Economic and Social Commission for Asia and the Pacific

CAPSA WORKING PAPER No. 82

Enhancing Sustainable Development of Diverse Agriculture in India

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United Nations
ESCAP

UNESCAP-CAPSA

The Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific (CAPSA) is a subsidiary body of UNESCAP. It was established as the Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) in 1981 and was renamed CAPSA in 2004.

Objectives

CAPSA promotes a more supportive policy environment in member countries to enhance the living conditions of rural poor populations in disadvantaged areas, particularly those who rely on secondary crop agriculture for their livelihood, and to promote research and development related to agriculture to alleviate poverty in the Asian and Pacific region.

Functions

1. Coordination of socio-economic and policy research on secondary crops.
2. Networking and partnership with other international organizations and key stakeholders.
3. Research and analysis of trends and opportunities with regard to improving the economic status of rural populations.
4. Production, packaging and dissemination of information and successful practices on poverty reduction.
5. Dissemination of information and good practices on poverty reduction measures.
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Enhancing Sustainable Development of Diverse Agriculture in India

"UNESCAP-CAPSA: Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific"

WORKING PAPER 82

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UNESCAP-CAPSA
Centre for Alleviation of Poverty
through Secondary Crops' Development
in Asia and the Pacific

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List of Acronyms

AP	:	Andhra Pradesh
CFTRI	:	Central Food Technological Research Institute
CGPRT	:	Coarse grains, pulses, roots and tubers; secondary crops
CMIE	:	Centre of Monitoring Indian Economy
DARE	:	Department of Agricultural Research and Extension
EXIM	:	Export and Import Policy
FCDS	:	Food Characteristic Demand System
FHP	:	Farm Harvest Price
FYP	:	Five-Year Plan
GCA	:	Gross Cropped Area
GDP	:	Gross Domestic Product
GR	:	Green Revolution
HYV	:	High Yielding Variety
IARI	:	Indian Agricultural Research Institute
ICAR	:	Indian Council for Agricultural Research
INR	:	Indian Rupees
MIS	:	Market Intervention Scheme
MP	:	Madhya Pradesh
MSP	:	Minimum Support Price
NCDC	:	National Cooperative Development Corporation
NSS	:	National Sample Survey
PDS	:	Public Distribution System
QPM	:	Quality Protein Maize
SID	:	Simpson Index to Measure Diversification
SMP	:	Statutory Minimum Price
TMOMP	:	Technology Mission on Oilseeds, Maize and Pulses
UP	:	Uttar Pradesh
VFC	:	Varginia Flue Cured tobbaco
WHP	:	Wholesale Price

Foreword

Most Asian countries succeeded in multiplying major cereal production through the green revolution. This was made possible by the introduction of high yielding varieties and policy support which promoted the construction of irrigation facilities and the use of modern inputs such as chemical fertilizers and pesticides. However, recently the growth in productivity of major cereals has reached a plateau. Agricultural diversification has a number of positive effects, among others, food security, risk mitigation, labour absorption and conservation of biodiversity. It is crucial to be aware of the driving forces and constraints to agricultural diversification to formulate policy options which realize the coexistence of sustainable agricultural development and poverty reduction in rural areas.

Responding to this vital need, UNESCAP-CAPSA conducted a three-year research project, "Identification of Pulling Factors for Enhancing Sustainable Development of Diverse Agriculture in Selected Asian Countries (AGRIDIV)", from April 2003, in collaboration with eight participating countries, namely Bangladesh, India, Indonesia, Lao People's Democratic Republic, Myanmar, Sri Lanka, Thailand and Viet Nam.

It is my pleasure to publish "**Enhancing Sustainable Development of Diverse Agriculture in India**" as a result of the first phase of the India country study of the project. This volume presents a descriptive and quantitative analysis of the current secondary crop agriculture and development constraints and options. This study focuses on policy recommendations, as well as areas of/for farther study.

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Executive Summary

Agriculture in India occupies an important place as it contributes nearly 25 per cent of GDP and two-thirds of the population depend upon it. With a population of nearly 1,027 million, India accounts for approximately one-sixth of the world's population but on just 2.4 per cent of the world's surface area. Agricultural growth in the past has been sufficient to move from severe food crisis to aggregate food surplus today. Most of the development in agriculture has taken place in irrigated regions overlooking the rainfed marginal environments. The rainfed regions are diverse in terms of resource base, varying from resource rich regions harnessing substantial production to resource poor regions with restricted potential. These resource poor regions are plagued with widespread poverty and degradation of natural resources and are mostly dominated by secondary crops, i.e, coarse grains, pulses, roots and tubers. Barring maize and potato, secondary crops are loosing ground against the finer cereals, cash and commercial crops. Therefore, there is an urgent need to provide a leverage to these crops by providing priority support in terms of technological advancement and much needed policy support vis-à-vis other crops. Moreover, some of the coarse grains and pulses are nutritionally superior and the increased productivity of this group will add to the nations trust for providing nutritional security. Keeping this in mind, the present study on "Enhancing Sustainable Development of Diverse Agriculture in India" is an attempt to provide some much needed succor to secondary crops, thereby supporting millions of livelihoods inhabiting the rainfed marginal environments of the country.

During the last 10 years, the agricultural and allied sector continued to be a major contributor to GDP. The economy has been growing at an annual rate above 6 per cent since 1992-1993. As a consequence, per capita income has increased and reached an all-time high of INR 16,487 in 1999-2000.

The agricultural sector in the country continues to occupy the lion's share of nearly 60 per cent in providing employment to the populace but with fewer employment opportunities and increases in the workable population, the unemployment rate is rising at a faster rate. The poor educational status of the populace to a greater extent has hampered economic growth. Currently, nearly sixty-five per cent of the population is literate in the country.

Although the country has gained momentum in its economic fundamentals, the impact of development planning on the economic welfare of the people has not been equitable in the past. Income inequalities have become more pronounced. The significant increase in the savings of the household sector since 1983 reflects a rapid increase in the income of the highest 20 per cent. The Gini-Lorenz ratio for urban areas is about 10-12 per cent higher than that for rural areas confirming that the inequalities are more pronounced in urban areas. It can further be inferred that the income of the higher groups has risen faster than the consumption expenditure. The ratio for the urban areas was stable at 0.33 over the two decades from the mid 1960's to the mid 1980's.

The average size of operational holdings declined from 2.30 ha during 1970-1971 to 1.41 ha in 1995-1996. Marginal holdings have doubled during the past twenty-five years, while medium and large holdings have declined significantly. This marginalization of land holdings leads to difficulties in modernizing farming practices resulting in low productivity. Further, due to increases in the total labour force and persistent marginalization of holdings, the number of landless labours is on the rise and had grown to approximately 94 million in 1999-2000.

Due to diverse agro-climatic conditions in the country, a large number of agricultural crops, namely food grains and commercial crops are produced. Since independence, the cornerstone of country's food policy was self-sufficiency. But of late, in order to tap huge

potential and meet the challenges of a vast population and liberalization, diversification is receiving more attention from all quarters. Diversification gives wider choice in the production of a variety of crops in a given area to expand production and lessen the risk. During the last three decades, the extent of diversification was largely in favour of fine cereals and commercial crops and has cast shadows on coarse grains. The acreage under coarse grains has been taken away by more remunerative crops.

It was observed that Gujarat state, being highly diversified, boasts the highest SID index (Simpson Index to measure diversification) within the selected states and Uttar Pradesh the lowest in terms of cropping patterns. The more irrigated area of Uttar Pradesh encouraged the specialization of crops/farms in favour of superior cereals. In other words, the subsistence nature of the farming discouraged farm diversification. The Simpson Index for the country grew in the last two decades signifying government thrust towards diversification.

CGPRT crops, despite playing a vital role in the past and still providing livelihoods to millions of farmers in India lost their importance in the changing agricultural economic scenario. Share of coarse cereals and pulses in gross cropped area (GCA) have come down to about 15 and 11 per cent respectively. Major gainers were wheat, rice, and oilseeds to some extent. Among major CGPRT crop growing states (based on Concentration Index), Maharashtra, Rajasthan, Karnataka, Madhya Pradesh (MP), Uttar Pradesh (UP), Andhra Pradesh (AP) and Gujarat; together occupy more than 80 per cent of total area under these crops in the country. Acreage of coarse cereals decelerated substantially in most of the states under study. However, pearl millet and maize have increased significantly in some of the selected states. Area under chickpea has also distended more aggressively during the post-green revolution (GR) period. Similarly, area under potato has increased in all these states during both pre- and post- GR periods.

The strong negative growth in area led to decelerated growth in production of secondary crops, even in the presence of moderate positive growth in their yield. However, maize and chickpea have shown robust growth in production during the post-GR period. Pulses are facing great difficulty in expanding acreage mainly due to highly unstable yield performance. Potato is the only tuber crop under the secondary crop group, which has received praise from every corner of the country due to its wide acceptance as an all-season vegetable crop. On the other hand, non-CGPRT crops have shown mixed response to the changed agricultural environment in the country. Due to the favourable policy environment, area under fine cereals and other commercial crops has increased substantially. Only 12-13 per cent of cultivated area under secondary crops receives irrigation. Potato being a cash crop enjoys almost 100 per cent irrigated area.

During the last three decades, the drop in per capita consumption of coarse cereals is almost two thirds. Secondary crops contributed to the tune of 12 per cent to the total consumption basket in the rural areas of the country. In urban areas, it contributed only 8 per cent**.** In India, there is no specific market for secondary crops. Most of the states, however, have a huge marketed surplus of coarse cereals as well as pulses, but in the absence of proper marketing facilities and institutional support, these crops find difficulty in reaching the regulated markets. Maize is the major secondary crop, which is marketed in bulk in many states. Similarly, pearl millet and sorghum are traded in bulk in Maharashtra, Gujarat and Uttar Pradesh.

In many cases, the farm harvest price (FHP) is higher than the wholesale price (WHP), which shows the fragile market behaviour of these commodities due to low demand as well as trade across the states. Further, a minimum support price for these crops does not have much relevance in the country. Thus, the study calls for a level playing field to be provided to the secondary crops for equitable growth in Indian agriculture.

Under the existing conditions, the nations' economy, which is primarily agrarian, with small land holdings and huge population pressure, the diversification of the rural economy should receive higher priority to meet the twin objectives of eradicating poverty and unemployment. This will also lead to the improved welfare of the populace and the overall development of the country.

1. General Introduction

1.1 Background

Agriculture in India occupies an important place as it contributes nearly 25 per cent of GDP and two-thirds of the population is dependent/engaged in it. Agricultural growth has been sufficient to move from a severe food crisis situation to an aggregate food surplus today. Most of the development in agriculture has taken place under irrigated conditions. Unfortunately, the opportunities for the continued expansion of irrigated areas are now limited and hence planners are looking for rainfed or un-irrigated agriculture to help meet the rising demand for food over the upcoming decades. At the same time, rainfed areas are equally diverse, varying from resource rich regions (harnessing substantial production potential) to resource poor regions (having restricted potential). In these resource poor regions, there is widespread poverty and degradation of natural resources.

Secondary crops, i.e, coarse grains, pulses, roots and tubers, mostly dominate the resource poor regions. These crops are important for vulnerable sections of society. Except maize and potato, secondary crops are loosing ground against finer cereals, cash and commercial crops. Moreover, continued neglect of these crops has pushed them to marginal lands and the low productivity areas. Therefore, there is an urgent need to provide a leverage to these crops by providing priority support in terms of technological advancement and much needed policy support *vis-à-vis* other crops. Further, with increased per capita income and changes in dietary patterns, preferences for secondary crops are diminishing, thereby increasing the vulnerability of the masses whose livelihoods come from secondary crops. Moreover, the increased productivity of pulses will offset the import payments on this account as the demand for pulses (India being a predominantly vegetarian state) is far ahead of the supply.

1.2 Study objectives

1. Examine the existing production, marketing and consumption patterns of secondary crops *vis-à-vis* other food crops, and
2. Review the various policies concerning agricultural diversification, production, consumption and the marketing of food crops.

1.3 Scope of study

Secondary crops, which are predominantly nutritionally rich food crops and support millions of livelihoods of the farmers in rainfed marginal environments, have been neglected during the course of agricultural development in the country. This has led to the inequitable distribution of developmental gains and regional imbalances. In order to reinforce balanced developmental strategies and improve the livelihoods of the populace belonging to the marginal and fragile regions of the country, agricultural developmental plans need to be rationalized. This requires an in-depth assessment of the production, marketing, consumption and value addition scenario of secondary crops in India that will form the basis for devising the strategies/policies concerning enhancing the sustainable development of secondary crops.

1.4 About the project

The project entitled "Identification of Pulling Factors for Enhancing Sustainable Development of Diverse Agriculture in Selected Asian Countries (AGRIDIV)- Case study of India" is an approved collaborative project under the ICAR-UNESCAP-CAPSA work plan. The specific objectives of the project are as follows:

1. Examine the existing production, marketing and consumption patterns of secondary crops *vis-à-vis* other food crops,
2. Review the various policies concerning agricultural diversification, production, consumption and the marketing of food crops,
3. Assess the impact of globalization on and prospects of secondary crops,
4. Identify and prioritize various constraints and accelerators to secondary crop production and agricultural diversification, and
5. Suggest policy measures/strategies for sustainable development of diverse agriculture.

The project has been conducted under UNESCAP-CAPSA, Bogor, Indonesia as a lead centre with eight collaborative Asian countries, namely, Bangladesh, India, Indonesia, Lao People's Democratic Republic, Myanmar, Sri Lanka, Thailand and Viet Nam. The study is planned into two phases, the first phase of the study is confined to examine the first and second objectives based on secondary data from published sources and the findings are reported as "Enhancing Sustainable Development of Diverse Agriculture in India". In succeeding phases, the study will undertake the assessment of the impact of globalization on secondary crops and identify the various pulling factors and accelerators for enhancing secondary crop production followed by recommendations of policies/strategies for sustainable development of diverse agriculture.

2. General Framework and Research Methodology

2.1 General framework

The study will be carried out in three phases. The first phase of the study will be confined to examine the first and second objectives of the proposed study, based on secondary data and published sources.

In succeeding phases, the focus of the study will be to assess the impact of globalization and to identify the various pulling factors and prioritize them for immediate policy intervention followed by a recommendation of policies/strategies for the sustainable development of diverse agriculture.

2.2 Research methodology

The study is confined to major coarse cereals, pulses and root crops, covering seven major secondary crop growing states and accounting for an area of over 80 per cent of secondary crops grown in the country. The study is based on secondary data, obtained from various published sources. The data was analyzed keeping in mind the objectives of the study. The statistical methods used were:

2.2.1 Estimation of growth

The annual growth rates for area, production and yield of secondary crops were estimated for the period 1990/1991 to 2000/2001, using the growth model (1):

Exponential growth function, $Y_t = A\, e^{bt}$ … (1)

Where,

Y_t = area/production/yield of secondary crops for the year 't'.

A = constant

t = time variable (1,2…, n) for each period.

Log transformation of the above function is $\ln Y_t = \ln A + b\, t$

Growth rate (per cent) = $b \times 100$ … (2)

2.2.2 Measurement of diversification

There are many methods to explain either concentration or diversification of commodities at a given time. Among them, some important methods are (i) Herfindal Index, (ii) Index of Maximum Proportion, (iii) Entropy Index, (iv) Simpson Index, etc. (Kelley *et al*., 1995; Pandey and Sharma, 1996; Chand, 1996). Out of these, the Simpson Index provides a clear dispersion of commodities in a geographical region (Joshi *et al*., 2004). The index ranges between 0 and 1. If there exists complete specialization, the index tends towards 0 and in cases of complete diversification, it tends towards 1. The Simpson Index (SID) is calculated using the following equation:

$$SID = 1 - \sum_{i=1}^{n} W_i^2 \quad where, \; W_i = \frac{X_i}{\sum X_i}$$

Where,

X_i is the value or area of the i^{th} commodities, and
W_i is the proportionate value or area of the i^{th} commodities in the total value or area.

3. Basic Socio-economic Information of the Country

India is a country of great diversity with a wide range of landform types, including major mountain ranges, deserts, rich agricultural plains, and hilly jungle regions. Indeed, the term *Indian subcontinent* aptly describes the enormous extent of the earth's surface that India occupies, and any attempt to generalize about its hypsography would be incomplete. Diversity is also evident in the geographical distribution of India's ethnic and linguistic groups. As a result of thousands of years of cultural and political expansion and amalgamation, contemporary India has come to include many different natural and cultural regions.

The Himalayas (and the nations of Nepal and Bhutan) form India's northern frontier with China. Pakistan borders India to the west and Bangladesh (formerly East Pakistan) to the east. The boundaries of the Indian polity are not fully demarcated because of regional ethnic and political disputes and are the source of occasional tension.

India's population as of 2001 stood at 1,027 million, having 531.3 million males and 495.7 million females. India accounts for a meager 2.4 per cent of the world's surface area of 135.79 million sq. km. Yet, it supports and sustains a whopping 16.7 per cent of the world's population. Various demographic and economic attributes are mentioned below.

3.1 Demographic profiles

The demographic background of the country portrays the population profile, its composition, sex ratio and the occupational structure of the people in the country.

3.1.1 Population age structure

The economic worthiness of the population depends upon the workable population in the country. The population age structure depicted below categorizes the population into various age groups. The population of India, which was nearly 689 million in 1981, grew at the rate of 2.14 per cent and reached 844.8 million. The growth slowed to 1.94 per cent in the subsequent decade, but still surpassed the 1,000 million mark and reached 1,027 million. This is clear from the decrease in percentage of the population belonging to the 0-4 and 5-14 age groups from 13.4 to 11.5 and from 23.0 to 22.0 respectively, during the decade. The reason could well be attributed to the intense governmental programme on family planning and birth control. The workable population belonging to the 15-64 age bracket rose from 57.5 per cent in 1981 to 59.3 per cent in 1991 and has risen further to 61.5 per cent in 2001. This increase in workforce has led to increases in unemployment, due to a lack of new employment creation and opportunities (Table 3.1).

Table 3.1 Population distribution (millions)

Census	Population distribution (%)							Total
year	0-4	5-14	15-64	60-64	65-79	80 +	Median	(million)
1981	14.0	24.5	57.5	6.5	4.0	0.3	20.6	688.8
1991	13.4	23.0	59.3	6.8	4.3	0.4	21.9	844.8
2001	11.5	22.0	61.5	7.6	5.0	0.6	23.7	1009.0

Source: Census of India, 2001, 1991 and 1981.

The period also witnessed large-scale migration from resource poor regions to resource rich regions. On the contrary, due to better health care and civic amenities, the aged population is on the rise. The population above 60 years old rose from 10.8 per cent in 1981 to 11.5 per cent in 1991 and then to 13.2 per cent in 2001. This has led to more dependency upon the workable population, and the median population age has risen from 20.6 to 23.7 per cent.

3.1.2 Dependency ratio

A rapidly growing population with a high fertility rate implies that a relatively large proportion of the population consists of children. The population pyramid of India shows that due to a large population of under 14 year-olds, the pyramid has a large base. The children will be dependent on the land and their families for sustenance. In addition to the children, adults who have left the labour force because of their advanced age are also dependent. The dependency ratio tells us how many young people (under 14) and older people (over 64) depend on people of working age (15-64).

The dependency ratio is worked out as:

Dependency ratio = [(per cent of population under 14) + (per cent of population over 64)] / [per cent of population between15 and 64] * 100.

