversion of fresh grapes into raisins. Some of these models are discussed here.

Case Studies

Tomato. Tomato often experiences violent fluctuations in the wholesale prices. While a link with processing would reduce distress sale by farmers, lack of flexibility in the procurement policy of the processing units prevents any contractual agreement between the two. Discussions with the farmers revealed that the low procurement price offered by the processing units is a very important

[7] The effect of contract farming on yield and income of farmers was positive. However, effective integration of small farmers into contracts depended on the backward linkage in terms of assured input supply (Haque 2000).

[8] Personal communication with the factories for obtaining details of contractual agreements.

reason for not supplying tomatoes directly for processing (Sudha and Subrahmanyam 1994; and Subrahmanyam and Sudha 1993 a&b). The analysis of the wholesale and the procurement prices of tomato in Karnataka indicated that the processing units prefer a contractual agreement for the procurement. The produce is procured at a fixed price agreed upon in the beginning of the season, which is much lower than the wholesale market price as well as the cost of cultivation, which results in breaking of agreement by the farmers (Subrahmanyam and Mruthyunjaya 1979). A procurement price at least 40 per cent higher than the cost of cultivation was found to be reasonable and effective for motivating farmers to supply tomato to the processing unit.

Further, the small-scale growers who plant at least 0.45 ha under tomato every season, could form a group by bringing about 3-12 ha area or 6-10 members together and enter into a contractual agreement with the processing unit. With an initial investment of over Rs 10-15 million for establishment and machinery, the processing unit for processing semi-finished products like tomato puree/ concentrate would need around Rs 1 million as working capital. The unit would need to produce around 32 tonnes annually to reach the break-even point. Forming co-operative in the production area for semi-processing would help farmers minimize the post-harvest losses.

Mango. Similar arrangement can be worked out for fruits like mango as well. Feasibility studies based on the experience of semi-processing units located in Chitoor region of Andhra Pradesh (Sudha 1998a) indicated that a continuous area of 200 ha under bearing mango orchard is required for successful running of such a semi-processed product unit based in rural areas (Table 5).

Studies on the functioning of such semi-processing units located in Chittoor district of Andhra Pradesh indicated the availability of working capital to be an important constraint faced by the processors, which forces them into job-work (custom hiring) type of processing linkage with the large-scale units. A linear programming model based on the optimum utilization of the available processing capacity indicated that with increase in the working capital, their option swings more in favor of self-processing rather than custom processing (Sudha and Subrahmanyam 1994; and Sudha 1998a).

Grapes. In contrast to the case of tomato and mango, grape growers from Solapur region of Maharashtra adopt a very simple method of on-farm conversion of fresh seedless grapes into raisins. The technology, which involves an additional expenditure of about Rs 17,000 for 10 tonnes of fresh grapes, was found to be

Table 5. Economic feasibility of establishing small-scale semi-product processing units for fruits (mango) and vegetables (tomato) in rural areas, 1991

Sl No.	Particulars	Value and quantity details for Mango pulp unit	Tomato puree unit
1.	Capacity (MT /annum)	150-500	150
2.	Capital investment (land, buildings, etc) (Rs million)	1.30	1.50
3.	Cost of processing of one tonne of processed product (Rs)	4,600	11,185
4.	Gross returns (Rs/tonne)	5,100	24,788
5.	Net returns (Rs/tonne)	500	13,603
6.	Break-even production (tonnes)	500	33
7.	Minimum feeder area required (ha)	200	3- 12
8.	Minimum number of growers required	—	7-15

Source: Sudha and Subrahmanyam (1994)

highly profitable and easily replicable. The fact that the raisins can be cold stored and sold after the season of fresh grapes, extends the season of sale and prevents distress sale. Such a technology was also found to be an efficient alternative for the cost-intensive exports (Sudha 1998b).

Institutional Support for Linking Production with Processing

There is an urgent need for institutional support for facilitating the linkages between production and processing. Incentives in the form of grant-in-aid announced by the Government for agro-processing units, which enter into contractual arrangement with at least, 25 farmers, is one form of support for promoting such linkages.[9] However, it should be noted that this type of incentive

[9] The Government announced Rs 2.5 million as incentive for the private processing units for such contracts, during 1990. The recently announced schemes of MoFPI also provide incentives for such linkages (MoFPI 1998).

only promotes a contractual agreement and not the kind of forward/backward linkage between production and marketing through processing. The pattern of linkage adopted by grape growers in Solapur is worth replication in other crops. Formation of farmer co-operatives, federation of these co-operatives at the district level and institutionalization of marketing on the pattern of MAHAGRAPES at the regional level present a three-tier system that needs replication by other states as well.

Infrastructure parks. In order to promote agro-processing, in general, and production-processing linkages in particular, efforts are in progress to create infrastructure parks. Out of four parks approved so far, one near Mallapuram in Kerala has already acquired 70 acres of land with financial assistance of Rs 40 million from MoFPI and Rs 155 million from Karnataka Small Scale Industries Development Corporation (KSSIDC) (IFP 2000). Further, removal of quantitative restrictions on imports under the new WTO regime is likely to attract a number of multi-national companies investing into food-processing sector in India.[10] It is unlikely that these companies will benefit small farms and therefore, co-operative processing units provide collective bargaining power to producers, and integrate small farmers with export-oriented production.

Conclusions and Suggestions

Although institutional support for linking agricultural production with processing has been in focus for quite sometime, the system needs frequent revamp, given the dynamic nature of the processes involved. This paper has reviewed the efforts at institutionalizing agricultural marketing and processing over the years through some case studies. The following conclusions can be drawn from the discussion:

(1) Institutional support in the form of co-operative marketing societies has proved to be useful for providing necessary impetus to agricultural marketing. The guiding principles for success of such an effort should be 'participation and collective action' by the producers themselves, with government playing a regulatory role, as has been observed in KISSAN society of banana marketing in Jalgaon.

[10] One such joint venture has been initiated in Kerala State.

(2) Performance evaluation of the cooperative marketing societies should focus more on their ability to achieve the objective of 'collective action' rather than their financial performance only. Extent of coverage and their effectiveness as an alternate marketing institution in minimizing the role of exploitative market intermediaries need to be emphasized.

(3) Though the cooperative institutions like KISSAN have been able to solve the problems of member-producers, they have not been able to add much value to the produce by diversification towards processing. Although several forms of the production-processing linkages are operational, such as contract or captive farming, there are still some concerns to be addressed. For instance, gestation period (from planting till harvest) in perennial fruits plays an important role in the success of these linkages.

(4) Lack of flexible procurement price policy of the processing units and non-availability of adequate working capital have been the two most important constraints for smooth functioning of the linkages between producers and processors.

(5) Institutional support for the provision of technology for developing innovative products for new market segments (such as production technology for fruit candy) needs emphasis.

(6) Quality control assumes significance in the processing of fruits and vegetables and therefore, the processors should avail the incentives provided by the government to ensure international quality standards like ISO 9000 and HACCP.

References

Anon. 1997. Modernizing the Indian food chain. *Food and agriculture integrated development action*. Report of the CII, Food Processing Committee, McKinsey and Co., Inc.

Anon. 1998. *Outline of assistance under schemes of the Ninth Plan.* 1997-2002. New Delhi. Ministry of Food Processing Industry, Government of India.

Anon. 1998a. Gherkins-Modern technique of cultivation. *Agriculture and Industry Survey* 8(8): 35.

Anon. 1998b. Gherkins in the world market. *Agriculture and Industry Survey* 8(8): 36.

Barua, Pranab. 1997. Raw material procurement for food processing industries - issues and interfaces. *Indian Food Packer* 51(6): 39-41.

Gajanana, T. M. 1993. Cooperatives and Indian agriculture, *Indian Cooperative Review* 30(4): 307-19.

Gajanana, T. M. and K. V. Subrahmanyam. 1993. Cooperative marketing of fruits and vegetables – Present status and future requirements. *Indian Cooperative Review* 31(1): 34-48.

Gajanana, T. M. and K. V. Subrahmanyam. 1996. Fruit marketing through cooperatives: A case study of Jalgaon banana. *Agricultural Economics Research Review* 9(1): 36-48.