Table 3.2 Percentage of dependent population

Year	Age (stage) %			Dependency ratio
	Young (0-14)	Old (65 +)	Total	
1981	38.6	6.5	45.1	82.15
1991	36.4	6.9	43.3	76.37
2001	33.3	7.6	40.9	69.20

Source: Census of India, 2001 and 1991.

Due to slight increases in average age and a consistent decrease in child birth in the past decades, the dependency ratio has gone down from 82.15 in 1981 to 76.37 in 1991 to 69.20 in 2001 (Table 3.2). Decreased dependency leads to an overall improvement in welfare and economic well-being of the people on account of higher per capita share in income.

3.1.3 Sex ratio

Sex ratio, defined, as the number of females per thousand males is an important social indicator to measure the extent of prevailing equality between males and females in a society at a given point of time. The sex ratio in the country has always remained unfavourable to females. It was 972 at the beginning of the twentieth century but thereafter showed continuous decline. Table 3.3, representing the sex ratio of the population of the country, revealed an improvement in the sex ratio. There were 927 females per thousand males in 1991 but this improved to 933 in 2001.

Table 3.3 Sex ratio (female population per thousand males)

Year	Rural	Urban	Total
1991	939	894	927
2001	936	897	933

Source: Census of India, 1991 and 2001.

3.1.4 Occupational structure

The study of the sectoral employment pattern of the country revealed that agriculture continues to play an important role in employment, absorbing about 59.84 per cent of the population in 1999-2000. Other sectors contributing significantly to employment were manufacturing, followed by trade, community and social/personal services, etc. The above five sectors absorbed almost 90 per cent of the workforce (Table 3.4).

This study revealed that there was a decline in growth of employment in the manufacturing and all other major sectors of employment and some other primary sectors such as mining, quarrying, and agriculture. Electricity, gas and water sanitation also recorded a negative growth rate. The sectors with the highest employment growth were in construction, transport, storage and communication, followed by trade.

Table 3.4 Sectoral employment pattern

Particular	Numbers (millions)		
	1983	1993-1994	1999-2000
Agriculture	207.23	242.46	237.56
Mining and quarrying	1.76	2.70	2.27
Manufacturing	34.03	42.50	48.01
Electricity gas and WS	0.85	1.35	1.28
Construction	6.78	11.68	17.62
Trade	19.22	27.78	37.32
Transport, storage and communication	7.39	10.33	14.69
Financial services	1.70	3.52	5.05
Community social services	23.80	35.13	33.20
Total employment	302.76	377.45	397.00

Source: Economic Survey (various issues), Government of India.

3.1.5 Population growth

India's population as of 2001 stood at 1,027 million inhabiting a meager 2.4 per cent of the world's surface area. Yet, it supports and sustains a whopping 16.7 per cent of the world's population.

Table 3.5 Population growth over the decades

Years	Population (millions)	Decadal growth (%)	Annual growth (%)
1951	361.09	13.31	1.25
1961	439.23	21.64	1.96
1971	548.16	24.80	2.20
1981	683.33	24.66	2.22
1991	846.39	23.86	2.14
2001	1027.02	21.34	1.93

Source: Census of India, 1991 and 2001

The population of the country, which at the turn of the 1950s was around 361.09 million, increased to nearly treble that level at the dawn of this century registering an annual growth rate of nearly 2 per cent. The per cent decadal growth in the inter-censual period 1991-2001 was 21.34 per cent (Table 3.5). The decadal and annual growth rate has declined during census decade 1991-2001 as compared to the previous census decade.

3.1.6 Education and literacy

For the purpose of ascertaining literacy rates, a person aged seven and above, who can both read and write with understanding in any language, is treated as literate. A person, who can only read but cannot write, is not literate. The progress of the literacy status in the country over the decade has been presented below.

By looking at Table 3.6, it is very encouraging to see a rise in the literacy level from 52.21 per cent in 1991 to 65.38 per cent in 2001. The female literacy level has shown remarkable progress showing greater emphasis towards female literacy. However, rural literacy is still lagging far behind urban literacy in both sexes with female literacy even below the half mark of 50 per cent.

Table 3.6 Literacy rate (per cent)

Particular	% of population literate					
	1991			2001		
	Male	Female	Total	Male	Female	Total
Rural	57.90	30.60	44.70	71.40	46.70	59.40
Urban	81.10	64.00	73.10	86.70	73.20	80.30
Average	64.13	39.29	52.21	75.85	54.16	65.38

Source: Census of India, 2001.

3.2 Economic profiles

The Indian economy, which is predominantly agricultural, has acquired remarkable resilience in the last decade. About one-third of the national income is derived from agricultural and allied activities, employing about two-thirds of the workforce. Since independence, planning has been centered on diversifying the economy. Various indicators portraying the Indian economy are discussed below.

3.2.1 Growth in national economy

National income, which is identically the same as Gross Domestic Product at factor cost, is the sum of income accruing to factors of production, supplied by normal residents of the country in a particular year. It is an important indicator of the economic status of a country.

The Table 3.7 depicts the Gross Domestic Product (GDP) and per capita income over 10 years. Despite the year-on-year differential increases, the fact is that the Indian economy is growing faster than ever before. Between 1992-1993 and 1996-1997, India's GDP at 1980-1981 prices had recorded a trend growth rate of above 6.0 per cent. Never once has the growth rate fallen below 5 per cent since 1991-1992 when it grew by only 1 per cent and when the economic liberalization process started. As a consequence of robust growth in the economy, per capita income has increased from INR 6,293 in 1990-1991 to INR 16,487 in 1999-2000.

Table 3.7 Trend in national income

Year	Gross domestic product at factor cost		GDP per capita
	(INR billion)	% change	(INR)
1990-1991	6,928.71	-	6,293
1991-1992	7,018.68	1.30	7,088
1992-1993	7,377.92	5.11	7,690
1993-1994	7,813.45	5.90	8,857
1994-1995	8,380.31	7.2	10,149
1995-1996	8,995.63	7.34	11,564
1996-1997	9,700.83	7.84	12,707
1997-1998	10,165.94	4.79	14,395
1998-1999	10,827.48	6.51	15,562
1999-2000	11,484.42	6.07	16,487

Source: CSO, National Accounts Statistics, 2001 and Economic Survey, 2002-2003.

3.2.2 Sectoral shares in national economy

The Indian economy is characterized by the presence of the primary sector, *viz*, agricultural and allied sectors, the secondary sector comprising manufacturing and construction etc. and the tertiary sector comprising trade, finance, insurance, etc. During the last ten years, the agricultural and allied sectors have been the major contributor to the GDP followed by the secondary sector. The reason why GDP growth has remained strong since 1991-1992 is that the contribution of non-agricultural sectors has considerably increased. This has enabled the economy to withstand sharp declines in the agricultural sector and yet register good overall growth.

Though in absolute terms the contribution of the primary sector has increased over the years, its share as evident from Table 3.8 in total GDP is declining. This is a healthy sign for any developing economy. The service sector, in particular, is growing very fast in comparison to the other sectors.

Table 3.8 Share of major economic sectors (per cent)

Year	Agriculture, forestry, logging, fishing, mining and quarrying	Manufacturing, construction, electricity, gas and water supply	Trade, transport, storage and communication	Financing, insurance, real estate and business services	Public administration and defense and other services
1990-1991	34.93	24.49	18.73	9.67	12.18
1991-1992	34.09	23.93	18.96	10.69	12.33
1992-1993	34.18	23.74	19.04	10.77	12.27
1993-1994	33.54	23.69	19.26	11.53	11.98
1994-1995	32.94	24.35	19.82	11.35	11.54
1995-1996	30.59	25.47	20.92	11.43	11.59
1996-1997	30.87	25.45	20.92	11.34	11.43
1997-1998	29.02	25.19	21.53	12.08	12.18
1998-1999	28.86	24.56	21.77	12.18	12.62
1999-2000	27.36	24.31	22.28	12.70	13.36

Source: Computed from data of National Accounts Statistics of India (1950-1951 to 2000-2001), EPW Research Foundation, 2002.

Throughout the 1990s, agriculture's share in the GDP fell by 7.57 per cent from 34.93 per cent to 27.36 per cent. The declining role of the agricultural sector in the Indian economy is the most noteworthy development. In the 1980s and earlier, fortunes in the agricultural sector used to determine the GDP growth rate as is typical of less developed economies. With the increasing contribution of non-agricultural sectors, the Indian economy is arguably undergoing a structural shift towards the fundamentals of a developed economy (in developed economies, the industrial and service sectors contribute a major share in GDP while agriculture accounts for a relatively lower share). The fact that the service sector now accounts for nearly half the GDP probably marks a watershed in the evolution of the Indian economy.

3.2.3 Income distribution pattern

In order to understand the impact of development planning on the economic welfare of the people in its proper perspective, it is necessary that we investigate how the gains of economic growth in this country have been distributed, which classes have benefited from the increase in the national income, and whether over the years the distribution of income has improved or not. Expenditure behaviour has been discussed here as a proxy of income distribution.

3.2.3.1 Households' expenditure pattern

Per capita household expenditure collated from the different rounds of the National Sample Survey (NSS) explains clearly the trend and pattern of expenditure behaviour as income increases. The expenditure strata, four for the rural and four for the urban, were formed on the basis of the poverty lines adopted by the Planning Commission. Based on the expenditure classes of NSS, persons below 75 per cent of the poverty line were defined as very poor; between 75 per cent and poverty line as poor; between poverty line and 150 per cent of the poverty line as non-poor lower and; expenditure classes above 150 per cent of poverty line as non-poor higher.

Table 3.9 shows that total expenditure has increased more than three times among all the income groups in the country during the past two decades. Similarly, the share of food items in total expenditure has come down from about 65 per cent in 1983-1984 to about 56 per cent in

1999-2000. This decline in share of food items by around 9 per cent has been observed mainly among very poor and moderately poor income groups. Conversely, among non-poor groups, this decline has been a little less at around 6-7 percentage point.

Table 3.9 Trends of household expenditure on food and non-food items by income group

(INR/annum)

Income groups	1983/1984 (38th round)		1987/1988 (43rd round)		1993/1994 (50th round)		1999/2000 (55th round)	
	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food
Very poor	554	157	768	235	1,299	498	2,082	893
	(77.89)	(22.11)	(76.57)	(23.43)	(72.27)	(27.73)	(69.98)	(30.02)
Moderately poor	790	260	1,055	356	1,773	737	2,725	1,306
	(75.26)	(24.74)	(74.77)	(25.23)	(70.64)	(29.36)	(67.61)	(32.39)
Non-poor lower	1,026	419	1,385	557	2,333	1,136	3,600	1,979
	(71.01)	(28.99)	(71.33)	(28.67)	(67.26)	(32.74)	(64.53)	(35.47)
Non-poor higher	1,604	1,262	2,332	1,881	3,742	3,501	6,188	5,775
	(55.96)	(44.04)	(55.35)	(44.65)	(51.66)	(48.34)	(51.73)	(48.27)
Overall	1,030	556	1,564	937	2,621	1,856	4,556	3,553
	(64.96)	(35.04)	(62.54)	(37.46)	(58.55)	(41.45)	(56.18)	(43.82)

Source: Worked out from various census reports of NSSO.

Interestingly, the gap between very poor and non-poor higher has not widened over the years at the national level. It is evident from the table that during 1983/1984, total per capita expenditure (PCE) of the very poor (INR 711 p.a.) was around 25 per cent of that of the non-poor higher group (INR 2,866 p.a.). This difference continued even to the end of the 20th century as during 1999/2000, total PCE for very poor households was INR 2,975 p.a. against that of INR 11,963 p.a. for the non-poor higher group. This result is in contradiction to the belief that over the years the disparity between poor and rich has increased.

3.2.3.2 Gini coefficient ratios

Gini-Lorenz ratios of the size distribution of nominal per capita household private consumption expenditure have been computed for both rural and urban areas for the various plan periods, to see the inequalities in the distribution of consumption expenditure. Since the 1950s, the ratio has declined over time. From 1960 up to the end of the seventh plan, the Gini-Lorenz ratio of the rural areas was stable at around 0.30 (Table 3.10). This implies that during this period spanning three decades, inequalities in the rural areas did not increase. The Gini-Lorenz ratio for the urban areas was stable at 0.33 over the two-decade period from the mid 1960s to the mid 1980s, which means that there is no evidence in support of the commonly held notion that inequalities increased in urban areas. The ratio for urban areas are about 10 to 12 per cent higher than that for rural areas, suggesting that the inequalities are more pronounced in urban areas. It can be inferred that the income of the higher income groups has risen faster than the consumption expenditure.

Table 3.10 Plan wise average Gini-Lorenz ratio

Five-year plans	Rural	Urban
First (1951-1956)	0.34	0.38
Second (1956-1960)	0.33	0.37
Third FYP (1961-1965)	0.33	0.35
Annual Plans (1966-1968)	0.30	0.33
Fourth FYP (1969-1973)	0.29	0.33
Fifth FYP (1974-1979)	0.31	0.33
Sixth FYP (1980-1984)	0.30	0.33
Seventh FYP (1985-1990)	0.29	0.33

Source: Iyenger, N.S and Brahmananda, P.R, Estimated Distribution parameters and their Behaviour, in P.R Brahmamananda and V.R.Panchmukhi (eds.), The Development Process of the Indian Economy, 1997.

3.2.4 Agricultural land holdings and their distribution

The relationship between farm size and productivity is subjected to different views and opinions. While some argue that there is an inverse relationship in that productivity declines as farm size increases, others argue that no such relationship exists. Land distribution/possession paints a very grim picture of Indian agriculture, which is one of the most important reasons for poor crop yields per hectare. Numbers of holdings are increasing and because of which, the average size of operational holding declined from 2.30 ha during 1970-1971 to 1.28 ha in 2000-2001 as presented in Table 3.11. Maximum growth has been witnessed in marginal holdings, which have doubled during the past twenty-five years, while medium and large holdings have significantly declined.

The table shows the average size of operational holdings in the country over time. The number of holdings was seen to be constantly on the rise from 1970-1971 to 2000-2001 when group-size results were reviewed. It was observed that their number was constantly on the rise except in the case of large and medium groups of farmers where it showed a decreasing trend.

Table 3.11 Distribution of operational holdings and their average size in India

Categories of holdings	1970-1971	1980-1981	1990-1991	2000-2001*
		Numbers of holding (million)		
Marginal (less than 1 ha)	35.68	50.58	63.39	79.93
Small (1-2 ha)	13.43	16.10	20.09	23.31
Semi-medium (2-4 ha)	10.68	12.48	13.92	14.61
Medium (4-10 ha)	7.93	8.08	7.58	6.63
Large (above 10 ha)	2.77	2.16	1.65	1.19
Total/ Average	70.49	89.39	106.64	125.67
		Average size of holding (ha)		
Marginal (less than 1 ha)	0.41	0.39	0.39	0.39
Small (1-2 ha)	1.44	1.43	1.43	1.40
Semi-medium (2-4 ha)	2.81	2.77	2.76	2.71
Medium (4-10 ha)	6.08	5.98	5.90	5.78
Large (above 10 ha)	18.10	17.24	17.33	17.12
Total/ Average	2.30	1.82	1.57	1.28

Source: Government of India, Ministry of Agriculture, Agricultural Statistics at a Glance (various issues).
* Figures for the year 2000-2001 are estimated.

The main reason behind this increase or decrease in the number of holdings in respective groups may be due to the division of land holdings between family members. The average size of the holdings had decreased drastically from 2.30 ha in 1970-1971 to 1.28 ha in 2000-2001. Category-wise results revealed that declines in size were most pronounced in cases of large farmers and least decline was seen with the marginal farmers. Since horizontal expansion of the land is not possible to any large extent, the decline in the average size of land holdings was due to the increase in the number of holdings. The causes of smaller land holdings could be attributed to increased pressure from the burgeoning population, decline of the joint-family system, and farmers ineptness to name a few. This leads to wastage of lands, difficulties in modernization and land management, disguised employment and often low productivity.

3.2.5 Agricultural landless labourers and wage rates

All those persons who derive a major part of their income as payment for work performed on farms of others can be designated as agricultural workers. For a major part of the year, they work on the land of others on wages. Agricultural workers constitute the most neglected class in Indian rural structure. Their income is low and employment is irregular and since they possess no skill or training they have no alternative employment opportunities either. Socially, a large number of agricultural workers belong to lower segments of society

Table 3.12 depicts the situation of landless labourers in India. Due to marginalization of their lands, there has been a steady rise in the number of landless labourers. In the 1991 census, their number was 74.60 million which rose to 93.52 million by 2001. During the same period, decadal increase in the total labour force was from 314.13 million to 441.17 million. They

constituted nearly 21 per cent of the total labour force in 2001 as compared to nearly 24 per cent in 1991.

Table 3.12 Number of landless labours (millions)

Census years	Total labour force	Landless labours	
		Number	% total labour force
1991	314.13	74.60	23.75
2001	441.17	93.52	21.20

Source: Compiled from CMIE, Basic Statistics Relating to India Economy, Vol.1, All India, 1993 and 2003.

Since these workers are not organized and cannot fight for their rights in a rationale manner, they are oppressed in many ways. Because of these inherent weaknesses, the five decades of planning exercises have failed to improve their economic lot. It seems that the planning process has bypassed them.

Perusal of Table 3.13 reveals the monetary value of daily wages in major secondary crop growing states in the country for 1991 and 2001. During this period, in almost all the states, wages have increased and ranged from INR 30 to 50 in 1991 and INR 35 to 94 per day in 2001. The wages are comparatively lower than the industrial workers who are unionized and can fight for their wage hikes.

Table 3.13 Wage rates of daily workers in major secondary crop growing states

(INR per day)

States	1991	2001
Andhra Pradesh	35.50 to 37.20	52 to 55.50
Gujarat	48.00	78.00
Karnataka	50.00	94.42
Madhya Pradesh	35.50	50.50 *
Maharastra	30.50 to 35.5	35.00 to 41.00
Rajasthan	40.30	60.00
Uttar Pradesh	37.50	47.00

Source: Government of India, Ministry of Labour, Annual Report, 1993 and 2002.
* Indicate the provision of variable dearness allowance with the minimum rates of wage.

3.2.6 Share of informal (social) sectors in the Indian economy

The government had worked out sectoral distribution of investment in the eighth plan on the basis of the pattern of sectoral output. Since investments invariably contribute to output with a lag, the investment output relationships take into account this fact. However, for the informal sector involved in social contribution, investment relies mostly on the basis of needs and changing priorities. In a country having more than 70 per cent of the people residing in rural areas, the neglect of the rural development sector is quite a discouraging fact. The share of the informal sector in the annual expenditure of the country (share of annual expenditure of Government of India) is shown in Table 3.14. The development of the informal sector's investment and its contribution to national development cannot be ignored. During the period, in monetary terms, the investment in this sector has almost quadrupled.

Table 3.14 Share of informal (social) sector in the Indian economy

Sectors	Percentage share (%)			
	1992-1993	1998-1999	1999-2000	2000-2001
Education, sports and youth affairs	19.55	22.59	21.70	21.28
Health and family welfare	17.92	13.66	15.36	14.63
Water services, sanitation and urban development	8.20	13.94	13.68	13.64
Information and broadcasting	3.86	3.56	3.58	3.64
Welfare of SC/ST/OBC	5.08	3.13	2.91	2.68
Labour employment and welfare	3.61	2.42	2.59	2.47
Other social services	8.36	8.26	11.90	11.40
North - Eastern areas	-	-	-	3.67
Rural development	33.42	20.03	15.88	12.30
Basic Minimum Services (BMS) and slum development and others	-	12.60	12.40	14.30
Total (INR billion)	96.08	292.88	326.38	361.70

Source: Government of India, Economic Survey (various issues).