George, M. V. and A. J. Singh. 1970. Development of rural industries – A case for vegetable processing at farm level. *Journal of Research* 7(3): 388-394.

Gupta, V. K. and Ramesh Gupta. 1986. *KANCHAN and its strategy for growth*, Ahmedabad: FAO/IIM.

Haque, T. 2000. Contractual arrangements in land and labor markets in rural India. *Indian Journal of Agricultural Economics* 55(3): 233-252.

IFP, *Indian Food Packer,* 2000. 54(2): 41-42; 54-55.

Kaul, G. L. 1993. Development of horticulture: A boost in the VIII Plan. *Indian Horticulture* 38(1): 9-13.

Kaul, G. L. 1997. Horticulture in India - production, marketing and processing. *Indian Journal of Agricultural Economics* 52(3): 561-573.

NCDC (various years). *Annual Report.* New Delhi..

NHB (National Horticultural Board). 1998. *Indian Horticulture Database.* New Delhi: Ministry of Agriculture. Govt. of India.

Sami. 1990. Food processing industry in India. *Indian Food Packer* 46(5): 90-96.

Sanghani, Sanjay. 1999. Inside story of an exporter (Gherkins). *Agriculture and Industry Survey* 9(3&4): 19-22.

Sinha, Sanjay and Saurabh Sinha. 1992. Small scale fruit and vegetable processing: dynamics of development. *Economic and Political Weekly* 27(26): 93-99.

Singh, S. 2000. Contract farming for agricultural diversification in the Indian Punjab: a study of performance and problems. *Indian Journal of Agricultural Economics* 55(3): 283-294.

Subrahmanyam, K. V. 2000. *Linkage between farm and non-farm sectors: role of processing of horticultural products*. Occasional Paper. Mumbai: NABARD.

Subrahmanyam, K. V. and M. Sudha. 1993a. Economics of linking tomato processing with production and marketing. *Indian Food Packer* 47(3): 25-33.

Subrahmanyam, K. V. and M. Sudha. 1993b. Economic feasibility of establishing a small scale cooperative processing unit in rural area: case study of tomato. *Indian Journal of Agricultural Marketing* 7(1): 23-31.

Subrahmanyam, K. V. and Mruthyunjaya. 1979. Economics of production and marketing of tomato around Bangalore. *Indian Journal of Horticulture* 36(3): 294-300.

Subrahmanyam, K. V. and T. M. Gajanana. 2000. *Cooperative marketing of fruits and vegetables in India.* New Delhi: Concept Publishing Company.

Subrahmanyam, K. V., M. Sudha and T. M. Gajanana. 1994b. Planning a successful fruit and vegetable cooperative marketing society: lessons from the existing societies. *Agricultural Marketing* 37(2): 36-39.

Subrahmanyam, K. V., T. M. Gajanana and M. Sudha. 1994a. Cooperative marketing of fruits and vegetables: policies and performance – A case study of HOPCOMS, Bangalore. *Indian Journal of Agricultural Marketing* 8(2): 186-93.

Sudha, M. and K. V. Subrahmanyam. 1994. *Economics of processing of fruits and vegetables*. Bangalore: IIHR (mimeo).

Sudha, M. and K. V. Subrahmanyam. 1996. Marketing of fruits and vegetable through cooperatives – a case study of FRESH, Hyderabad (AP). *Indian Cooperative Review* 33(3): 255-67.

Sudha, M. 1998a. Optimum allocation of processing capacity between custom hiring and self processing - a case of mango pulp making in Chitoor district of Andhra Pradesh. Paper presented at the training programme on '*Post-harvest management of mango and grapes'*, organized by the National Institute of Agricultural Marketing, in collaboration with the Karnataka State Agricultural Marketing Board, 25-30 May, 1998, Mysore.

Sudha, M. 1998b. Post-harvest handling and economics of raisin making. Paper presented at the training program on '*Post-harvest management of mango and grapes'*, organized by the National Institute of Agricultural Marketing, in collaboration with the Karnataka State Agricultural Marketing Board, 25-30 May, 1998, Mysore.

Viswanathan, K. V. and K. J. S. Satyasai. 1997. Fruit and vegetable production trends and role of linkages. *Indian Journal of Agricultural Economics* 52(3): 574-83.

Appendix I. Growth of fruit and vegetable processing industry in India

Year	No. of units	Installed capacity (000 tonnes)	Production (000 tonnes)	Capacity utilization (per cent)
1991	3925	950	360	37.89
1992	4057	1108	469	42.33
1993	4132	1260	559	44.37
1994	4270	1402	676	48.22
1995	4368	1750	850	48.57
1996	4674	1910	960	50.26
1997	4932	2040	910	44.61
1998	5112	2080	940	45.19
1999	5198	2100	980	46.67
CGR (per cent)	3.84	11.14	13.16	1.82

Source: Sudha and Subrahmanyam (1994) and Subrahmanyam (2000).

Appendix II. Growth of fruit and vegetable processing industry by category

Capacity of the unit	1990		1995		1999	
(tonnes/annum)	Number	Per cent	Number	Per cent	Number	Per cent
Large (>250)	442	11.49	497	11.38	598	12.00
Small scale (50-250)	654	17.01	714	16.45	834	16.00
Cottage (10-50)	768	19.97	854	19.55	1083	20.00
Home (1-10)	1303	33.38	1520	34.80	2002	38.00
Relabeller (<1)	676	17.65	783	17.63	681	14.00
Total	3846	100	4368	100	5198	100

Source: Sudha and Subrahmanyam (1994) and Subrahmanyam (2000).

Discussant's Note

M. S. Bhatia

The first paper (by P. G. Chengappa) on agricultural marketing in India discussed establishment and functioning of (a) the Regulated Markets, (b) Directorate of Agricultural Marketing, and State Agricultural Marketing Boards, (c) Regulation of Rural Markets, and (d) Marketing Cooperatives. The paper has highlighted the weakness of the existing regulated markets, particularly in regard to market functions related to finance, processing, packaging, market extension, market information and intelligence. The need to reform the regulated markets to update their capability to perform varied market functions was emphasized. In regard to functioning of some of the marketing cooperatives, there is a need for linking credit with marketing. Marketing cooperatives can play a lead role in agricultural/rural production and marketing system on the pattern of agri-business consortium. Strengthening of market finance, improvement in technology in the field of post-harvest management and greater emphasis on export-oriented commodities are other areas needing attention. The need for future trading in selected commodities to link the domestic markets with the international markets was also indicated. While most of us are aware of productive and supportive role of some of the marketing institutions like cooperative, FCI, NAFED, etc., we do not view future markets on commodity exchanges as productive activities.

The paper on the market interventions (by Ramesh Chand) has very lucidly covered the major issues relating to the various forms of market interventions. Detailing the successes and failures of the administered prices, including system of minimum support prices (MSP), buffer stocking, and system of levy and state trading, the author has made important suggestions to improve marketing institutions, so that they can be more effective in the changed scenario under the World Trade Organization (WTO) and can provide incentive for adopting

© NCAP 2003. Institutional Change in Indian Agriculture (eds Suresh Pal, Mruthyunjaya, P. K. Joshi and Raka Saxena)

new technology. Without attempting to summarize the valuable suggestions contained in the paper, I would like to focus on some important themes which may require more detailed discussion and deliberations.