Within the informal sector, activity-wise investment reveals an interesting trend. It was found that in 1992-1993 the rural development sector had a share of 33.42 per cent of the total investment, which decreased to only 12.3 per cent in 2000-2001. The major gainers from this shift in focus of investment were education, sports and youth affairs, sanitation and urban development and other social services sector. This decline in focus toward the rural sector will lead to an increase in income disparity.

3.3 Extent of agricultural diversification

Indian agriculture is characterized by small landholdings, the average size being 1.57 hectares. Around 93 per cent of farmers have land holdings smaller than 4 ha and they constitute nearly 55 per cent of the arable land. Due to diverse agro-climatic conditions in the country, a large number of agricultural crops, namely food grains and commercial crops are produced. Due to the vast challenge of feeding our immense population and experience of food shortages in the pre-independence era, self-reliance in food grains has been the cornerstone of our policies during the past five decades. Around 66 per cent of total cultivated area is under food grain crops. Concurrently commercial agriculture flourished in the post-independence era and has been a major earner of foreign exchange for the country.

3.3.1 Diversification

Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk. In India, this is generally viewed as shift from traditionally grown, less remunerative crops to more remunerative crops. The shift also takes place due to governmental policies and thrust on some crops over a given period of time. Market infrastructure development and certain other price related support also induce crop shifts. Higher profitability and also the resilience/stability in production also induce crop diversification.

The extent of diversification can be best seen in Table 3.15. The share of superior cereals namely, rice and wheat, oilseeds, spices, fruits and vegetable and plantation crops increased, while that of coarse cereals and pulses declined during the TE 1966/1967 to TE 1996/1997. The decrease was more pronounced to the extent of one-quarter in the case of coarse cereals. More remunerative crops like rice and wheat and other commercial crops took the acreage of coarse cereals away. The area under fruits and vegetable has almost doubled in the last three decades. Also, the area share of jute and allied fibers has gone down substantially. The diversification can be better understood by the Simpson Index quantifying horizontal diversification.

Table 3.15 Temporal change in the area share of main crops (per cent)

Crops	TE 1966-1967	TE 1976-1977	TE 1986-1987	TE 1996-1997
Rice	23.90	24.13	24.75	25.29
Wheat	11.99	10.01	9.62	15.03
Coarse cereals	26.49	29.20	28.09	18.70
All cereals	62.38	63.34	62.47	59.03
Gram and pigeonpea	7.26	6.48	6.25	6.30
Other pulses	8.06	7.99	7.85	7.45
All food grains	77.70	77.80	76.56	72.78
Sunflower and soybean	0.54	0.79	0.91	0.77
All oilseeds	11.27	11.24	12.07	15.35
Fibers	6.28	5.25	5.18	5.72
Spices	0.64	0.83	1.02	1.12
Fruits and vegetables	0.75	0.92	1.15	1.40
Other field crops	3.04	3.54	3.51	3.23
Plantation crops	0.33	0.42	0.51	0.41
All commercial crops	11.03	10.96	11.36	11.87
All non-cereals	37.62	36.66	37.33	40.98

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

3.3.1.1 Simpson Index (SID) of various states in India

Diversification involves diverse activities undertaken on and off farm production units. The major concept of horizontal diversification is to increase the number of crops in fields as long as it has economic rationality. The Simpson Index has been calculated to evaluate the extent of diversification. The minimum value of SID is 0 (the least diversified) and the maximum value is 1 (the most diversified).

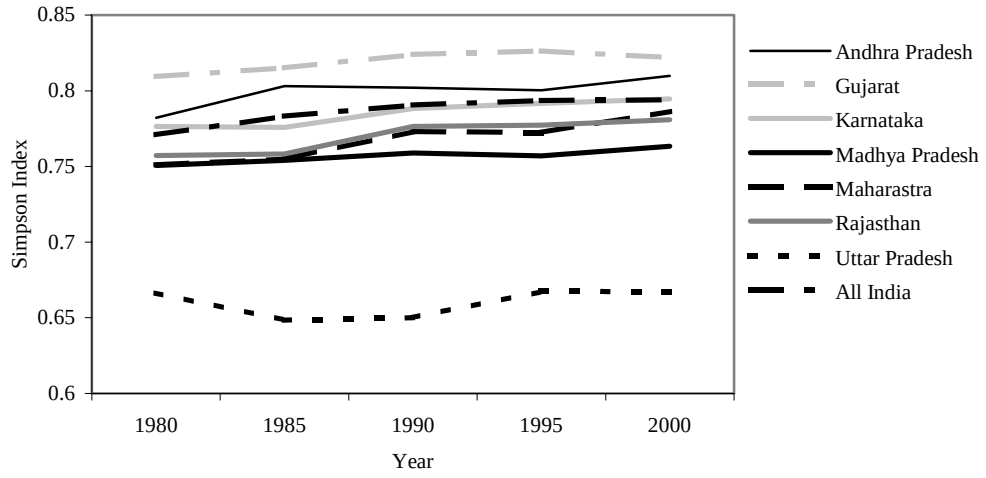
In the present study, the SID value of the various important secondary crop growing states in India was calculated over a period of time from 1980 to 2000. The states are Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh. The SID values of the country as a whole were also estimated for various intervals spanning two decades (Table 3.16).

Table 3.16 Simpson Index (SID) of various CGPRT crop growing states in India

States	1980	1985	1990	1995	2000
Andhra Pradesh	0.7821	0.8031	0.8020	0.8004	0.8098
Gujarat	0.8095	0.8151	0.8240	0.8264	0.8219
Karnataka	0.7764	0.7758	0.7883	0.7916	0.7947
Madhya Pradesh	0.7507	0.7541	0.7590	0.7570	0.7633
Maharastra	0.7512	0.7549	0.7730	0.7725	0.7863
Rajasthan	0.7573	0.7583	0.7764	0.7774	0.7810
Uttar Pradesh	0.6664	0.6484	0.6500	0.6675	0.6671
All India	0.7710	0.7833	0.7906	0.7935	0.7940

Note: SID is calculated by individual commodity data.

Figure 3.1 Diversification Index of major CGPRT crop growing states in India



The index values were found to be highest in Gujarat state in 1980, which continued to be a highly diversified state in terms of cropping patterns even in 2000. Andhra Pradesh, Karnataka, Rajasthan, Maharashtra and Madhya Pradesh followed Gujarat with SID indexes of 0.809, 0.795, 0.786, 0.781 and 0.763 respectively.

The state of Uttar Pradesh, which is predominantly irrigated, was found to be least diversified in 1985 with an SID index of 0.666 and continued to maintain its status through 2000. Wheat and rice, being remunerative and less risky, grown under the irrigated conditions, substituted other crops and led to the specialization of farms in the region. In other words, the non-subsistence nature of crop production has discouraged farm diversification. The SID index for the country grew from 0.771 in 1980 to 0.794 in 2000 due to various incentive schemes launched by the government for giving thrust to crops other than rice and wheat.

3.4 Extent of unemployment and poverty

Unemployment is normally found in all economies, irrespective of their level of development. It does not affect only unskilled workers. Often a sizeable number of skilled workers, sometimes even after acquiring formal training fail to find gainful employment. From societal point of view, this is a colossal waste of the nation's human resources. The demand for labour is less and employment opportunities are limited in developing countries like India on account of agricultural backwardness, underdevelopment of industries and the small size of the service sector. India, presently suffers mainly from structural unemployment, which exits in open and disguised forms. The unemployment pattern in rural and urban areas is portrayed below.

3.4.1 National unemployment-rural/urban

The unemployment status of the country was studied for the time periods 1983-1984, 1993-1994 and 1999-2000. Table 3.17 reveals that although the population at the three points of time were 718.20 million, 894.0 million and 1003.97 million, the labour force accounted for 261.33 million, 335.97 million and 363.33 million respectively. Overall unemployment during the same time periods was 8.30 per cent, 5.99 per cent and 7.32 per cent respectively. It was noticed that the highest rural unemployment was 7.96 per cent observed in 1983 (currently 7.21 per cent).

Table 3.17 Trend in unemployment (millions)

Particulars	1983-1984	1993-1994	1999-2000
	Rural		
Population	546.61	658.83	727.50
Labour force	204.18	255.38	270.39
Workforce	187.92	241.04	250.89
Unemployment rate (%)	7.96	5.61	7.21
No. of unemployed	16.26	14.34	19.50
	Urban		
Population	171.59	234.98	276.47
Labour force	57.15	80.60	92.95
Workforce	51.64	74.80	85.84
Unemployment rate (%)	9.64	7.19	7.65
No. of unemployed	5.51	5.80	7.11
	All India		
Population	718.20	894.01	1,003.97
Labour force	261.33	335.97	363.33
Workforce	239.57	315.84	336.75
Unemployment rate (%)	8.30	5.99	7.32
No. of unemployed	21.76	20.13	26.58

Source: Planning Commission (2001).

Urban unemployment showed a very discouraging trend. It has been on the increase since 1983. It was 5.51 per cent in 1983, 5.80 per cent in 1993-1994, and 7.65 per cent in 1999-2000. The absolute number of unemployed people in the country showed a dip in 1993-1994 but rose again. It was 21.76 million in 1983, 20.13 million in 1993-1994 and 26.58 million in 1999-2000. Consequently, is very clear that most of the unemployment in the country is structural. Its main causes are slow growth and rapid decline in employment, increase in the labour force due to an ever increasing population and prolonged age, poor educational status and the inappropriateness of technology to some extent. The government is trying to contain these abnormalities and provide employment.

3.4.2 Incidence of poverty-rural/urban

In almost all underdeveloped countries where per capita income is low, income inequality has resulted in a number of evils, of which poverty is certainly the most serious one. In India, even now in spite of all the development during the past five decades, nearly 26 per cent of the population is poor and for most of the time suffers from extreme destitution. India lacks appropriate and reliable data for direct estimation of the extent of the poverty. However, on the basis of consumption expenditure, the incidence of poverty for rural and urban areas can be determined.

Table 3.18 Incidence of urban and rural poverty

Year	No. of poor (million)			Percentage of poor		
	Rural	Urban	Combined	Rural	Urban	Combined
1973-1974	261.3	60.0	321.3	56.4	49.0	54.9
1977-1978	264.3	64.6	328.9	53.1	45.2	51.3
1983	252.0	70.9	322.9	45.7	40.8	44.5
1987-1988	231.9	75.2	307.1	39.1	38.2	38.9
1993-1994	244.0	76.3	320.3	37.3	32.4	36.0
1999-2000	193.2	67.1	260.3	27.1	23.6	26.1

Source: Compiled from World Bank, India; Poverty, Employment and Social Services, 1989; Planning Commission, 1998; Ninth Five-Year Plan, 1997-2002, Vol.1 and Planning Commission Press release on Poverty Estimates for 1999-2000.

The status of poverty in the country, as shown in Table 3.18, has shown mixed trends. The overall count of the number of people below the poverty line showed a declining trend from

321.3 million in 1973-1974 to 260.3 million in 1999-2000. The rural poverty count has been in constant decline from 261.3 million in 1973-1974 to 193.2 million in 1999-2000. Converse to the rural poverty, urban poverty was on the rise. It rose from 60.0 million in 1973-1974 to 67.1 million in 1999-2000. When the percentage of people below the poverty line is observed, it can be seen that there was decline in all cases of rural, urban and overall poverty. From the table it is quite encouraging to see the decline in the poverty percentage. The rise in the urban poverty is in absolute numbers and may be attributed largely to the migration of unemployment and landless people from the rural areas to urban areas in search of better employment opportunities.

3.4.3 Factors affecting unemployment and poverty

3.4.3.1 Factors affecting unemployment

India is an underdeveloped, though developing economy. The nature of unemployment, therefore, sharply differs from the one that prevails in industrially advanced countries. The situation is more serious than cyclical unemployment or frictional unemployment, in an under developed economy like India there is the prevalence of chronic underemployment in the rural sector and the existence of urban unemployment among the educated classes. The various causes of unemployment in India are:

i. Slow growth and rapid decline in employment.
ii. Increase in size of labour force.
iii. Inappropriate technology.
iv. Poor educational status.

Although the reduction of unemployment has been a proclaimed objective of India's economic planning, it is not until the sixth five-year plan that there finds any reference to a long-term employment policy to tackle the unemployment problem in a forthright manner. Since then, high priority has been accorded to the reduction of unemployment and the government has envisaged various policies and programmes for the reduction of unemployment.

3.4.3.2 Factors affecting poverty

Poverty can be defined as a social phenomenon in which a section of the society is unable to fulfil its basic necessities of life. When a substantial segment of a society is deprived of the minimum level of living and continues at a barely subsistence level, that society is said to be plagued with mass poverty. Countries of the third world, especially India, invariably exhibit the existence of mass poverty, although pockets of poverty exist even in developed countries. The major causes of poverty in India are to be found in the socio-economic structure in the countryside. It is this reason why major policy measures to remove poverty have been undertaken with a view to tackle rural poverty. Some of the factors inducing poverty in India are:

i. Increased population growth and pressure on land.
ii. Inappropriateness of land reform measures.
iii. Marginalization of land holdings.
iv. Slow pace of industrialization.
v. Poor educational status.

The Government of India has embarked upon an extensive poverty eradication programme. For various reasons, acceleration of the poverty eradication programmes could not be achieved. The absolute poverty in India (rural and urban) declined during the 1970s and 1980s but not in the 1990s. The interstate variability in agricultural output per capita and per worker is substantially higher than that in non-agriculture and increased during the 1980s and 1990s. Consequently, interstate disparities between the agricultural and non-agricultural sector have increased. The nutrition level of the bottom 30 per cent of the poor has slightly improved

on an all-India basis. Despite the improvement, however, calorie intake of the poor was still below the required daily allowance. Variations across states in nutritional intake level and composition of cereal consumption are high.

Strategies for providing nutritional security to the poor and social safety nets created through various rural development schemes, integrated or otherwise, as part of the agricultural development policy have not succeeded in dissolving rural poverty in India. However, states with an active development orientation, for example, Kerala, Punjab, West Bengal, Tamilnadu and more recently Himachal Pradesh, have emerged with a degree of success.

Four ingredients of their success have been (a) growth in the agricultural sector, (b) larger and better organized use of the public distribution system of food grains, (c) success in providing school education and public health facilities, and (d) growing strength of linkages between agricultural and non-agricultural sectors (Chaudhri and Wilson, 2001). The first two have augmented demographic transition resulting in reduced family size and a deceleration in population growth. The last is an important indication of the success of the development strategy and the structural change of the economy. The effective solution of the problem of poverty without success on each of these four fronts is inconceivable. Therefore, under the existing circumstances, emphasis has to be on diversifying the rural economy through the encouragement of agriculture and allied industries and so on. Further, in future, rural industrialization has to be accorded much higher priority than what it has received in the past.

3.5 Concluding summary

India with a population of nearly 1,027 million, accounts for approximately one-sixth of the world's population on merely 2.4 per cent of the world's surface area. The country boasts a varied demographic and economic profile in its composition and structure. Due to massive population control measures, population growth slowed in the last quarter of the century, especially during the nineties. It came down to less than 2 per cent of the annual growth rate. However, due to better healthcare and an improved quality of life, the workable population rose to nearly 62 per cent in 2001. This vast workforce puts tremendous pressure on employment opportunities and its ramifications are clearly evident from the rising unemployment level in the country. The decrease in dependency has led to improved welfare and economic well-being of the people on account of higher per capita share in income. The sex ratio, which had always remained unfavourable to females improved slightly in the last decennial rising from 927 to 933 females per thousand males. This improvement in sex ratio could be attributed to several governmental programmes on women empowerment and female protection.

The agricultural sector in the country continues to occupy the lion's share with nearly 60 per cent in providing employment to the populace. The trade and services sectors are where new employment opportunities are becoming available and continue to provide considerable employment after the manufacturing sector. The poor educational status of the populace has to some extent hampered economic growth in the country. A significant rise in the literacy rate was observed in the nineties. Currently, nearly sixty-five per cent of the population is literate in the country.

The Indian economy is witnessing impressive growth, especially since liberalization. The economy is characterized by the presence of a primary sector, *viz*, agriculture and allied sector, a secondary sector comprising manufacturing and construction and a tertiary sector comprising trade, finance, insurance etc. During the last 10 years, the agriculture and allied sector has continued to be the major contributor to GDP, followed by secondary sector. Due to the relatively increased contribution of non-agricultural sectors, the GDP has remained strong since 1991-1992. The economy has grown at an annual growth rate above 6 per cent since 1992-1993. As a consequence of the robust growth in the economy, per capita income has increased and reached an all time high level of INR 16,487 per annum in 1999-2000. The share of the agricultural sector in GDP fell from 35 per cent in 1990-1991 to 27 per cent in 1999-2000. This

is a reflection of the fact that the Indian economy is undergoing a structural shift towards the fundamentals of a developed country.

Although, the country has gained momentum in its economic fundamentals, the impact of development planning on the economic welfare of the people has not been equitable in the past. Income inequalities were more pronounced than expenditure inequalities. The first and second quintile group of households, constituting the households below the poverty line, could make no savings, whilst the highest income group of 20 per cent of the households made most of the country's savings. The significant increase in the savings of the household sector since 1983 reflects a rapid increase in the income of the highest 20 per cent. The Gini-Lorenz ratio for urban areas is about 10-12 per cent higher than that for rural areas suggesting that the inequalities are more pronounced in urban areas. It can further be inferred that the income of the higher groups has risen faster than the consumption expenditure. The ratio for the urban areas was stable at 0.33 over the last two decades from the mid 1960's to the mid 1980's.

Land distribution/possession paints a very grim picture of Indian agriculture, which is one of the most important reasons for the poor crop yields. The number of holdings are increasing, due to which the average size of operational holdings declined from 2.30 ha during 1970-1971 to 1.41 ha in 1995-1996. The marginal holdings have doubled during the past twenty-five years, while medium and large holdings have declined significantly, largely attributable to the fragmentation of land holdings between the family members due to increased pressure of population and decline of a joint system (a family system which includes several nucleus families under the same clan). This marginalization of land holdings leads to a wastage of lands, difficulties in modernization and land management, disguised employment and often low productivity. Further, due to increases in the total labour force and persistent marginalization of holdings, the number of landless labours is on the rise and has grown from 74.60 million to approximately 94 million. Because of numerous inherent weaknesses, economic planning has failed to do much for this section of the populace. The wages of the unorganized workers are lower than industrial workers and any increase in the wages is more perceptible in the industrial sector than the agricultural sector. The sectoral contribution of investment is based on the pattern of sectoral output, but for the informal sector not having much perceptible output, the government needs to put in extra investment in order to provide basic needs and services. During the last decade, investment in the informal sector has quadrupled in monetary terms, but the rural development sector which continues to receive the highest attention of the government, with regards to lion's share in the informal sector's investment, has dwindled in the recent past. Though there is an increase in investment in education and other related activities. The decline in rural development expenditure will lead to increases in income disparity.