The first and the most important observation of the author regarding the administered prices is that the price policy has been very successful in providing incentive for adoption of new technology of rice and wheat, but it failed to induce changes in production pattern consistent with the overall needs of the economy. The author has observed that this happened as both the price policy and technological change remained biased towards rice and wheat. He has given the example of 30 per cent of the output having as buffer stock and deficit in oilseeds to the extent of 40 per cent. Let me comment first on these observations. Most of us share the view that agricultural price policy of MSP and market intervention for procurement of surpluses have been quite effective, encouraging the farmers for adoption of modern technology, investment and thus raising production. The policy has a long history of over 35 years and has been successful in balancing the procurement and public distribution system (PDS), except some marginal deviations in certain years depending up to two or three successive good or bad years. However, balance of procurement and PDS got disturbed during the last two years not due to faulty pricing policy for the producers but because of changes in the PDS policy. The government has changed the PDS policy by targetting food subsidy and supplying of foodgrains to above the poverty line (APL) families at economic cost of FCI and at half of this price to below the poverty line (BPL) families. The quantity is also restricted to 10 kg per family per month for the BPL families. Taking into consideration the total number of BPL families of about 60 million, ever with 100 per cent off take for the BPL, total off take of foodgrains would be about 0.6 million tonnes per month or 7.2 million tonnes per annum. As APL supplies were being made at the economic cost, which in many states was almost equal or even higher than market prices, the off-take for this section of population fell to almost negligible. This situation remained for almost 2-3 years, which resulted large accumulation of stocks with the government. Thus, building of large stock of foodgrains in the recent period does not suggest the biased nature of MSP policy towards rice and wheat but because of changes in pricing policy for the PDS.

The other indicator used to show biased nature of the pricing policy towards wheat and rice is the deficit in edible oils to the extent of 40 per cent. The

shortage of edible oils in the country is to be seen in the overall scenario of demand and supply in terms of growth in per capita income, income elasticity of demand and pattern of growth in the production and productivity. In the early 1980s, country was importing edible oils to the extent of 1.6-2 million tonnes annually, when domestic production was about 3.5-4 million tonnes and the per capita annual consumption was about 5 kg. The rate of growth of oilseed production during the 1980s and 1990s was 5.75 and 3.06 per cent per annum, respectively. Even with the relatively slow rate of growth in the nineties, the rate of growth of production and productivity of oilseeds were close to those of wheat and almost 60 per cent higher than those of rice. The rate of growth of area under field oilseed crops (1.27 per cent) is about 120 per cent higher than that of rice (0.49 per cent). The higher rate of growth of production has raised the per capita availability/consumption of edible oil to about 9-10 kg in 2000, against 5 kg in the mid-eighties. Thus, the continued import of edible oils is because of relatively lower prices in the international market. I agree with the author about the limited impact of the price policy on pulses, but this may be more attributed to the absence of appropriate technology rather than deficiency in the price policy.

The author has rightly pointed out the institutional weaknesses for implementation of price and market interventions in some of the states like Bihar, Orissa, West Bengal and Madhya Pradesh. He has also expressed concern for finding ways to make MSP more effective for various commodities and in major producing regions. The author has further raised some issues about the MSP policy which relate to (a) criteria for coverage of crops under MSP, (b) a price intervention system that encourages diversification in agriculture, (c) the basis for determination of MSP. These criteria should be considered further in the context of a commodity to be covered under the MSP policy.

The author has pointed out that direct market interventions by public agencies have repressed the private trade in grain, discouraged modernization and caused inefficiencies. In this regard, it may be mentioned that the public-sector agencies procured only 18-20 million tonnes of cereals out of about 180 million tonnes of the annual production, which is 10-12 per cent of the total production, or about 25 per cent of the marketable surplus. In other words, 75 per cent of the market supplies were still handled by the private trade. Excluding Punjab and Haryana, where the public agencies were more active, the private agencies handled about

90 per cent of the marketed quantities. Is marketing more efficient and market infrastructure better modernized in these regions in comparison to Punjab and Haryana?

Discussion on the system of levy leaves some confusion. It is stated that the levy is very high at 75 per cent in the northern states, and after contributing three-fourths of rice at a price which is often below the open market price, the millers are left with small produce to run the business. In the subsequent statement, it is said that the millers supply inferior, broken and adulterated rice to FCI, which would sell at a very low price in the open market. If the second statement is correct, then the millers should not have complained as made in the earlier statement.

There is hardly any difference of opinion on the statement that there is a considerable scope for improving the efficiency of FCI to reduce the economic cost and food subsidy. Similarly, liberalization of the domestic markets is a part of the present policy. The author has also suggested an approach for imposition of variable tariff, based on the difference between the domestic and world prices. This suggestion of continuous monitoring of international price and supply situation merits serious consideration.