Due to diverse agro-climatic conditions in the country, a large number of agricultural crops, namely food grains and commercial crops are produced. Since independence, the cornerstone of the country's food policy was self-sufficiency. But of late, in order to tap huge potential and to meet the challenges of the vast population and liberalization, diversification has been the answer. Commercial agriculture flourished in the post-independence era and has been a major earner of foreign exchange for the country. Diversification gives wider choice in the production of a variety of crops in a given area to expand production and lessen the risk. During the last three decades, the extent of diversification was largely in favour of fine cereals and commercial crops which has cast a shadow on coarse grains. More remunerative crops have reduced the acreage under coarse grains. In order to better understand the diversification in major secondary crop growing states in India, the Simpson Index (SID) has been computed. It was observed that Gujarat state, being highly diversified, boasts the highest SID index within the selected states, and Uttar Pradesh the lowest. This signifies Uttar Pradesh to be least diversified state in terms of cropping pattern. The more irrigated area of Uttar Pradesh encouraged the specialization of crops/farms in favour of superior cereals. In other words, the

subsistence nature of farming discouraged farm diversification. The Simpson Index for the country grew in the last two decades demonstrating government thrust towards diversification.

In spite of the significant economic growth and agricultural development, the country suffers from two major evils in society. The higher extent of unemployment and poverty has continued to be a major developmental plank of successive governments, but due to increases in the population and other related factors, not much headway has been made in this area. Currently, overall unemployment is hovering around 7 per cent with the number of unemployed at an all time high level of 26.58 million. The poor educational status and the inappropriateness of technology to some extent is attributable to the higher unemployment status. Further, in spite of all the development that has taken place since independence five decades ago, 26 per cent of the population continues to be plagued with acute poverty. The incidence of poverty is slightly higher in rural areas compared to urban areas, with the number of poor hovering around 260 million. Although there has been a decline in the poverty level, a lot still needs to be done to eradicate this malaise. Poverty in India is largely attributable to the migration of unemployed and landless people from rural areas to urban areas, poor educational status and above all increased population growth and pressure. Eradication of poverty is at the top of the government's agenda.

Under the existing circumstances, the nations' economy that is primarily agrarian, with small land holdings and huge population pressure, the diversification of the rural economy should receive higher priority to meet the twin objectives of eradicating poverty and unemployment. This will also lead to the improved welfare of the populace and the overall development of the country.

4. Historical and Current Status of Secondary and Other Crops

4.1 Status of secondary crops

Before the advent of the green revolution in India, secondary crops were considered to be important crops in the agrarian economy and large numbers of rural households were totally dependent on these crops across the states/regions. Thereafter, with the introduction of dwarf varieties of fine cereals along with government support in various forms (demonstrations of seed-fertilizer-irrigation packages, price support mechanism, etc.) and with the expansion of irrigation, slowly but surely these crops, particularly coarse cereals were replaced by fine cereals in many regions. It is clearly evident from Table 4.1 that during the early sixties, coarse grains were spread over 28 per cent of the total cropped area, which dropped to merely 15 per cent during 1999-2001. Similarly, the share of pulses in cropped area also decreased from about 16 per cent to only 11 per cent over the same period. Major gainers were obviously wheat and rice, and oilseed up to an extent. Among secondary crops, maize is the only crop under which acreage has expanded, which is mainly due to its increasing demand for feed purposes and various industrial uses.

Table 4.1 Diversification of cropped area from secondary crops in India

Particulars	Share in total cropped area (%)		
	1959-1961	1979-1981	1999-2001
Maize	2.84	3.38	3.39
Pearl millet	7.33	6.49	4.85
Finger millet	1.25	1.61	1.32
Sorghum	11.80	9.39	5.20
All coarse grains	28.66	24.21	15.40
Chickpea	6.64	4.11	3.37
Pigeonpea	1.60	1.59	1.83
Lentil	-	0.54	0.74
All pulses	15.86	13.23	11.19
All oilseeds	8.88	10.09	12.68
Rice	22.06	23.19	23.24
Wheat	8.49	12.95	13.86
Total cropped area (million ha)	152.80	172.6	192.62

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

A composite index has been calculated to explain the concentration of secondary crops in different states considering the share of individual states in the total area in the country under the crop (Table 4.2). This has been calculated for selected major secondary crop growing states in the country in order to have detailed data and information about their performance, preferences and other governmental support given to these crops.

Table 4.2 Area under secondary crops across the states in the country

(2000-2001, million ha)

States	Coarse cereals	Pulses	Potato	Total	Composite index for secondary crops (%)[1]
Maharashtra	7.50	3.55	0.02	11.07	21.47
Rajasthan	6.51	2.37	-	8.88	17.22
Karnataka	3.98	2.06	0.04	6.08	11.79
Madhya Pradesh	2.16	3.32	0.03	5.51	10.68
Uttar Pradesh	2.41	2.68	0.40	5.49	10.65
Andhra Pradesh	1.45	1.80	-	3.25	6.30
Gujarat	1.57	0.64	0.03	2.24	4.34
Tamil Nadu	1.08	0.75	-	1.83	3.55
Bihar	0.69	0.78	0.15	1.62	3.14
Haryana	0.78	0.11	0.02	0.91	1.76
Chhattisgarh	0.34	0.56	-	0.90	1.75
Punjab	0.20	0.63	0.06	0.89	1.73
Orissa	0.20	0.60	-	0.80	1.55
West Bengal	0.06	0.32	0.30	0.68	1.32
Others	0.23	0.38	0.01	0.62	1.20
All India	**30.33**	**20.67**	**1.21**	**52.21**	

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Note: [1] The composite index for secondary crops has been calculated as: Area under all secondary crops in the ith state/Total area under all secondary crops in the country x 100 (per cent).

It may be observed that Maharashtra has maximum area under these crops, coarse cereals (mainly sorghum) being the most favoured crop among them. Around 21 per cent of total secondary crop cropped area of the country is in Maharashtra. Rajasthan stands next to Maharashtra with 17 per cent (8.88 million ha) of total area, where as Bajra (pearl millet) alone occupies around a 5 million ha area. In Karnataka, sorghum and maize are cultivated on more than 2 million ha. Similarly, other states like Madhya Pradesh (MP), Uttar Pradesh (UP), Andhra Pradesh (AP) and Gujarat are important states for another secondary crop. Therefore, these 7 states (Maharashtra, Rajasthan, Karnataka, MP, UP, AP and Gujarat) have been selected for more detailed study in the report.

In order to have a comparative study on the performance of secondary crops with respect to other competing crops like rice and wheat, growth rate of area under the crops, their production and yield have been calculated for two periods i.e. during the green revolution period (1966-1985) and after the green revolution period (1986-2002). It is observed that except for maize, growth of area under other coarse cereals and pulses has decelerated during both periods in the country (Table 4.3).

Table 4.3 Growth performance of secondary crops *vis-à-vis* fine cereals in India

(% per annum)

Crops	Area		Production		Yield	
	1966-1985	1986-2002	1966-1985	1986-2002	1966-1985	1986-2002
Sorghum	-0.58	-3.48	1.39	-3.06	1.97	0.42
Pearl millet	-0.05	-1.62	0.44	0.07	0.49	1.69
Maize	0.01	0.86	0.96	2.81	0.95	1.95
Chickpea	-0.70	-0.44	-0.66	0.64	0.04	1.08
Pigeonpea	1.38	-0.21	1.79	-0.57	0.41	-0.36
Potato	3.35	3.12	6.59	4.43	3.24	1.31
Rice	0.54	0.57	2.41	1.75	1.87	1.18
Wheat	2.11	1.13	5.12	3.07	3.01	1.94

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Potato is the only crop, which expanded its acreage rapidly during both periods. Similar is the case with non-CGPRT crops like rice and wheat. This has happened even with the increasing per hectare production of all the secondary crops, as the growth rates of all these

crops remained positive during both periods. It shows that these crops didn't receive the attention of policy makers, as they deserve.

Table 4.4 Growth performance of secondary crops in major growing states-area

(% per annum)

Crops	Period	AP	Guj	Ktk	MP	Maha	Rajas	UP
Sorghum	1966-1985	-2.16	-2.29	-1.58	-1.11	0.69	-1.14	-1.20
	1986-2002	-6.62	10.92	-2.33	-8.24	-1.98	-1.29	-4.12
Pearl millet	1966-1985	-1.83	-1.89	0.02	-2.87	-0.55	-0.17	-0.69
	1986-2002	-9.46	-0.74	-2.89	-2.26	0.56	5.86	0.32
Maize	1966-1985	1.74	1.26	7.17	2.18	6.01	1.26	-1.93
	1986-2002	0.64	3.77	4.87	0.81	5.32	1.57	-2.12
Finger millet	1966-1985	-1.57	-1.32	1.31	-	0.31	-	-2.66
	1986-2002	-4.78	-6.86	-1.78	-	-3.77	-	-0.86
Pigeonpea	1966-1985	1.20	8.34	2.43	-0.05	1.57	0.92	-0.79
	1986-2002	0.85	1.30	-1.14	-1.78	2.22	4.43	-0.63
Chickpea	1966-1985	1.80	1.68	0.14	0.76	2.02	0.60	1.00
	1986-2002	7.00	28.32	-2.27	0.19	-0.11	2.75	-4.96
Potato	1966-1985	-	7.53	4.63	3.82	-0.66	-	4.27
	1986-2002	-	9.36	4.13	6.18	3.09	-	2.57
Rice	1966-1985	0.93	0.47	0.05	0.90	0.87	1.89	1.34
	1986-2002	-0.65	0.30	0.99	-3.31	-0.52	0.84	0.11
Wheat	1966-1985	0.04	1.60	-0.11	1.04	1.33	2.53	3.05
	1986-2002	0.74	6.25	0.17	-0.54	4.90	0.76	-1.58

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Note: AP-Andhra Pradesh, Guj.-Gujarat, Ktk-Karnataka, MP-Madhya Pradesh, Maha.-Maharashtra, Rajas.-Rajasthan, UP-Uttar Pradesh.

Growth performance of these crops has also been observed across their major growing states. It can be seen from Table 4.4 that the acreage of coarse cereals decelerated very fast in most of the selected states. However, in the case of pearl millet, the area under this crop has increased at a significant rate in the states of Rajasthan, Maharashtra and even Uttar Pradesh. Similarly, the area under maize has increased significantly in all the selected states except in Uttar Pradesh. The area under chickpea distended more aggressively during the second period in Gujarat, Andhra Pradesh and Rajasthan states. Surprisingly, area under potato has increased in all these states during both periods. This may be due to the increasing demand of value-added products of potato in the country. Conversely, after picking up during the green revolution period, the area under rice has started decelerating in many states, although this is not true of wheat.

Table 4.5 Growth performance of secondary crops in major growing states-yield

(% per annum)

Crops	Period	AP	Guj	Ktk	MP	Maha	Rajas	UP
Sorghum	1966-1985	2.21	4.49	1.49	1.19	3.74	1.80	1.44
	1986-2002	2.12	9.17	2.33	-0.23	3.89	-0.52	0.01
Pearl millet	1966-1985	2.21	2.34	1.66	-0.01	1.61	0.52	1.73
	1986-2002	2.37	5.14	1.61	3.22	6.54	6.32	3.26
Maize	1966-1985	2.36	-1.18	-0.17	1.76	2.82	0.84	1.60
	1986-2002	6.74	8.68	2.95	4.95	2.34	14.63	2.63
Finger millet	1966-1985	1.03	1.28	3.15	-	2.55	-	1.50
	1986-2002	0.84	5.35	2.91	-	1.36	-	2.78
Pigeonpea	1966-1985	-2.90	3.46	0.69	0.61	1.35	-0.82	1.44
	1986-2002	4.64	4.85	0.12	-3.27	0.03	8.91	-1.83
Chickpea	1966-1985	-2.51	6.34	-0.59	1.14	1.99	1.90	-2.76
	1986-2002	21.72	0.08	-2.70	3.77	10.38	1.33	1.19
Potato	1966-1985	-	0.88	3.94	0.53	1.53	-	4.25
	1986-2002	-	0.11	1.77	2.30	0.07	-	0.40
Rice	1966-1985	2.73	3.42	0.75	0.70	2.70	1.41	3.47
	1986-2002	1.21	1.20	-8.61	-1.26	0.45	-1.58	1.73
Wheat	1966-1985	3.92	2.65	1.54	2.79	4.49	3.32	3.22
	1986-2002	-0.12	1.87	2.67	-5.29	-2.96	-4.36	-3.98

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Note: AP-Andhra Pradesh, Guj.-Gujarat, Ktk-Karnataka, MP-Madhya Pradesh, Maha.-Maharashtra, Rajas.-Rajasthan, UP-Uttar Pradesh.

Despite the secondary crops experiencing setbacks in most of the selected states in terms of declining acreage, their yields have improved over the years. Except in a few cases, yields of all the other crops under study have increased significantly in all states (Table 4.5). The growth rate of increase in yield of these crops was higher during the second period than that of the green revolution period. On the other hand, it is widely accepted that the yield of rice and wheat have achieved their plateau and therefore, have started declining in many states.

Table 4.6 Growth performance of secondary crops in major growing states-production

(% per annum)

Crops	Period	AP	Guj	Ktk	MP	Maha	Rajas	UP
Sorghum	1966-1985	0.01	2.10	-0.11	0.06	4.46	0.63	0.22
	1986-2002	-4.88	-3.55	-0.05	-8.44	-0.33	-5.29	-4.03
Pearl millet	1966-1985	0.33	0.41	1.68	-2.89	1.05	0.35	1.03
	1986-2002	-6.02	4.39	-1.32	0.80	5.94	5.62	-3.58
Maize	1966-1985	4.65	0.07	6.99	3.98	8.99	1.30	-0.35
	1986-2002	7.44	12.75	7.92	5.50	7.65	16.36	0.46
Finger millet	1966-1985	-0.56	-0.06	4.50	-	2.87	-	-1.10
	1986-2002	-3.92	-1.01	1.08	-	-3.57	-	2.03
Pigeonpea	1966-1985	-0.76	12.13	3.14	0.56	2.94	0.09	0.63
	1986-2002	5.48	6.22	-1.02	-5.09	2.29	13.72	-2.43
Chickpea	1966-1985	-0.75	8.13	-0.45	2.63	4.04	2.52	1.79
	1986-2002	28.33	28.46	-4.90	4.36	10.45	4.14	-3.77
Potato	1966-1985	-	8.47	8.75	4.37	0.85	-	8.70
	1986-2002	-	9.58	6.05	8.62	3.16	-	2.98
Rice	1966-1985	3.69	3.90	0.80	1.61	3.59	3.32	4.86
	1986-2002	0.55	1.52	2.32	-4.55	-0.06	-0.74	1.84
Wheat	1966-1985	3.92	4.29	1.42	3.56	5.88	5.94	6.37
	1986-2002	0.29	8.24	2.83	-5.81	1.79	-3.62	-5.18

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

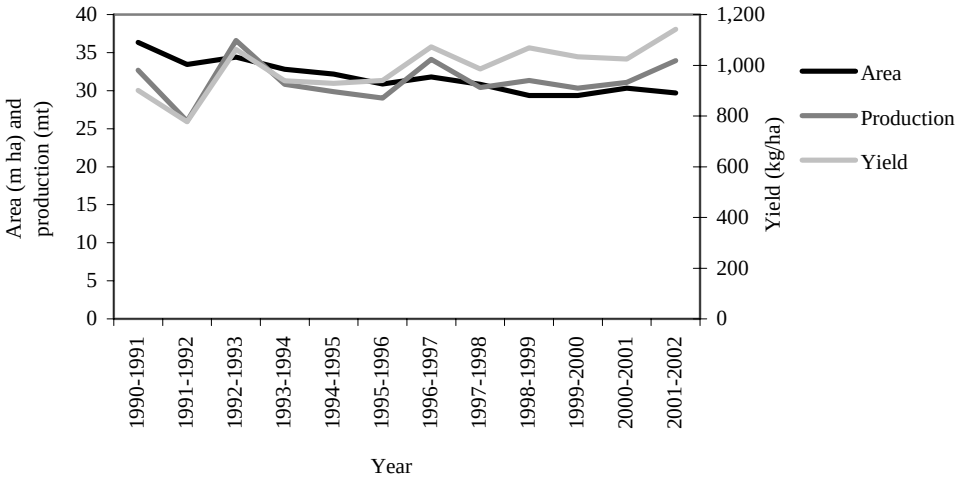
Note: AP-Andhra Pradesh, Guj.-Gujarat, Ktk-Karnataka, MP-Madhya Pradesh, Maha.-Maharashtra, Rajas.-Rajasthan, UP-Uttar Pradesh.

Growth performance of production is a combined effect of area under the crop and its yield. Due to very strong negative growth in the area under secondary crops, production growth has decelerated even in the presence of moderate positive growth in yields (Table 4.6). However, maize and chickpea have shown robust growth in production during the second period in most of the selected states. In comparison to these, rice and wheat have maintained a low ebb in terms of their production growth during the second period in most of the selected states.

4.2 Trends in area, production and yield of secondary crops

The following figures give a better idea of the performance of all the secondary crops and other related crops during the past decade. It can be observed from Figure 4.1 that the area under these crops is continuously declining and whatever increase in production that is observed is mainly due to increases in the yield of these crops. The trend line of production and yield move together during entire period.

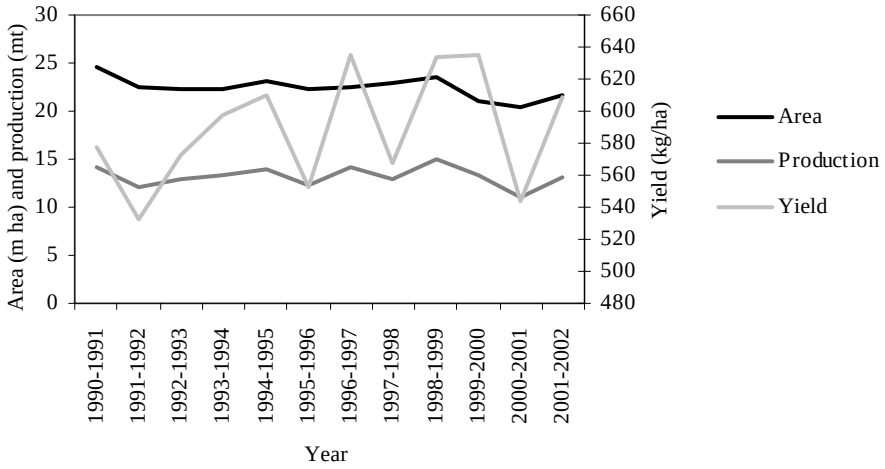
Figure 4.1 Trends in area, production and yield of coarse cereals



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

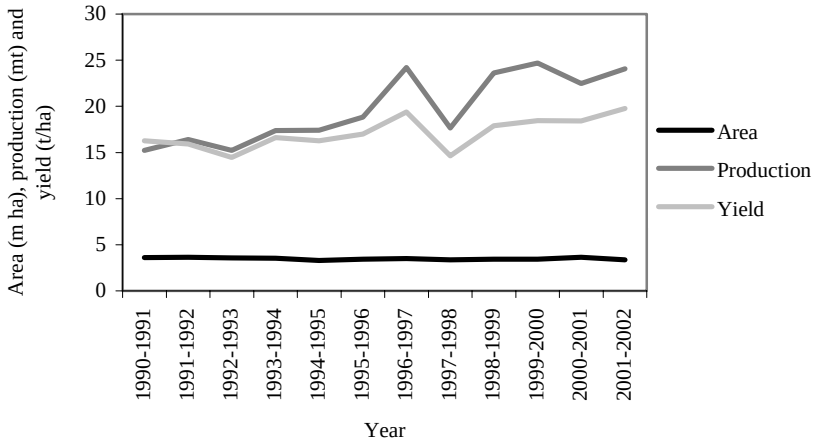
On the other hand, pulses are facing great difficulty in expanding their acreage, however, the market prices of pulses are comfortably high and the country is net importer of pulses. Yield of these crops are very unstable which creates very high uncertainty among the farmers and with the majority of them being small and/or marginal farmers, they are risk averse. This is a plausible reason for not increasing the area under this crop over the years. Total production of pulses is therefore somewhat static in nature at around 15 million tons. This demands greater attention from researchers to break the genetical yield barrier in these crops through biotechnological tools.

Figure 4.2 Trends in area, production and yield of pulses



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Figure 4.3 Trends in area, production and yield of potato



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

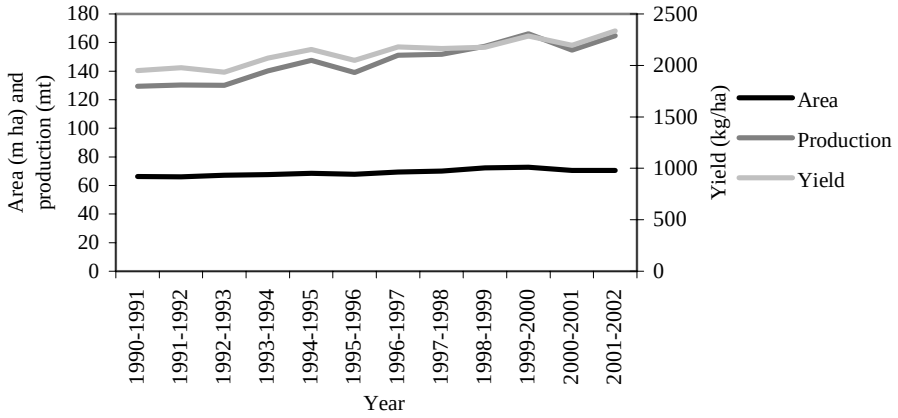
Potato is the only tuber crop under the CGPRT group which has received praise from every corner of the country due to its wide acceptance as an all-season vegetable crop. Although the area under this crop has remained static around at 4-5 million hectares in the country, commendable growth in yield (per unit area) has carried the total production of this crop over the years.

4.3 Trends in area, production and yield of non-CGPRT crops

In comparison to the above-mentioned secondary crops, non-CGPRT crops have shown mixed response to the changed agricultural environment in the country. Fine cereals i.e. rice and

wheat, were the most favoured crops during the green revolution period in many states. Due to the favourable policy environment, area under this crop has increased appreciably. However, later on, due to the various kinds of environmental problems to arise from monoculture (rice-wheat cropping pattern), area under these crops has since ceased to expand further. Continued research efforts on these crops are continuing down the yield-increasing path but at a slow pace. As shown in Figure 4.4, area under fine cereals is static at around 62-65 million hectares, while yield and production are still increasing, just slowly.

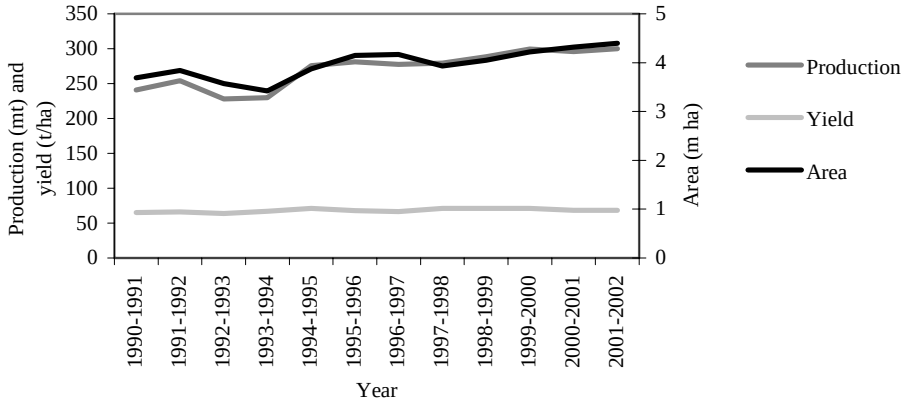
Figure 4.4 Trends in area, production and yield of fine cereals



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Sugarcane production in the country is controlled more by political reasoning than anything else. Sugar mills being mostly under the co-operative sector, the pricing of sugar has a different dimension in the country. For this crop, the central government fixes the Statutory Minimum Price (SMP) at which the sugar mills are supposed to purchase the canes from farmers. However, due to many reasons, sugarcane growers are unable to get the price at the time of delivery. This kind of uncertainty is creating havoc for this crop. On the one hand, farmers are reluctant to expand the area under this crop; on the other hand, they don't even try to increase the productivity per unit area. The reason being that the production of this crop in the country is mainly linked to area, with yield remaining stagnant at around 65 tons per hectare (Figure 4.5).

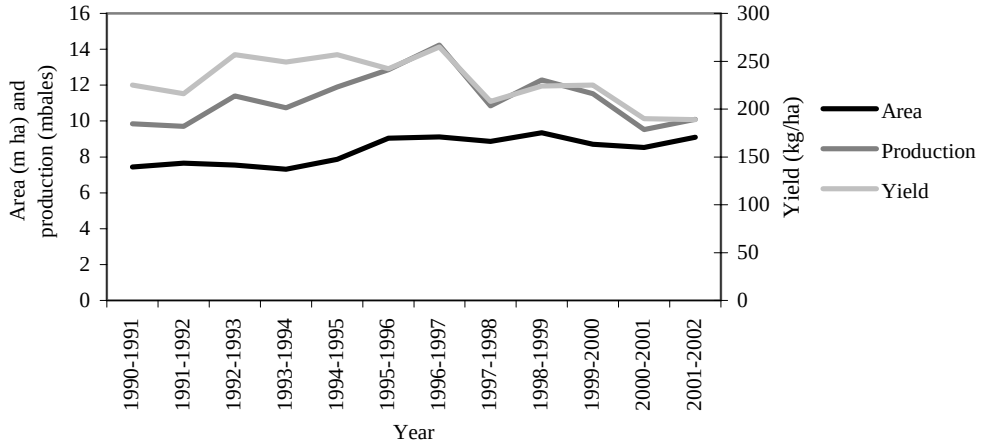
Figure 4.5 Trends in area, production and yield of sugarcane



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Since long ago, cotton was considered as one of the most profitable crops in the country. But more recently, due to persistent drought affecting the cotton growing belt and an insurgence of insect pest attacks, it has now not only raised the eyebrows of farmer-growers but the policy makers, too. Due to a sudden decline in harvest, many farmers in those areas committed suicide. Despite the area under this crop having marginally increased, due to setbacks in yield, total production has declined considerably (Figure 4.6).

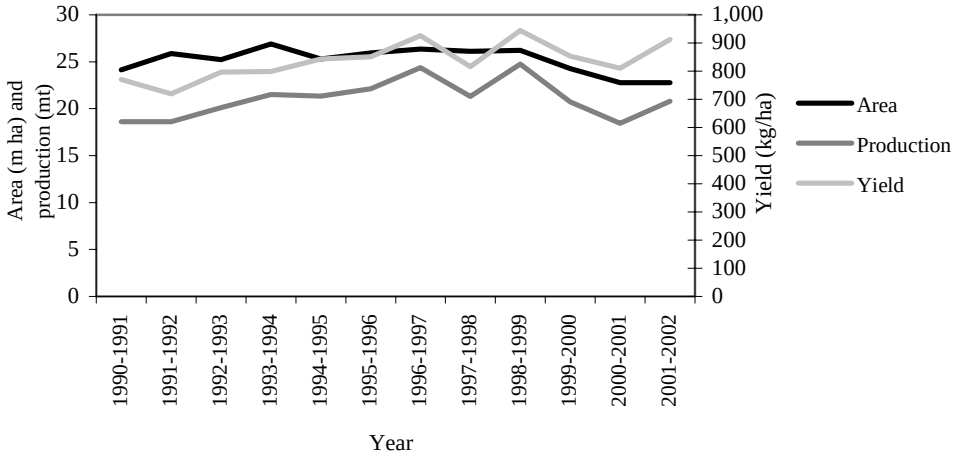
Figure 4.6 Trends in area, production and yield of cotton



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Oilseeds are another very important crop group for the Indian economy because India is spending considerable amounts of foreign exchange in order to import large quantities of edible oil every year to meet the demand-supply gap. For this reason, the country launched the Technology Mission on Oilseeds (TMO) in 1986, which has achieved commendable results, but not nearly enough. During the late nineties, the crop started loosing cropped area and the yield of these crops fluctuated like pulses (Figure 4.7). It also led to a drastic decline in total oilseed production in the country.

Figure 4.7 Trends in area, production and yield of oilseeds



Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

4.4 Trends in area, production and yield of perennial crops

Plantation crops like coconut, tea, coffee, natural rubber, fruits and nuts are generally perennial in nature. For convenience, vegetables, roots and tubers have also been discussed under this section. The details of trends for area, production and yield of these crops are given in Appendix 3. It has been observed that the area under these crops has been constant over the years. Yield has increased marginally in the case of tea, coffee, fruits and vegetables. There was significant improvement in the yield of natural rubber during the nineties, while coconut has almost stagnated in yield. These are the crops, which are still grown in traditional growing areas and due to soil and climatic reasons that could not make inroads into newer areas. In the case of many plantation crops like tea and coffee, the bushes are even older than 30-40 years. As replacement costs are very high, the entrepreneurs are reluctant to replace, resulting in either stagnating or declining yield of the crop.

4.5 Status of irrigation

Irrigation was the cradle where HYV seeds and fertilizer consumption thrived, bringing about the green revolution in Indian agriculture during the late 1960s and 1970s. The development of irrigation was assigned high priority by the government in its successive plans and with an investment of about Rs 650 billion (at constant price) on irrigation projects by the end of Eighth Plan, 90 million ha of potential irrigated area has been created (Kumar *et al*., 2003).

Table 4.7 Irrigation status of CGPRT crops *vis-à-vis* other crops grown in India

Particulars	1989-1991	1994-1996	1998-2000
Gross cropped area (million ha)	183.43	187.34	184.45
Share in gross cropped area (%)			
Fine cereals	36.01	36.23	38.46
Coarse cereals	20.48	17.02	16.17
Pulses	12.94	11.64	12.17
Potato	0.51	0.57	0.69
Gross irrigated area (million ha)	61.82	70.08	76.36
Share in gross irrigated area (%)			
Fine cereals	62.26	60.90	60.74
Coarse cereals	6.32	4.84	4.64
Pulses	3.64	3.84	3.85
Potato	1.52	1.54	1.69
Coverage under irrigation (%)			
Fine cereals	58.26	62.75	65.38
Coarse cereals	10.41	10.60	11.86
Pulses	9.48	12.31	13.07
Potato	100.00	100.00	100.00
All crops	33.70	37.33	41.40

Source: Agricultural Statistics at a Glance (various issues), Ministry of Agriculture, Govt. of India.

However, the actual irrigated area is far less and was estimated to be about 76 million hectares during 1998-2000, the highest in the world. Although fine cereals-rice and wheat-occupy only 38 per cent of gross cropped area (GCA) of the country, more than 60 per cent of the irrigated area is allocated to these two crops only. On the other hand, coarse cereals and pulses occupy around 16 and 12 per cent of GCA respectively but have only 3-4 per cent of total irrigated area (Table 4.7). Similarly, more than 65 per cent of cultivated area under fine cereals is irrigated while only 12-13 per cent of cultivated area under coarse cereals and pulses receive irrigation. Potato being a cash crop has almost 100 per cent irrigated area. Furthermore, as the farmers expect assured irrigation facilities in their regions, they prefer to allocate more area to

finer cereals due to more remunerative prices and other government policies like assured procurement facilities.

4.6 Cropping pattern and cropping intensity

The cropping pattern of any country gives an idea about the crops grown in that country and their share in total cropped area. Table 4.8 explains the percentage area under the important crop groups grown in India.

Table 4.8 Changing cropping pattern of Indian agriculture

(%)

Year	Coarse cereals	Pulses	Fine cereals	Oil seeds	Cash crops	Planta. crops	Fruit and nuts	Veg. roots and tubers	GCA (million ha)
1990-1991	19.55	13.28	35.72	13.00	2.65	1.36	-	-	185.74
1991-1992	18.34	12.37	36.19	14.21	2.85	1.41	1.58	3.07	182.24
1992-1993	18.56	12.05	36.25	13.61	2.66	1.47	1.73	2.72	185.49
1993-1994	17.61	11.94	36.31	14.43	2.60	1.52	1.71	2.62	186.42
1994-1995	17.11	12.25	36.43	13.45	2.83	1.56	2.29	2.67	188.05
1995-1996	16.55	11.94	36.37	13.92	3.03	1.65	1.80	2.86	186.56
1996-1997	16.78	11.84	36.57	13.90	3.07	1.67	1.89	2.91	189.54
1997-1998	16.18	12.00	36.81	13.71	2.91	1.65	1.94	2.94	190.57
1998-1999	15.23	12.20	37.55	13.62	3.03	1.59	1.93	3.05	192.62
1999-2000	15.33	11.04	37.97	12.69	3.16	1.62	1.98	3.13	191.35
2000-2001	15.45	10.37	35.89	11.60	3.04	0.93	1.98	3.18	196.25
2001-2002	15.29	11.15	36.31	11.73	3.12	0.97	-	-	194.26

Source: Agricultural Statistics at a Glance (various issues), Ministry of Agriculture, Govt. of India.

Detailed crop-wise area coverage and cropping intensity are given in Appendix 4. It is evident from the table that during the past 10 years, the shares of coarse cereals and pulses in GCA have come down to about 15 and 11 per cent respectively, while that of fine cereals, cash crops, fruits and nuts and vegetables (including roots and tubers) have marginally increased. In total, gross cropped area has increased from about 186 million ha during 1990-1991 to 194 million ha during 2001-2002, net sown area remaining constant at around 142 million ha. Thus, cropping intensity has increased from about 130 per cent to 137 per cent.

4.7 Trends in animal production

In India, the animal husbandry sector contributes around 25 per cent of the total value of output from the agricultural sector. This is mainly due to the large population base of various domesticated animal species in the country. The country has over 286 million bovines, which include 198 million cattle and 89 million buffalo, the largest in the world (Table 4.9). Besides, the country is also inhabitted by a large population of sheep, goat and many other livestock species making a total of 480 million in 1996. Furthermore, the poultry sector has experienced phenomenal growth in the recent past and the population of poultry birds has sky-rocketed.

Table 4.9 Livestock population in the country

(millions)

Species	1951	1961	1971	1981	1991	1996
Cattle	155.3	175.6	178.3	192.5	204.6	197.7
Adult female cattle	54.4	51.0	53.4	59.2	64.4	n.a.
Buffalo	43.4	51.2	57.4	69.8	84.2	88.8
Adult female buffalo	21.0	24.3	28.6	32.5	43.8	n.a.
T. Bovines	198.7	226.8	235.7	262.4	289.0	286.5
Sheep	39.1	40.2	40.0	48.8	50.8	56.8
Goats	47.2	60.9	67.5	95.3	115.3	120.8
Others	7.9	8.6	10.0	13.3	15.9	15.9
Total livestock	292.9	336.5	353.2	419.8	471.0	480.0
Poultry	73.5	114.2	138.5	207.7	307.1	352.0

Source: Department of Animal Husbandry and Dairying, Ministry of Agriculture, New Delhi.
Note: n.a. - not available.

The dairy sector accounts for nearly two-thirds of the value of animal husbandry output. During 2001-2002, the total production of milk increased to an all time high of 85 million tons, thus making India the largest producer of milk in the world (Table 4.10). Egg production increased to 30 billion in 2001-2002 from 21 billion in 1990-1991.

Table 4.10 Production of major livestock products

Year	Milk (mt)	Eggs (billion nos.)	Fish			Wool (m kgs)
			Marine (mt)	Inland (mt)	Total (mt)	
1990-1991	53.9	21.10	2.30	1.54	3.84	41.2
1991-1992	55.7	21.98	2.45	1.71	4.16	41.6
1992-1993	58.0	22.93	2.58	1.79	4.37	38.8
1993-1994	60.6	24.17	2.65	2.00	4.64	39.9
1994-1995	63.8	25.98	2.69	2.10	4.79	40.6
1995-1996	66.2	27.20	2.71	2.24	4.95	42.4
1996-1997	69.1	27.50	2.97	2.38	5.35	44.4
1997-1998	72.1	28.69	2.95	2.44	5.39	45.6
1998-1999	75.4	29.48	2.70	2.60	5.30	46.9
1999-2000	80.8	30.63	2.85	2.82	5.68	47.9
2000-2001	81.4	31.77	2.81	2.85	5.66	49.2
2001-2002	85.4	34.03	2.86	3.13	5.99	50.7

Source: Department of Animal Husbandry and Dairying, Ministry of Agriculture, New Delhi.

India is the seventh largest producer of fish in the world and is second in inland fish production, which contributes 45 per cent of total production in the country. Fish production reached a level of 5.99 million tons in 2001-2002, comprising of 2.86 million tons of marine fishery and 3.13 million tons of inland fishery. The country is also producing over 50 million kgs of wool.

4.8 Consumption of coarse cereals and pulses in India

During the last three decades Indian agriculture has witnessed significant technological changes, which have resulted in an impressive growth in food-grain production, leading to increases in availability of rice and wheat, which has caused a significant negative impact on the consumption of coarse cereals in the country (Table 4.11). It can be observed that from 1983-1984 to 1999-2000, there was a sharp decline in the consumption of coarse cereals and on the other hand, substantial increases in the consumption of total cereals and pulses in all of the income groups.

Table 4.11 Change in consumption patterns of coarse cereals and pulses in India

(kg/person/annum)

Category/income group	1983-1984	1987-1988	1993-1994	1999-2000
	Coarse cereals			
Bottom income group	37.0	25.3	19.4	11.9
Middle income group	31.1	22.5	15.8	12.0
Upper income group	28.8	18.9	13.3	9.0
All groups	32.0	21.8	15.8	10.4
	Fine cereal (rice and wheat)			
Bottom income group	110.1	120.5	120.2	120.5
Middle income group	144.2	147	141.2	135.8
Upper income group	165.4	167.1	148.6	145.7
All groups	133.6	143.2	135.1	135.0
	Total cereals			
Bottom income group	147.1	145.8	139.7	132.4
Middle income group	175.4	169.4	156.5	147.8
Upper income group	194.3	156.5	161.1	154.6
All groups	165.6	165.0	150.9	145.6
	Total pulses			
Bottom income group	7.6	7.8	7.0	6.9
Middle income group	11.5	11.0	9.2	10.4
Upper income group	17.7	16.4	12.5	16.6
All groups	12.3	11.7	9.6	11.3

Source: National Sample Survey Organization, various rounds and; Kumar and Kumar (2003).

The drop in per capita consumption of coarse cereals is almost two-thirds. Since coarse cereals are treated as inferior goods in the country, the decline in their consumption was partially due to increases in per capita income and partially due to the easy availability of superior cereals through PDS. The share of coarse cereals in total cereals' consumption in rural India was close to one quarter in 1983-1984, which came down to merely 9 per cent in 1999-2000. Similarly, in urban India, the share of coarse cereal consumption dropped from 9.2 per cent in 1983-1984 to 3.51 per cent in 1999-2000. The decline in the consumption of coarse cereals is thus confirmative of both factors, pure income effect and consumption diversification effect.