The paper on the institutional aspects of agro-industry by Vasant Gandhi reviewed the growth of this sector in India and highlighted the experiences of some of the developing and developed countries. Based on available literature, the author has examined the importance, characteristics and constraints for the development of this sector. The author has also examined the various agro-industry models in existence in the country like cooperative organization model (AMUL), the private multinational partnering with farmers model (Pepsico), multinational-local firm partnership with corporate model, government model (HPMC), etc. The author has suggested that a partnership approach between small farmers through contract or cooperative arrangement and building confidence and trust through a meaningful and mutually beneficially long-term relationship have better chances of success. He has also highlighted the role of modern technology and professional management in the changing and competitive market scenario for the success of the agro-industry.

The second paper on agro-processing by M. Sudha and T. M. Gajanana has examined the dynamic nature of the agro-processing and institutional support needed for linking agricultural production to marketing. It reviewed the functioning of three case studies, viz. HOPCOMS, FRESH and KISSAN, having different

types of institutional structure – first two being government-run organization but with different orientation of consumer and producer, while the third is producer-oriented cooperative institution.

The authors have also examined the status and need for processing of agricultural commodities, particularly of fruits and vegetables and initiatives taken by the Government by creating the Ministry of Food Processing Industry and institutions like National Horticulture Board, APEDA. The authors feel that linking of production with marketing through processing has generally been inadequate. Based on the performance of these case studies, the authors have concluded that institutional support in the form of cooperative marketing society is essential for promoting fair trade practices and serving small farmers. This may require provision of adequate incentives to setup processing unit, enter into contractual arrangements with growers, setting up of infrastructure parks for integrated production and processing, etc.

The importance of marketing institutions to encourage adoption of technology in agricultural sector is well recognized. The coming years are likely to witness increasing attention towards changes in technology in the light of the WTO and globalization and their impact on agricultural trade, land and water resources, and environment. Efficient marketing governed by a host of institutions would play a vital role in informing the producers about the needs and desires of consumers.

Contributors

S. S. Acharya, Director, Institute of Development Studies, 8-B Jhalana Institutional Area, Jaipur 302 004, Rajasthan
Email: ssacharya@idsj.org

Vishwa Ballabh, Professor, Institute of Rural Management, Anand 388 001, Gujarat Email: root@irm.ernet.in

B. C. Barah, Principal Scientist, National Centre for Agricultural Economics and Policy Research, Library Avenue, Pusa, New Delhi 110 012
Email: barah@iasri.delhi.nic.in

M. S. Bhatia, Former Member, Commission for Agricultural Costs and Prices, New Delhi 110 012

Ramesh Chand, Principal Scientist, National Centre for Agricultural Economics and Policy Research, Library Avenue, Pusa, New Delhi 110 012
Email: rc@iasri.delhi.nic.in

P. G. Chengappa, Director of Instruction (Agric.), University of Agricultural Sciences, GKVK Campus, Bangalore 560 065, Karnataka
Email: pgchengappa@yahoo.com

K. K. Datta, Principal Scientist, ICAR Research Complex for NEH Region, Barapani 793 103, Meghalaya

R. S. Deshpande, Professor, Institute for Social and Economic Change, Nagarbhavi, Bangalore 560 072, Karnataka
Email: despande@isec.kar.nic.in

T. M. Gajanana, Scientist, Social Sciences Division, Indian Institute of Horticultural Research, Hessarghatta, Bangalore 560 089, Karnataka Email: gajanana@iihr.kar.nic.in

Vasant P. Gandhi, Professor, Indian Institute of Management, Vastrapur, Ahmedabad 380 015, Gujarat Email: gandhi@iimahd.ernet.in

T. Haque, Member, Commission for Agricultural Costs and Prices, Room # 408 Shastri Bhavan, New Delhi 110 001

A. K. Jha, Research Associate, National Centre for Agricultural Economics and Policy Research, Pusa, New Delhi 110 012
Email: akj66@indiatimes.com

P. K. Joshi, Principal Scientist, National Centre for Agricultural Economics and Policy Research, Library Avenue, Pusa, New Delhi 110 012 Email: pjoshi@iasri.delhi.nic.in

D. P. Khankhoje, Professor, National Institute of Bank Management, Kondowe Khurd, Pune, Maharashtra Email: dpk@nibm.ernet.in

D. K. Marothia, Professor and Head, Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidhyalaya, Raipur 492 012, Chhattisgarh Email: dkmarothia@yahoo.com

G. Mini, Research Associate, Institute for Social and Economic Change, Bangalore, Karnataka

J. P. Mishra, Assistant Director General (ES&M), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi 110 001

Mruthyunjaya, Director, National Centre for Agricultural Economics and Policy Research, Pusa, New Delhi 110 012
Email: jaya_ncap@iasri.dehi.nic.in

Suresh Pal, Senior Scientist, National Centre for Agricultural Economics and Policy Research, Pusa, New Delhi 110 012
Email: suresh_ncap@iasri.delhi.nic.in

P. A. Lakshmi Prasanna, Scientist, National Centre for Agricultural Economics and Policy Research, Pusa, New Delhi 110 012
Email: lakshmi_ncap@iasri.delhi.nic.in

Rajeshwari S. Raina, Scientist, National Institute of Science Technology and Development Studies, Dr. KS Krishnan Marg, New Delhi 110 012

N. Rajalakshmi, Professor, Department of Economics, Madras University, Chennai, Tamil Nadu

V. M. Rao, Former Member, Commission for Agricultural Costs and Prices, 22 CHBS, I Layout, Vijaynagar, Bangalore 560 040, Karnataka, Email: vmrao@vsnl.com

R. Maria Saleth, Professor, Institute for Social and Economic Change, Nagarbhavi P.O., Bangalore 560 072, Karnataka Email: isec!saleth@kar.nic.in

K. J. S. Satyasai, Assistant General Manager, National Bank for Agricultural and Rural Development, Department of Economic Analysis and

Research, Jeevan Seva Complex (Annexe), SN Road, Santacruz (West), Mumbai 400 054, Maharashtra

Raka Saxena, Research Associate, National Centre for Agricultural Economics and Policy Research, Pusa, New Delhi 110 012
Email: saxenaraka@rediffmail.com

R. L. Shiyani, Associate Professor, Gujarat Agricultural University, Junagarh**,** Gujarat

M. Sudha, Senior Scientist, Indian Institute of Horticultural Research, Hessarghatta, Bangalore 560 089, Karnataka
Email: sudham@iihr.kar.nic.in

Rasheed Sulaiman V., Scientist, National Centre for Agricultural Economics and Policy Research, Library Avenue, Pusa, New Delhi 110 012
Email: rasheed@iasri.delhi.nic.in

Laxmi Tewari, Research Associate, National Centre for Agricultural Economics and Policy Research, Pusa, New Delhi 110 012
Email: laxmi_ncap@rediffmail.com

A. Vaidyanathan, President, Indian Society of Agricultural Economics, and Professor Emeritus, Madras Institute of Development Studies, Chennai 600 020 Email: ssmids@ren.nic.in

Subject Index

Institutional Change in Indian Agriculture

Edited by
Suresh Pal, Mruthyunjaya, P K Joshi and Raka Saxena

Globalization, privatization and scientific advancements pose new challenges and opportunities for the development of Indian agriculture. The emerging paradigm shifts focus to creation and application of new knowledge for agricultural development and global competitiveness. To facilitate this shift and realize greater economic efficiency, a new set of responsive institutions should emerge.

This volume discusses the direction of institutional change in Indian agriculture. The roles of the state, markets and collective actions are examined for evolving the knowledge-intensive agriculture. The contributed papers from a number of leading researchers cover the institutions for R&D, land and water resources, credit, marketing, trade and agro-processing.

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र
NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
(Indian Council of Agricultural Research)
POST BOX No. 11305, LIBRARY AVENUE, PUSA, NEW DELHI-110012.
Phone : 91-11-25847628, 25848731 Fax : 91-11-25842684 E-mail : ncap@iasri.delhi.nic.in
http: // www.icar.org.in/ncap/index.htm