Table 4.12 Share of secondary crops in monthly per capita consumption in rural areas of major growing states in India, 1999-2000

Major secondary crop growing states	Coarse cereals and their products		Pulses and their products		Potato		All CGPRT crops and their products	
	Qty (kg)	Share* (%)	Qty (kg)	Share* (%)	Qty (kg)	Share* (%)	Qty (kg)	Share* (%)
Andhra Pradesh	0.62	1.66	0.73	6.52	0.26	0.66	1.61	8.84
Gujarat	4.39	9.34	0.92	7.18	1.07	1.86	6.38	18.38
Karnataka	5.06	12.08	1.01	8.20	0.25	0.54	6.32	20.82
Madhya Pradesh	1.09	2.52	0.87	7.71	1.15	2.08	3.11	12.31
Maharashtra	4.53	10.97	1.10	8.97	0.50	1.13	6.13	21.07
Rajasthan	4.05	8.07	0.67	4.34	0.70	1.01	5.42	13.42
Tamil Nadu	0.42	0.87	0.83	7.82	0.35	1.01	1.60	9.70
Uttar Pradesh	0.22	0.41	1.07	8.40	2.87	3.37	4.16	12.18
All India	1.35	3.09	0.84	6.62	1.61	2.31	3.80	12.02

Source: Worked out from various census reports of NSSO.

* Figures show the share of respective crops in the total expenditure on food items.

An attempt has also been made to see the consumption patterns of secondary crops in their major growing states and is presented in Table 4.12 and 4.13. In rural areas, the share of coarse cereals in per capita consumption expenditure was at a maximum in Karnataka state followed by Maharashtra, Gujarat and Rajasthan. Pulses have almost equal share of about 6-8 per cent in total consumption expenditure in all the selected states. Per capita consumption of

potato was less than even coarse cereals, except in Uttar Pradesh. CGPRT crops as a total, contributed to the tune of 12 per cent in the total consumption basket of the country.

In urban areas, secondary crops have a lesser role in the daily consumption basket in most of the states. They contributed only 8 per cent in total per capita consumption expenditure in the country. Coarse cereals have very little share in urban areas, while pulses contribute around 6-7 per cent in the consumption expenditure. The expenditure share of potato was also found less in urban areas as compared to rural areas.

Table 4.13 Share of secondary crops in monthly per capita consumption in urban areas of major growing states in India, 1999-2000

Major secondary crop growing states	Coarse cereals and their products		Pulses and their products		Potato		All CGPRT crops and their products	
	Qty (kg)	Share* (%)	Qty (kg)	Share* (%)	Qty (kg)	Share* (%)	Qty (kg)	Share* (%)
Andhra Pradesh	0.13	0.31	0.87	6.48	0.38	0.76	1.38	7.55
Gujarat	0.99	1.77	1.03	6.16	1.03	1.39	3.05	9.32
Karnataka	2.18	3.93	1.04	6.79	0.36	0.58	3.58	11.3
Madhya Pradesh	0.17	0.27	1.00	7.46	1.28	1.72	2.45	9.45
Maharashtra	1.03	1.93	1.02	6.35	0.66	0.95	2.71	9.23
Rajasthan	0.49	0.84	0.96	4.30	0.84	0.97	2.29	6.11
Tamil Nadu	n.a.	n.a.	1.02	7.14	0.44	0.90	1.46	8.04
Uttar Pradesh	n.a.	n.a.	0.98	7.18	2.51	2.60	3.49	9.78
All India	0.31	0.63	1.00	6.13	1.32	1.54	2.63	8.30

Source: Worked out from various census reports of NSSO.
* Figures show the share of respective crops in the total expenditure on food items.

4.8.1 Elasticity and projections of demand for coarse cereals and pulses

A number of demand models are available for estimating the expenditure and price elasticity of demand for a commodity. Kumar (2004) has estimated these elasticities for India for different commodities using Food Characteristic Demand System (FCDS), a non-econometric model. The study based on calorie elasticity concluded that the demand elasticity obtained from FCDS gave the most reliable demand projections for food-grains and other food commodities. The data used in that study was from the National Sample Survey (NSS), 50th Round, conducted in 1993/1994.

Table 4.14 compares the own-price elasticity and expenditure elasticity of coarse cereals and pulses with that of finer cereals i.e. rice and wheat. The commodities with the cheapest source of calories have the lowest income elasticity. These elasticities were used in demand projections.

Table 4.14 Price and expenditure elasticity and demand projections for coarse and fine cereals and pulses in India

Particulars	Rice	Wheat	Coarse cereals	Pulses
Own-price elasticity	-0.29	-0.22	-0.31	-0.52
Expenditure elasticity	0.02	-0.08	-0.17	0.21
Year		Demand projection (mt)		
2000	84	63	32	17
2010	96	71	36	20
2020	106	77	39	22

Source: Kumar and Kumar (2003).

As expected, it has been observed that coarse cereals and pulses have higher own-price elasticity as well as income elasticity than that of finer cereals. Higher income elasticity for coarse cereals seems a little debatable, but a plausible reason may be due to growing derived demand of maize for the purpose of feed and other industrial uses. Using these elasticities and taking into account the growth in price of these commodities and per capita income, demand

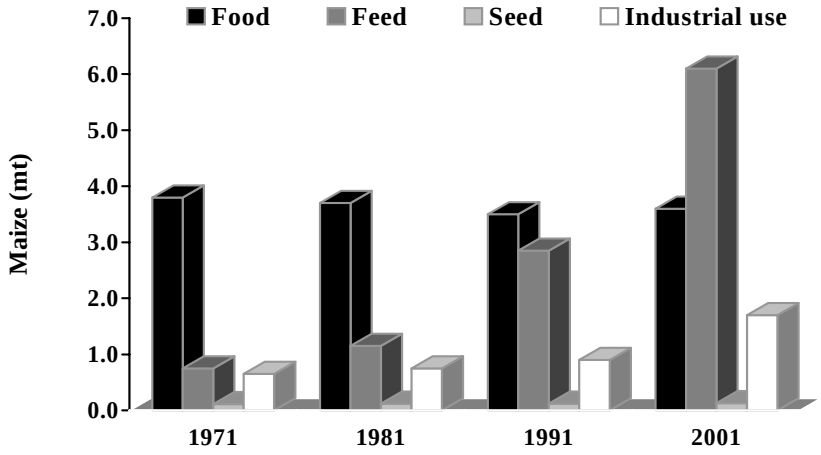
projections for CGPRT commodities have been calculated. In 2020, domestic demand for coarse cereals and pulses in India is estimated to be 39 million tons and 22 million tons respectively, against 26.36 million tons and 21.12 million tons currently produced (2002-2003) in the country. This calls for concerted efforts to diversify Indian agriculture to meet the growing demand of coarse cereals and pulses in years to come.

4.9 Commercial uses of products at a macro-level

Though, secondary crops like coarse cereals and pulses are rich in nutrition and can be a better weapon to fight against malnutrition among the poor in the country, but we can find very few cases of industrial uses in general, except for a few commodities. Moreover, they are found to be a valuable ingredient in pancake mixes, baby foods, cookies, biscuits, ice cream cones, ready-to-eat cereals, better breeding mixes, etc. However, their potential in commercial uses has not been fully explored in the country.

Of all the coarse cereals, maize and sorghum have a wider range of uses than any other cereal, because of their wider industrial applicability. They can be processed into different products for various end-uses. Maize has been exploited for its wide range of uses as a staple food, animal feed and raw material for industrial products. In developed countries, a larger proportion of maize is used for livestock feeding than as an industrial raw material. The trend in use of maize as animal feed has recently picked up in India due to two reasons (Figure 4.8). Firstly, the increasing per capita income has taken an upward swing, which has changed the consumption pattern towards the non-vegetarian food. This requires more animal products and indirectly, demand for animal feed has increased. Secondly, encroachment of common property resources in rural areas and declining per capita landholdings have increased the pressure on agriculture, which has ultimately squeezed the pastureland in a big way, forcing domestic livestock to depend mainly on stall-feeding.

Figure 4.8 Maize utilization patterns in India



Source: Indian Maize Development Association, New Delhi.

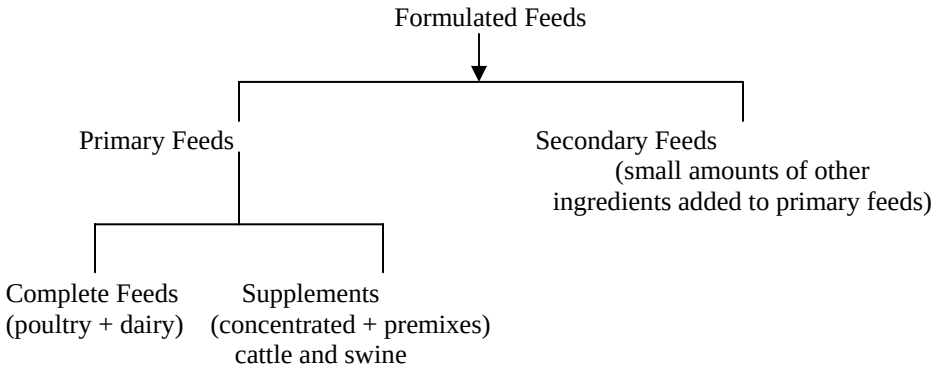
Maize is used extensively as the main source of calories in animal feeding and feed formulation as maize gives the highest conversion of dry substance to meat, milk and eggs as compared to other cereal grains. Maize is a valuable feed grain because it is among the highest in net energy content and lowest in protein and fiber content. It is fed either directly or is dried, milled and compounded with other ingredients, the mixture is then fed or converted into forms

preferred by specific animals. By-products of industrial wet and dry milling are also used as feed.

As a human food, traditionally, maize in India is utilized in the form of *chapatti* (home made bread), *sattu* (grinded roasted grain), *bhuja* (roasted grain), *dalia* (grinded grain) etc. The Central Food Technological Research Institute (CFTRI), Mysore is paying utmost attention in value-added products of maize for its diversification and popularization, like noodles, improved flour, deep fat-fried products like chips and flakes that can be converted to savory or sweet preparations or ready-to-eat flavoured flakes to boost maize utilization.

Recently, a number of nutritional products from Quality Protein Maize (QPM) such as weaning food, health food, convenience food, and speciality foods have been developed in Rajendra Agricultural University, Pusa (Bihar), which can solve the multifaceted nutritional problems, which are widespread in rural India. These products are catching the attention of farmers, NGOs, industrialists etc., however, still await much needed promotion from governmental organizations (Singh and Maurya, 2003). Some of the industrial products of maize are:

A. Formulated feeds



B. Wet milling product: Corn starch is the primary product of wet milling. It is recovered in purified form in a yield of 67 to 69 per cent of corn dry substance. It is widely used because it is inexpensive, lacks characteristic flavour and makes clear paste.

Industrial application

1. Unmodified starch: It is also called milk starch or thick boiling starch. It is the lowest cost industrial starch product. High paste viscosity, strong gel and retrogation are its special properties. This starch is used in:

- Charcoal briquette molding.
- Beneficiation of bauxite ores.
- Dusting powder manufacturing.
- Paper and paper product manufacture (60 per cent of all raw starch sold is used for this purpose).
- As an internal binder in forming the paper sheet.
- As an adhesive in the manufacture of paperboard.

2. Acid modified corn starch: It is used as adhesive for paper lamination and clay coating. Other uses are as textile wrap-size applications (where smooth, strong film coatings are needed to protect the fibers during weaving).

Malto-dextrins and pyro-dextrin:

Malto-dextrin:

- It is instantly soluble in water giving a clear hazy solution of low viscosity.
- It adds body in frozen desserts and soups, etc.
- It is an excellent cover for spray dried hygroscopic solids (such as instant tea and coffee).
- Excellent protective colloidal action for fats.
- Major constituents of coffee whiteners.

Pyro-dextrin:

- Adhesives for fabricating paper products and for remoistenable gums (on postage stamps and packaging tape, sizing and finishing textiles).
- Thickeners for water soluble fabric printing inks, etc.

3. Oxidized starch: Its paste, if spread in thin a layer, dries to a clear, adherent continuous film. It is desired for paper, clay coating adhesive, textile wrap-size for cotton and rayon and laundry finishing.

4. Pre-gelatinized starch: It has the property of instant solubility and different paste viscosity.

Chemical derivatives:

Heavily cross-bonded corn starch is used for dusting surgical gloves (after being autoclaved). This starch is not gelatinized but is slowly digested in the body.

i. Hydroxy ethyl acid modified corn starch:
- used in paper sizing and clay coating.
- for thickening high gloss printing inks.

ii. Hydroxy ethyl starch:
- acts as a blood plasma extender.

iii. Hydroxy propyl starch (approved by Food and Drug Adulteration Act):
- used for thickening foods (such as salad dressings).

iv. Corn starch as amino alkyl and quaternary ammonium:
- broadly used as internal binders in paper manufacturing.

v. Waxy starch:
- in thin boiled and oxidized state, it produces improved film clarity for textile sizing and certain types of paper coating. Waxy corn starch is the preferred starting material for maltodextrins.

vi. Higher amylose starch:
- sizing of glass fibers prior to weaving.
- a component of gummed candies.
- preparation of a clear hot water dispersible, edible film (for packaging foods, dyes and other soluble materials and coating paper to reduce water and fat absorption).

C. Sweetener products

i. Corn syrups:
- generally used in bakery and dairy products.
- bodying agents in ink, shoe polish, textile finishes, adhesive formulations and pharmaceuticals; in tanning leather and as humectant in tobacco.

ii. Dextrose:

- major component of tabulated candies, chewing gums, gum confections, fondants and hard candy formulations.
- its modified form sorbitol is used in the production of synthetic Vitamin C.

iii. High Fructose Corn Syrups (HFCS):

- found in a wide variety of food systems such as confections, baked goods, table syrups, sweet beverages, etc.

D. Corn oil

Corn oil is commercially produced only from corn germ isolated by wet milling or dry milling. It has become a highly desirous vegetable oil because of its bland flavour and high smoke point (temperature at which smoke rises from oil). Another reason for the popularity of corn oil is its high content of unsaturated fatty acids recognized by medical authorities as a dietary component for reducing blood cholesterol levels.

E. Food products

Corn bread or corn muffins can be made from corn meal. In Mexico, corn bread is known as 'Tothriya'. Another favorite food is corn flakes. The flaking grits are cooked to a rubbery consistency with syrup, malt, salt, and flavourings added. After tempering, cooked grits are flattened between large steel rolls followed by toasting in traveling ovens to a golden brown colour. Corn flour has been found to be particularly valuable as an ingredient of pancake mixes, baby foods, cookies, biscuits, ice cream cones, ready-to-eat cereals, better breading mixes, etc. Corn flour (fine) is used in the preparation of thickening agents for soup in most continental food recipies.

F. Other corn foods

Besides many traditional foods of maize like breads, cakes, cornmeal and hominy, maize has importance in other food product preparations like:

Alkaline cooked foods: These are tortillas, tostadas, tortillachips, cornchips and dehydrated masalachips.

Popcorn: Popcorn is being selected on the basis of its expansion volume. As the kernels of popcorn are heated the water vapour within them expands, increasing the pressure until it is sufficient to make the kernels explode or pop. For best popping expansion, 13.5 per cent of moisture content is recommended. Popping can be done with or without fat.

Parching: Today parching corn is a popular snack item known by the trade name 'corn nuts'. Large flour type kernels on hot rocks, sends or ashes are generally used for these products.

Baby corn: The immature corn-on-the-cob can be used after grinding and cooking it in milk. The nutritional quality and easy digestibility of baby corn gives it a special place in infant and geriatric nutrition. Weaning and infant mixes can be prepared from baby corn; this needs to be emphasized.

G. Fermentation industries' products

Maize is being utilized extensively in fermentation industry products, like:

Beverages: Corn starch grits are used for beverages. Beer and distilled liquors are the leading beverage products with respect to volume of production and utilization of corn.

Beer and malt beverage: These products are being prepared primarily by dry-milled corn, corn flakes, corn syrups and liquid dextrose. The use of corn syrup provides the brewing industry a low capital cost and ways to expand, as it meets the growing total and per capita consumption of beer.

Wines: Sweet "pop" wines and "wine coolers" sweetened with high fructose corn syrup have achieved significant market penetration.

Distilled liquors: Corn serves as a major carbohydrate source in the manufacture of distilled liquors.

Fuel alcohol and chemicals: Ethanol, citric acid, glutamic acids, lysine and food grade lactic acid are made more economically by the fermentation of corn, dextrose or molasses. Two vitamins, riboflavin [B_2] and cobalamine [B_{12}] are made by fermentation, using dextrose and corn syrup liquor.

Antibiotics: The preferred carbohydrate sources for commercial antibiotic production are corn syrup, dextrose, corn starch, lactose and sucrose. Tetracycline is produced in the largest volume followed by penicillin, neomycin, becitracin and streptomycin. A very large volume of mainly penicillin, becitracin and neomycin has been used as growth stimulants in animal feeds.

Enzymes: For enzyme production, whole corn or corn meal supply carbohydrates for a production medium. Enzymes like alfa-amylase, gluco-amylase and gluco-isomerase can be prepared to fulfil the rapidly growing demands of fructose corn syrup from corn starch.

H. Corn-on the-cob usage

An undetermined amount of corn, still on the cob is used as feed for ruminant animals. The cobs are especially useful for blast polishing and the cleaning of electrical parts without danger. The free flowing highly absorbent properties of corn cob granules makes them useful as carriers for pesticides, fertilizers, vitamins etc. Finely divided fractions of cob are used in hand soaps, cosmetics and animal litters. The cob is useful in the extraction of crude petroleum.

The nutritive value of maize resembles that of other cereals in general, but differs in some important respects. Yellow maize contains a mixture of carotenoids [β-carotene, cryptoxanthins and β- zeacarotene having Pro Vitamin A activity]. The principal protein in maize is zein, an incomplete protein lacking tryptophan and lysine. Therefore, maize should be utilized in combination with legumes but this problem has been overcome by the rigorous efforts of scientists to discover Quality Protein Maize [QPM]. The nicotinic acid present in maize is in a bound form and is not available. The limewater treatment given to maize makes the nicotinic acid biologically active. Thus, maize is a versatile and high-potential crop that can pay dividends to the farmers of the policy makers, planners and scientists.

Sorghum is another important coarse cereal, which is being used as industrial raw materials for various purposes like as feed in the poultry and dairy industry; as a grain-base in the alcohol industry, etc. (Table 4.15). The demand for sorghum in alcohol industries is expected to be between 0.18-0.22 million tons by 2010. Sorghum grain is estimated to fulfil 60 per cent of the grain requirement of the distilleries (Rao *et al*., 2003).

Table 4.15 Industrial demand for sorghum in India

Industry	1998	2001-2002	2010[+]
Poultry feed	418 - 627	1078-1270*	2,668-3,085*
Dairy feed	160 - 240	440-450	600
Alcohol	90 - 100	92	216
Starch	50	-	-
Exports	-	11	-
Total	718-1,017	1,621-1,823	3,484-3,901

Source: Rao *et al*. (2003).

Note: + Annual growth rates considered for the projections are 8 per cent in layer; 15 per cent in broiler; 5 per cent in grower and parent stock, 3.5 per cent in dairy and 10 per cent in the alcohol industry.

* Sorghum inclusion rate in feed considered for the estimation are 12 to 15 per cent in layer; 10 per cent in broiler; 5 per cent in grower and parent stock and 10 per cent in dairy.

Besides these two secondary crops i.e. maize and sorghum, barley is also one of the coarse cereals being cultivated in very limited areas which is used for distilleries and also has medicinal properties. There is very little information available on the industrial uses of other millets. Pulses in India are mainly used for *dal* (de-husked pulse grain) purposes and have very few industrial/commercial uses. The country is not able to meet its own demand for pulses for table purposes and thus depends mainly on imports every year. Potato is another very important secondary crop, which is grown everywhere in the country, though is mainly used for vegetable purposes. As has also been shown in Table 4.12, per capita consumption of potato is about 19 kg per annum, thus very little produce remains left for commercial uses like confectionaries, starch making, etc. Therefore, among secondary crops, maize, sorghum and barley to an extent have great potential for commercial exploitation.

4.10 Marketing and prices of secondary crops

In India, there is no specific market of secondary crops. Furthermore, in the states, where these crops are concentrated, there has not been any horizontal and/or vertical expansion of regulated markets. Table 4.16 depicts the distribution of regulated markets in the major states growing these crops, which have not increased in number since long ago. Information on the market arrival of secondary crops is also very limited in India.

Table 4.16 Regulated markets in major secondary crop growing states, India (2002)

State	Number of markets
Rajasthan	28
Karnataka	48
Maharashtra	76
Madhya Pradesh	37

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.

Among coarse cereals, maize, pearl millet and sorghum are marketed in the states under study. It can be observed from Table 4.17 that most of these states have a huge marketed surplus of coarse cereals as well as pulses, but in the absence of proper marketing facilities and government support, these crops find difficulty in reaching the regulated market. As a result, very little information is available on the market arrival of these crops. Further, it is evident from Table 4.18 that maize is the major secondary crop, which is marketed in bulk in most of the major growing states.

Table 4.17 Marketed surplus ratio of secondary crops in selected states, India

Crops	State	1999-2000	2000-2001	2001-2002
Maize	Andhra Pradesh	88.5	100	100
	Karnataka	99.0	96.4	95.7
	Madhya Pradesh	65.9	52.9	61.8
	Rajasthan	37.5	36.8	42.3
	Uttar Pradesh	61.9	78.5	61.4
Sorghum	Andhra Pradesh	26.3	71.5	57.4
	Karnataka	40.0	71.5	58.4
	Madhya Pradesh	69.1	57.0	44.4
	Maharashtra	51.9	60.2	65.6
Pear millet	Gujarat	63.4	56.3	81.5
	Maharashtra	58.6	61.8	73.4
	Rajasthan	40.6	37.9	37.5
	Uttar Pradesh	72.6	90.2	74.5
Pigeonpea	Karnataka	83.3	72.7	84.6
	Madhya Pradesh	55.5	NR	58.5
	Maharashtra	75.8	93.3	82.1
	Uttar Pradesh	37.1	70.8	79.3
Chickpea	Madhya Pradesh	78.4	73.8	87.4
	Rajasthan	80.7	82.2	NR
	Uttar Pradesh	44.2	74.7	64.7

Source: Ministry of Agriculture, Government of India.

Note: NR= Not reported.

Marketed surplus ratio is the ratio between actual sales and total production of the crop.

Table 4.18 Volume of market arrival of selected secondary crops across the major states

('000 ton)

Crops	Years	MP	Maha	Rajas	UP	Ktk	AP	Guj
Maize	1990-1991	36.1	n.a.	64.0	108.6	67.2	110.8	10.4
	1995-1996	25.1	n.a.	40.2	119.7	40.1	141.8	32.2
Pearl millet	1990-1991	2.5	11.3	35.7	86.7	13.0	8.5	102.7
	1995-1996	17	10.2	67.8	120.6	8.7	30	122.3
Sorghum	1990-1991	47.2	38.1	24.9	42.4	67.2	34.5	9.8
	1995-1996	31.4	29.55	20.6	36.9	56.5	3.6	10.2
Finger millet	1990-1991	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	1995-1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Pigeonpea	1990-1991	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	1995-1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Chickpea	1990-1991	162.4	4.0	65.1	291.1	n.a.	n.a.	n.a.
	1995-1996	236.7	3.8	69.5	330.9	n.a.	n.a.	n.a.

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.
Note: AP- Andhra Pradesh, Guj.- Gujarat, Ktk.- Karnataka, MP- Madhya Pradesh, Maha.- Maharashtra, Rajas.- Rajasthan, UP- Uttar Pradesh; n.a.= not available.

In states like Andhra Pradesh, Uttar Pradesh, Karnataka and Rajasthan, huge quantities of maize are being traded. Similarly, pearl millet and sorghum are traded in bulk in select states like Maharashtra, Gujarat and Uttar Pradesh. There is very little information on the market arrivals of pulses.

Various prices prevailing in the market for some of the secondary crops for major states have been presented in Table 4.19. The Minimum Support Price (MSP) is announced by the central government assuring the farmers can purchase any quantity of the produce at announced prices. It is announced for many crops, but hardly implemented or enforced for secondary crops.

Table 4.19 Price information of the major secondary crops in India

(INR per ton)

Crops	State	Prices	Years		
			1990	1995	2002
Maize	Rajasthan	MSP	1,800	3,100	4,850
		FHP	2,110	4,080	5,150
		WHP	2,018	4,343	5,311
Pearl millet	Rajasthan	MSP	1,800	3,000	4,850
		FHP	2,170	4,240	5,840
		WHP	2,104	4,071	5,554
Finger millet	Karnataka	MSP	1,800	3,000	4,850
		FHP	2,000	3,940	4,050
		WHP	1,725	4,336	5,817
Sorghum	Maharastra	MSP	1,800	3,000	4,850
		FHP	2,288	4,000	5,280
		WHP	2,573	3,921	5,439
Chickpea	Madhya Pradesh	MSP	4,500	7,000	11,800
		FHP	5,770	8,810	11,820
		WHP	6,671	8,251	13,250
Pigeonpea	Maharastra	MSP	4,800	8,000	13,200
		FHP	9,340	16,570	19,920
		WHP	8,188	13,750	13,638

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India.
Note: MSP= Minimum Support Price, FHP= Farm Harvest Price, WHP= Wholesale Price.

As can be observed from the table, the MSP announced is too low for these crops to have any effect on the marketing of these crops. Farm harvest price (FHP) is the price, which a farmer receives from selling his produce. Wholesale price (WHP) is the price at which the produce is traded at the market in bulk. Therefore, it is assumed that the WHP must be higher than the FHP, but it can be observed that in many cases the reverse is true, which shows the

fragile market behaviour of these commodities in the market due to low demand as well as trade across the states.

4.11 Concluding summary

Secondary crops, which include coarse grains, pulses, roots and tuber crops played vital role in the past and still provide a source of livelihood to millions of farmers living in rainfed and marginal environments in India. Coarse cereals however, have not been given due attention as given to fine cereals and have therefore been by-passed during the process of agricultural development in the country. Although, most of the coarse cereals are much more nutritious than the fine cereals, it is the fine cereals which enjoy the lion's share in the consumer's basket now a days. Despite pulses being considered the only source of protein for the poor, the crops under this group are still struggling to compete in the cropping patterns of the country. Among roots and tuber crops, potato is the only crop that has significant presence in Indian agriculture due to its diversified uses and versatile presence in nature.

The shares of coarse cereals and pulses in gross cropped area (GCA) of the country have reduced significantly over the years. Major gainers were obviously wheat, rice and oilseed to some extent. Among the secondary crops, maize is the only crop under which acreage has expanded. Surprisingly, the area under potato has increased in all the states under study. Rice, after showing an increase in its area during the green revolution, started decelerating in many states in the post GR period, although this is not true with wheat. However, the yields of all the secondary crops have increased significantly in all states due to technological advancement. Thus, any increases in the production of coarse cereals that are observed are mainly due to increases in yield and not area. Pulses are facing great difficulty in expanding the acreage mainly due to their highly unstable yield performance. Potato is the only tuber crop under the CGPRT group which has received praise from every corner of the country due to its wide acceptance as an all-season vegetable crop.

Among non-CGPRT crops, area under fine cereals has increased substantially. The production of sugarcane in the country is mainly linked to the area under the crop, with yield remaining stagnant at around 65 tons per hectare. Recently, despite the area under cotton marginally increasing, due to setbacks in yield, total production has declined considerably. Oilseeds have made substantial progress in the past, but are unable to sustain the growth. Plantation crops like coconut, tea, coffee, natural rubber, fruits and nuts are generally perennial in nature. Area under these crops is constant over the years, though yield has increased marginally in the case of tea, coffee, fruits and vegetables. There was significant improvements in the yield of natural rubber during the nineties, while coconut has almost stagnated. These are the crops, which are still grown in traditional growing areas due to their soil and climatic requirement restrictions.

Irrigation was the cradle where HYV seeds and fertilizer consumption thrived, bringing about the green revolution in Indian agriculture during the late 1960s and 1970s. The superior cereals, namely rice and wheat, occupy more than 60 per cent of irrigated area. On the other hand, coarse cereals and pulses occupy around 16 and 12 per cent of GCA respectively, but have only 3-4 per cent of total irrigated area. Furthermore, only 12-13 per cent of the cultivated area under coarse cereals and pulses receive irrigation. Potato being a cash crop has almost 100 per cent irrigated area. Above all, as the farmers expect assured irrigation, they prefer to allocate more area to finer cereals due to more remunerative prices and other government policies. During the last three decades, the drop in per capita consumption of coarse cereals is almost two-thirds. Since coarse cereals are treated as inferior goods in the country, the decline in its consumption was partially due to increases in per capita income and partially due to the easy availability of superior cereals through the Public Distribution System (PDS). However, domestic demand for coarse cereals and pulses is estimated to be 39 million tons and 22 million tons respectively by 2020 in the country.

On the other hand, in India, there is no specific market for secondary crops and although most of the states have a huge marketed surplus of coarse cereals as well as pulses, in the absence of proper marketing facilities and institutional support these crops find difficulty in reaching the regulated market. Similarly, it has been observed that in many cases the farm harvest price (FHP) was higher than the wholesale price (WHP), which shows the fragile market behaviour of these commodities due to low demand as well as trade across states. Further, the minimum support price for these crops does not have much relevance in the country. Thus, the study calls for a level playing field to be provided to secondary crops for equitable growth in Indian agriculture.

5. Overview of Agricultural Diversification Policies

5.1 Background

India is the second most populous country in the world and third largest economy in Asia. Since independence five decades ago, India has followed a policy of self-sufficiency in food production and has undergone remarkable transformation. This may aptly be attributed to the sustained needs to feed the burgeoning population in the past, backed by the technological revolution largely referred to as the '*Green Revolution*'. The growth in agricultural production since the 1960s has been from a sustained rising trend in yields, with slight increases in area and thereby production. The three inputs, namely irrigation, fertilizer and high yielding varieties (HYVs) have accounted for much of the yield growth in the past decades. Apart from this, the conducive government initiatives creating irrigation infrastructure, input delivery systems, and investment in agricultural research and extension services have also contributed largely to the increased agricultural production. The country transformed itself from a perennial food importer to its current position of net exporter of rice and many other agricultural commodities, defying many predictions. However, the agricultural transformation was tilted in favour of finer cereals, and has castled its ramifications on the coarse cereals, pulses and oilseeds, predominantly grown in the rainfed areas comprising nearly 70 per cent of the arable land in the country. This has resulted in a sharp decline in acreage of this segment leaving just maize as the exception.

In contrast, India's agricultural production has slowed significantly in recent years. In the face of the declining growth of agricultural productivity and likely increases in the future for food demand, it is probable that the future source of growth lies squarely in the rainfed region. The nutrient composition and technological properties of coarse cereals and grains offer a number of opportunities for processing and value addition.

Crop diversification is intended to give wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also lessen risk. Crop diversification in India is generally viewed as a shift from traditionally grown, less remunerative crops to commercial crops including vegetables and fruits (Hazra, 2001). The crop shift (diversification) also takes place due to governmental policies and thrust on some crops over a given time, for example the creation of the Technology Mission on Oilseeds, Maize and Pulses (TMOMP) to advance oilseed, maize and pulses, production as a national need for the country's requirement for less dependency on imports. Market infrastructure development and certain other price related support has also induced crop shift. Often low-volume, high-value commercial crops also aid crop diversification. Higher profitability and also resilience/stability in production also induced crop diversification, for example sugarcane replacing rice and wheat. Crop diversification and also the growing of a large number of crops are practiced on rainfed lands to reduce the risk factor of crop failures due to drought or less rain. Crop substitution and shift are also taking place in the areas with distinct soil problems. For example, the growing of rice in high water table areas replacing oilseeds, pulses and cotton; promotion of soybean in place of sorghum, etc. The varied industrial uses and nutritional superiority of coarse cereals offer immense scope for diversification in these crops.

Most coarse cereals can be puffed or popped and the pearling and polishing of millets can improve the appearance and reduce the fibre content. The flour of popped grains of millet gives a fine aroma to ready-to-eat products. The marketing of flour of coarse cereals is an important cottage industry. Refined flour is useful in the preparation of many snacks foods. Especially, the extrusion cooking of millets appears to be highly promising in the preparation of

value added traditional and novel food products. The malting properties of barley are recognized in sorghum and other millets too. For example, finger millet malt and millet based beverage fermentation are popular in south India. The use of finger millet malt in low-bulk, nutrient-dense weaning food has been well demonstrated, the technology is well adopted not only in India but also elsewhere.

5.2 Policies in retrospect

Institutional policies like improvements in the seed and fertilizer distribution systems, and policies to provide access to credit and extension related services are also important in enhancing the risk bearing ability of the farmers. Moreover, the equal opportunities access to the women farmers is also important in increasing income. As it was largely found that a woman's role in farm management has been crucial for efficient farm operation. Women's contribution in utilization and household processing is immense and with improved awareness will give them an option to choose the best strategy for household food needs. With the liberalized market, the economic policies should be directed towards remunerative prices based on competitiveness compared to other crops, nationally as well as internationally.

Concerns have been expressed regarding the policies to reduce the extent of land under the major perennial crops especially fine cereals and subsequent repercussions of these will have long-term bearing. It was noted that such crop replacements, unless carefully analyzed, might have adverse effects on the food and industrial product supply in the nation. The development of links with the food industry for product diversification and value addition to meet the demands of the changing society are very much needed. Serious concerns were expressed of the soil fertility depletion, due to continued intensive cropping over long periods of time, which needs to be corrected.

5.2.1 Agricultural price policies

An effective instrument used by the government to increase agricultural production and to intervene in agricultural produce markets consists of the fixation and announcement of administered prices and making arrangements for their implementation. The administered prices include; Minimum Support Prices (MSP) for 23 commodities (seven cereals, four pulses, eight oilseeds, copra, raw cotton, raw jute and VFC tobacco), Statutory Minimum Prices for sugarcane, levy prices for rice and sugar and central issue prices for rice, wheat and coarse cereals for sale under the public distribution system. The price policy regime in India was mostly in favour of farmers with better endowed resources, particularly irrigation confining more cultivation to superior cereals. However, price support has not benefited the farmers located in marginal production environments, home to most of the inferior (coarse) grains, and do not generate marketable surplus to realize the benefits of price support.

5.2.2 Agricultural marketing policies

The present framework for the functioning of agricultural marketing in India is the outcome of many years of experimentation in state-intervention (Acharya, 1997). The policy framework can be divided into six components, namely:

a) ***Regulatory measures.*** The government monitors market conduct through the imposition of several regulatory measures. The regulatory framework consists of two distinct sets of measures. The first set of measures is the development and regulation of wholesale markets, popularly called "regulated markets" and the second is the regulation of market conduct through a series of legal instruments.

b) ***Marketing infrastructure.*** The second component, which affects the structure, conduct and performance of the marketing system, is the physical and institutional infrastructure. The government therefore, has had to take an active stance for the

creation of appropriate infrastructure like, storage, transportation and telecommunication facilities. Apart from these, expansion in the infrastructure for the grading of agricultural commodities is an important activity for exports and even for domestic marketing. Directorate of Marketing and Inspection has established several laboratories for the certification under AGMARK[1].

c) ***Direct intervention.*** The third set of instruments consists of the direct entry of public agencies into the market with a view to influence its structure, conduct and performance. Some of these which are currently *in vogue*, are the maintenance of stocks of rice and wheat, the distribution of cereals and sugar at prices lower than market prices and open market operations by public agencies. The stocks maintained by the government include both buffer and operational stocks. Apart from buffer stocking and Public Distribution System (PDS), the government also intervenes directly in the markets by undergoing open market purchase operations by government undertakings and state level federations. The other form of intervention in this category is the Market Intervention Scheme (MIS) of the Union Agricultural Ministry. The MIS is applicable to commodities not covered by the minimum price support scheme.

d) ***Macro economic policies.*** Another set of factors that affect the performance of the agricultural marketing system relates to fiscal and monetary policies. The taxes imposed by the government affect the cost of performing various marketing functions. The fees, taxes, levies and freight charges are all imposed by the state government. Interest rates also comprise an important component of the cost of marketing, particularly when storage is an important function in the marketing chain. These factors, along with availability of credit, influence the investment in marketing facilities and activities.

The agricultural marketing policies in the country were practically effective in the agriculturally developed states where surplus agricultural produce is generated. The market regulations and required market infrastructure were developed to handle the marketable surplus of food grains. Since the country's agricultural policies in the past were aimed to achieve self-sufficiency in food grains, greater emphasis was on the superior cereals, which have high yielding potential, particularly rice and wheat. During this process, the low yielding and low value crops, particularly coarse cereals, did not receive due attention and were deprived of legitimate market policy support.

5.2.3 Changes in policy induced consumption patterns

There is enough evidence that per capita consumption of cereals as food has declined while that of fruits, vegetables, meat, fish, eggs and dairy products has increased in recent decades. Researchers have supported that household income and food prices strongly influence food consumption patterns. Shifts in the consumption pattern also take place as a result of urbanization. Coarse cereals were excluded from the purview of PDS and only fine cereals and a few other commodities were in the ambit of same. Larger subsidies were extended to rice and wheat. This eventually had an adverse impact on the consumption pattern of coarse grains and pulses. In the past, even consumption policies were centered on fine cereals.

5.2.4 Agricultural export and import policies

Until the end of the eighties, imports and exports of major agricultural commodities were kept restricted. The trade flows were generally residual in nature and controlled through quantitative restrictions and canalization. Since 1991, the trade policy regime has undergone considerable change. Canalization has been almost abandoned. The negative lists of both

[1] The AGMARK standard was set up by the Directorate of Marketing and Inspection of the Government of India by introducing an Agricultural Produce Act in 1937. The 'AGMARK' seal ensures quality and purity.

imports and exports have been pruned. In the EXIM (Exports and Imports) policy announced for the period 2000-2001, most of the agricultural commodities have been deleted from the negative lists of imports and exports. The agricultural commodities, which do not appear on the negative list, are exportable without restriction and importable under an open general license. The quantitative restrictions on agricultural products have been withdrawn and duties on imports reduced. By the end of March, 2003, the quantitative restrictions on almost all the agricultural commodities were removed.

In the WTO regime, the competitiveness of crops and commodities will hold the key for the prospective exports. The superior cereals like rice and to some extent wheat are on par to compete with international prices. Hence, they are able to make forays into the international market. However, the coarse grains are unable to access the international market due to low productivity and the high unit cost of output. In order to promote the trade of these cereals, a technological push and value addition are the only solutions. These have not received due attention in the past.

5.2.5 Current government policies and strategies for crop diversification

The nature and speed of agricultural diversification is influenced by various factors. The evidence suggests that the process of diversification is triggered by rapid technological change in agricultural production, improved rural infrastructure, and diversification in food demand patterns. (Joshi *et al*., 2004) These are broadly classified as demand-and supply-side forces. The demand-side forces that influence the diversification include per capita income and increased urbanization. On supply-side forces, the diversification is largely influenced by improved infrastructure and technology, assured resource endowments and a better socio-economic mix in the society. Considering the importance of crop diversification in the overall developmental strategy in Indian agriculture, the Government of India has taken several initiatives for agricultural development in general and crop diversification in particular. These initiatives are as follows:

(i) *Launching a technology mission for the integrated development of horticulture in the north eastern region*: The programme will establish effective linkages between research, production, extension, post-harvest management, processing, marketing and exports and bring about the rapid development of agriculture in the region.

(ii) *Implementing National Agriculture Insurance Scheme*: The scheme will cover food crops and oilseeds and annual commercial and horticulture crops. Small and marginal farmers are eligible for 50 per cent subsidy under this scheme.

(iii) *Operationalizing Technology Mission on Cotton*: The technology mission will have separate mini-missions on technology generation, product support and extension, market infrastructure and modernization of ginning and pressing units.

(iv) *Provision of capital subsidy of 25 per cent for construction/modernization/expansion of cold storage facilities and storage for horticultural produce.*

(v) *Creation of Watershed Development Fund:* At the national level for the development of rainfed lands.

(vi) Infrastructure support for horticultural development with emphasis on post-harvest management.

(vii) Strengthening agricultural marketing: Greater attention to be paid for development of a comprehensive, efficient and responsive marketing system for domestic marketing as well as exports by ensuring proper quality control and standardization.

(viii) Seed crop insurance: A pilot scheme on crop seed insurance has been launched which will cover the risk factor involved in the production of seeds.

(ix) Seed bank Scheme: About 7-8 per cent of certified seeds produced in the country will be kept in buffer stock to meet any eventualities arising from drought, floods or any other form of natural calamities.

(x) *Cooperative sector reforms:* Amendment to the National Cooperative Development Corporation (NCDC) Act. 1952 and replacement of the Multi-State Cooperative Societies (MSCS) Act, 1984.

All these measures will lead to crop diversification and increase the production and productivity of crops, especially commercial and horticultural crops. Currently, no concrete policies/incentives for diversification in favour of coarse cereals are in force. However, government policy intervention to promote maize and pulses in the form of a mission-oriented approach by way of the technology missions for these two commodities is being undertaken. This was essentially to reduce the burden on the exchequer on the import of pulses, being a protein rich diet for a large number of the vegetarian population. Similarly, to meet the growing demand for maize as feed and industrial end uses, increases in maize production through technological enhancement is considered imminent.

In a nutshell, most of the agricultural development policies in the past were geared towards the larger farmers and resource rich regions. With secondary crops being cultivated mostly by small and marginal peasants and in predominantly marginal and fragile environments, the ideal mix of technological, economic and institutional packages must be devised and promoted.

6. Conclusion and Policy Recommendations

India, with a population of over one billion, accounts for approximately one-sixth of the world's population on merely 2.4 per cent of the world's surface area. The country boasts a varied demographic and economic profile in its composition and structure. In spite of the significant economic growth and agricultural development, the country suffers from two major evils in society. The higher extent of unemployment and poverty has continued to be a major developmental plank of successive governments, but due to increases in the population and other related factors, not much headway has been made on this account. Currently, overall unemployment is hovering around 7 per cent of the population with the number of unemployed at an all time high level of 26.58 million. The poor educational status and the inappropriateness of technology to some extent is attributable to the higher unemployment rate. The vast workforce places tremendous pressure on employment opportunities and has ramifications clearly evident from the rising unemployment level in the country. The agricultural sector in the country continues to provide nearly 60 per cent of the employment to the population.

The economy, which is characterized by the presence of the primary sector, namely, the agricultural and allied sectors has been a major contributor to GDP, followed by the secondary sector like manufacturing, construction, etc. Due to the relatively increased contribution of non-agricultural sectors, the GDP has remained strong since 1991-1992. The economy has grown at an annual growth rate above 6 per cent since 1992-1993. As a consequence of the robust growth in the economy, per capita income has increased and reached an all time high of INR 16,487 per annum in 1999-2000. The share of the agricultural sector in GDP has fallen from merely 35 per cent in 1990-1991 to 27 per cent in 1999-2000. However, dependency on agriculture continues to affect more than three-fifths of the nation's population. This is a reflection of the fact that the Indian economy is undergoing a structural shift towards the fundamentals of a developed country.

Furthermore, in spite of all the development that has taken place since independence, 26 per cent of the population continues to be plagued with acute poverty. The incidence of poverty is slightly higher in rural areas compared to urban areas, with the number of poor hovering around 260 million. Although, there is a decline in the poverty level, a lot still needs to be done to eradicate this malaise. Poverty in India is largely attributable to the migration of unemployed and landless people from rural areas to urban areas, poor educational status and above all increased population growth and pressure. Eradication of poverty is at the top of the national government's agenda.

Although, the country has gained momentum in its economic fundamentals, the impact of development planning on the economic welfare of the people has not been equitable in the past. Land distribution/possession paints a very grim picture of Indian agriculture, which is one of the most important reasons for the poor crop yields. Nearly 82 per cent of the holdings are of less than 2 hectares and command only 30 per cent of the cultivated land. This is indicative of inequitable distribution and marginalization of land holdings. Because of numerous inherent weaknesses, economic planning has failed to do much for this section of the populace.

Due to diverse agro-climatic conditions in the country, a large number of agricultural crops, namely food grains and commercial crops are produced. Since independence, the cornerstone of the country's food policy was self-sufficiency. But recently, in order to tap huge potential and to meet the challenges of the vast population and liberalization, diversification has held the key. Concurrently, commercial agriculture flourished in the post-independence era and has been a major earner of foreign exchange for the country. Diversification gives wider choice in the production of a variety of crops in a given area to expand production and lessen the risk. During the last three decades, the extent of diversification was largely in favour of fine cereals

and commercial crops which have cast a shadow over coarse grains. More remunerative crops have taken the acreage under coarse grains away.

Policy recommendations

Under the existing circumstances, the nations' economy that is primarily agrarian, with small land holdings and huge population pressure, diversification of the rural economy should receive higher priority to meet the twin objectives of eradicating poverty and unemployment. This will also lead to better welfare of the populace and the overall development of the country. Domestic market reforms are key to agricultural diversification. These reforms will ensure greater participation of small and marginal (holdings up to 2 ha) farmers predominantly growing secondary crops for sharing the benefits of globalization.

To gear up for the process of agricultural diversification in favour of secondary crops, the policies need to be aimed at reforming institutional arrangements, which can appropriately integrate production and marketing. The measures such as better market mechanisms, roads, appropriate infrastructure and promoting processing units for the value addition of secondary crops will go a long way in ensuring the diversification of secondary crops.

Further, research should be initiated to assess how appropriate institutional arrangements could convert the weaknesses of small farm holders into opportunities. Newer options like contract farming cooperatives and group action may lead to better opportunities to augment farm income. This will also avert the associated risks and uncertainty and establish strong vertical linkages between production, marketing and processing. Hence, the pragmatic interplay of institutional, economic and technological policies is a must for multi-pronged strategies affecting an overall improvement in the economy of secondary crops.

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Appendices

Appendix 1 Trends in area, production and yield of secondary crops in India

Year	Coarse grains				Pulses (total)	Potato
	Maize	Pearl millet	Sorghum	Others		
			Area (million ha)			
1990-1991	5.90	10.48	14.36	5.58	24.66	3.59
1991-1992	5.86	10.03	12.36	5.17	22.54	3.63
1992-1993	5.96	10.62	13.04	4.80	22.36	3.58
1993-1994	9.00	9.55	12.71	1.56	22.25	3.53
1994-1995	6.14	10.22	11.51	4.30	23.03	3.31
1995-1996	5.98	9.32	11.33	4.25	22.28	3.45
1996-1997	6.26	9.98	11.43	4.14	22.45	3.51
1997-1998	6.32	9.67	10.80	4.04	22.87	3.36
1998-1999	6.20	9.30	9.79	4.05	23.50	3.44
1999-2000	6.42	8.90	10.25	3.77	21.12	3.43
2000-2001	6.61	9.83	9.86	4.03	20.35	3.63
2001-2002	6.59	9.55	9.93	3.64	21.66	3.38
			Production (million tons)			
1990-1991	8.96	6.89	11.68	5.17	14.26	15.21
1991-1992	8.06	4.67	8.1	5.16	12.02	16.39
1992-1993	9.99	8.88	12.81	4.91	12.82	15.23
1993-1994	9.6	4.97	11.41	4.84	13.3	17.39
1994-1995	8.88	7.16	8.97	4.87	14.04	17.40
1995-1996	9.53	5.38	9.33	4.79	12.31	18.84
1996-1997	10.77	7.87	10.93	4.53	14.24	24.22
1997-1998	10.82	7.64	7.53	4.41	12.98	17.65
1998-1999	11.15	6.96	8.42	4.81	14.91	23.61
1999-2000	11.51	5.78	8.68	4.36	13.42	24.71
2000-2001	12.04	6.76	7.53	4.75	11.08	22.49
2001-2002	13.3	8.35	7.79	4.5	13.19	24.08
			Yield (kg/ha)			
1990-1991	1,518	658	814	142	578	16,254
1991-1992	1,376	465	655	154	533	15,904
1992-1993	1,676	836	982	143	573	14,458
1993-1994	1,602	521	895	147	598	16,610
1994-1995	1,570	700	779	151	610	16,272
1995-1996	1,595	577	823	155	552	16,991
1996-1997	1,720	788	956	142	635	19,391
1997-1998	1,711	791	697	143	567	14,635
1998-1999	1,797	748	859	164	634	17,,880
1999-2000	1,792	650	847	149	635	18,443
2000-2001	1,822	688	764	157	544	18,404
2001-2002	2,018	875	785	151	609	19,769

Appendix 2 Trends in area, production and yield of non-CGPRT crops in India

Year	Fine cereals		Sugarcane	Cotton	Oilseeds (total)
	Rice	Wheat			
			Area (million ha)		
1990-1991	42.17	24.17	3.69	7.44	24.15
1991-1992	42.69	23.26	3.84	7.66	25.89
1992-1993	42.65	24.59	3.57	7.54	25.24
1993-1994	42.54	25.15	3.42	7.32	26.90
1994-1995	42.81	25.70	3.87	7.87	25.30
1995-1996	42.84	25.01	4.15	9.04	25.96
1996-1997	43.43	25.89	4.17	9.12	26.34
1997-1998	43.45	26.70	3.93	8.87	26.12
1998-1999	44.80	27.52	4.05	9.34	26.23
1999-2000	45.16	27.49	4.22	8.71	24.28
2000-2001	44.71	25.73	4.32	8.53	22.77
2001-2002	44.62	25.92	4.40	9.10	22.78
			Production (million tons)		
1990-1991	74.29	55.14	241.05	9.84	18.61
1991-1992	74.68	55.69	254.00	9.71	18.60
1992-1993	72.86	57.21	228.03	11.40	20.11
1993-1994	80.30	59.84	229.66	10.74	21.50
1994-1995	81.81	65.77	275.54	11.89	21.34
1995-1996	76.98	62.10	281.10	12.86	22.11
1996-1997	81.74	69.35	277.56	14.23	24.38
1997-1998	85.53	66.35	279.54	10.85	21.32
1998-1999	86.08	71.29	288.72	12.29	24.75
1999-2000	89.68	76.37	299.32	11.53	20.72
2000-2001	84.98	69.68	295.96	9.52	18.44
2001-2002	93.08	71.71	300.10	10.09	20.80
			Yield (kg/ha)		
1990-1991	1,740	2,281	65,395	225	771
1991-1992	1,751	2,394	66,069	216	719
1992-1993	1,744	2,327	63,843	257	797
1993-1994	1,888	2,380	67,120	249	799
1994-1995	1,911	2,559	71,254	257	843
1995-1996	1,797	2,483	67,787	242	851
1996-1997	1,882	2,579	66,496	265	926
1997-1998	1,900	2,485	71,134	208	816
1998-1999	1,921	2,590	71,203	224	944
1999-2000	1,986	2,778	70,935	225	853
2000-2001	1,901	2,708	68,577	190	810
2001-2002	2,086	2,770	68,154	189	913

Appendix 3 Trends in area, production and yield of perennial crops in India

Year	Coconut	Tea	Coffee	Natural rubber	Fruit and nuts	Vegetables roots and tubers
			Area (million ha)			
1990-1991	1.48	0.42	0.27	0.36	n.a.	n.a.
1991-1992	1.53	0.42	0.25	0.37	2.87	5.59
1992-1993	1.54	0.42	0.27	0.50	3.21	5.04
1993-1994	1.64	0.42	0.28	0.51	3.18	4.88
1994-1995	1.71	0.43	0.28	0.52	4.31	5.01
1995-1996	1.83	0.43	0.31	0.52	3.36	5.34
1996-1997	1.89	0.43	0.30	0.53	3.58	5.52
1997-1998	1.86	0.43	0.31	0.54	3.70	5.61
1998-1999	1.75	0.44	0.33	0.55	3.73	5.87
1999-2000	1.77	0.44	0.34	0.56	3.80	5.99
2000-2001	1.82	n.a.	n.a.	n.a.	3.89	6.25
			Production (million tons)			
1990-1991	97.30	0.72	0.16	0.33	n.a.	n.a.
1991-1992	100.80	0.75	0.18	0.37	28.63	58.53
1992-1993	112.41	0.73	0.17	0.39	32.96	63.81
1993-1994	119.75	0.76	0.21	0.44	37.26	65.79
1994-1995	133.00	0.75	0.18	0.48	38.60	67.29
1995-1996	129.52	0.76	0.22	0.51	41.51	71.59
1996-1997	130.61	0.78	0.21	0.55	40.46	75.07
1997-1998	127.17	0.81	0.23	0.58	43.26	72.68
1998-1999	125.36	0.87	0.27	0.61	44.04	87.54
1999-2000	121.29	0.81	0.29	0.62	45.50	90.83
2000-2001	126.78	n.a.	n.a.	n.a.	45.37	93.92
			Yield (kg/ha)			
1990-1991	6,695	1,730	596	917	-	-
1991-1992	6,593	1,794	724	992	9,961	10,466
1992-1993	7,310	1,742	639	788	10,280	12,648
1993-1994	7,324	1,819	756	862	11,702	13,492
1994-1995	7,760	1,768	655	927	8,957	13,422
1995-1996	7,066	1,770	731	967	12,363	13,419
1996-1997	6,908	1,809	678	1,030	11,303	13,612
1997-1998	6,898	1,869	746	1,072	11,687	12,963
1998-1999	7,163	1,996	805	1,094	11,818	14,923
1999-2000	6,860	1,848	858	1,114	11,983	15,156
2000-2001	6,951	-	-	-	11,673	15,031

Appendix 4 Cropping pattern and intensity of cropping in India

(% share in GCA)

Year	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02
Maize	3.18	3.22	3.21	4.83	3.27	3.21	3.30	3.32	3.22	3.36	3.37	3.39
Pearl millet	5.64	5.50	5.73	5.12	5.43	5.00	5.27	5.07	4.83	4.65	5.01	4.92
Sorghum	7.73	6.78	7.03	6.82	6.12	6.07	6.03	5.67	5.08	5.36	5.02	5.11
Total coarse grains	19.55	18.34	18.56	17.61	17.11	16.55	16.78	16.18	15.23	15.33	15.45	15.29
Chickpea	4.05	3.06	3.48	3.41	4.01	3.82	3.61	3.97	4.40	3.21	2.64	3.14
Pigeonpea	1.93	1.99	1.93	1.89	1.76	1.85	1.85	1.76	1.79	1.79	1.85	1.74
Lentil	0.64	0.65	0.65	0.63	0.62	0.68	0.72	0.68	0.72	0.76	0.75	0.72
Total pulses	13.28	12.37	12.05	11.94	12.25	11.94	11.84	12.00	12.20	11.04	10.37	11.15
Rice	22.70	23.43	22.99	22.82	22.77	22.96	22.91	22.80	23.26	23.60	22.78	22.97
Wheat	13.01	12.76	13.26	13.49	13.67	13.41	13.66	14.01	14.29	14.37	13.11	13.34
Total fine grains	35.72	36.19	36.25	36.31	36.43	36.37	36.57	36.81	37.55	37.97	35.89	36.31
Groundnut	4.47	4.76	4.40	4.46	4.17	4.03	4.01	3.72	3.84	3.59	3.34	3.29
R/M seed	3.11	3.59	3.34	3.37	3.20	3.51	3.46	3.69	3.38	3.15	2.28	2.60
Soybean	1.38	1.74	2.04	2.34	2.30	2.70	2.88	3.14	3.37	3.25	3.27	3.20
Cotton	4.01	4.20	4.06	3.93	4.19	4.85	4.81	4.65	4.85	4.55	4.35	4.68
Total oil seeds	13.00	14.21	13.61	14.43	13.45	13.92	13.90	13.71	13.62	12.69	11.60	11.73
Sugarcane	1.99	2.11	1.92	1.83	2.06	2.22	2.20	2.06	2.10	2.21	2.20	2.27
Potato	0.51	0.57	0.57	0.56	0.57	0.59	0.66	0.63	0.69	0.70	0.62	0.63
Onion	0.16	0.18	0.17	0.20	0.20	0.21	0.21	0.21	0.24	0.26	0.21	0.23
Total cash crops	2.65	2.85	2.66	2.60	2.83	3.03	3.07	2.91	3.03	3.16	3.04	3.12
Coconut	0.80	0.84	0.83	0.88	0.91	0.98	1.00	0.98	0.91	0.93	0.93	0.97
Tea	0.22	0.23	0.23	0.22	0.23	0.23	0.23	0.23	0.23	0.23	n.a.	n.a.
Coffee	0.15	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.17	0.18	n.a.	n.a.
Natural rubber	0.19	0.20	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.29	n.a.	n.a.
Total plantation crops	1.36	1.41	1.47	1.52	1.56	1.65	1.67	1.65	1.59	1.62	0.93	0.97
Fruit and nuts	n.a.	1.58	1.73	1.71	2.29	1.80	1.89	1.94	1.93	1.98	1.98	n.a.
Vegetables roots and tuber	n.a.	3.07	2.72	2.62	2.67	2.86	2.91	2.94	3.05	3.13	3.18	n.a.
Net sown area (m ha)	142.87	141.49	142.64	142.42	142.96	142.20	142.81	142.08	142.58	141.23	142.01	141.95
Gross cropped area (m ha)	185.74	182.24	185.70	186.58	188.05	187.47	189.59	190.57	193.03	189.74	196.25	194.26
Cropping intensity (%)	129.9	128.7	130.1	131.1	131.5	131.8	132.8	134.1	135.4	134.3	138.19	136.85

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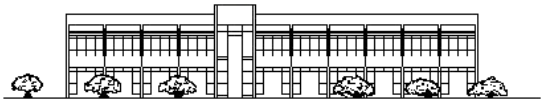

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