A Review of Key Issues and Recent Experiences in Reforming Agricultural Research in Africa

Sam Chema
Elon Gilbert
Johannes Roseboom

International Service for National Agricultural Research

isnar

International Service for National Agricultural Research (ISNAR)

ISNAR, one of the 16 Future Harvest Centers supported by the Consultative Group on International Agricultural Research (CGIAR), seeks to contribute to the generation and use of knowledge that fosters sustainable and equitable agricultural development. ISNAR's mission is to help bring about innovation in agricultural research institutions to increase the contribution of research to agricultural development for the poor.

ISNAR identifies and advances new arrangements that promote more effective generation of new knowledge. Emphasis on institutional innovation allows ISNAR to play a catalytic role in the change processes taking place in many developing countries. At the same time, it is strengthening its ability to play an important role in the new programs being developed by the CGIAR. The focus on institutional innovation puts ISNAR in a strategic position in a research community where national and international concerns are increasingly converging.

ISNAR conducts its work on institutional innovation through the following six thematic areas of work:
- Policies for institutional innovation for agricultural research
- Linking research organizations and stakeholders in a changing context
- Learning for institutional innovation
- Management of new technologies for agricultural research
- Building capacity to respond to cross-sector demands
- Entrepreneurial partnerships to support agricultural research

Founded in 1979, ISNAR is headquartered in The Hague, the Netherlands.

A Review of Key Issues and Recent Experiences in Reforming Agricultural Research in Africa

Sam Chema, Elon Gilbert, and Johannes Roseboom

isnar

About the author

Sam Chema and **Elon Gilbert** are international consultants with extensive experience in agricultural innovation issues in Africa. **Johannes Roseboom** was until recently a research officer at ISNAR and brought an institutional innovation perspective to the team of authors. He is currently working as an international consultant.

AGROVOC descriptors

agricultural policies; agriculture; case studies; government; research; research institutions; research support

CABI descriptors

agricultural research; agricultural policy; case studies; government policy; research institutions; research support

Contents

Tables

Figures

Acknowledgements

Abstract

This study reviews the ongoing reforms of national agricultural research systems (NARS) in sub-Saharan Africa. The study not only takes stock of the principal reform themes (i.e., a redefinition of the role of government, decentralization, stakeholder participation, new financing mechanisms, and system linkages), but also highlights the underlying ideas and concepts that shape the present NARS reform agenda. NARS reform details are illustrated and discussed in seven case-study countries: Côte d'Ivoire, Ethiopia, Ghana, Kenya, Senegal, Tanzania, and Uganda. While there is considerable consensus about the main trends, there are major differences and disputes on specific aspects of the reform agenda. Moreover, NARS reforms alone will not close the technological divide between Africa and the rest of the world—they are to be seen as part of a far broader modernization agenda.

Foreword

The potential of agricultural science and technology (S&T) to bring greater prosperity has, to date, not materialized for the large majority of the African farmers and consumers. This is not because of a lack of effort to exploit the potential of agricultural S&T (investments in agricultural research have, on average, been relatively higher in sub-Saharan Africa than in Asia), but because the institutional setting within which agricultural innovation has to take place is so much weaker in sub-Saharan Africa than in Asia or Latin America. Lack of markets, poor infrastructure, and political instability are just some of the factors that are placing significant constraints on the impact of agricultural S&T in sub-Saharan Africa. Moreover, the agricultural innovation system itself seems to function rather poorly. Donors and international agencies like the World Bank are therefore urging agricultural research and extension services in sub-Saharan Africa to reform.

This study focuses in particular on the ongoing reforms of African national agricultural research systems (NARS). It summarizes and evaluates the NARS reform agenda that is currently being implemented in Africa. The study not only takes stock of the principal developments, but also highlights the underlying ideas and concepts that are shaping the present NARS reform agenda. While there is considerable consensus on the main themes of the agenda, there can be heated debates on the specifics of the reforms. For example, while nobody objects to stakeholder participation in principle, there are many forms and levels of stakeholder participation. Finding the right balance between the various stakeholders is very location and situation specific.

We hope that this synthesis and analysis of current NARS reforms in Africa will help the many different players in agricultural innovation to understand better the ongoing changes in the African NARS and their conceptual origins. In addition, we hope it will create a starting point for further discussions on the future directions of the NARS reform agenda.

Jacques Eckebil
Director General, ISNAR

Executive Summary

This study evaluates ongoing efforts to restructure and reform national agricultural research systems in Africa. While there is an urgent need to make African agricultural research more relevant and efficient, it is not evident *a priori* that the current reforms contribute sufficiently to this objective. The information for the current analysis was provided by a literature review, seven commissioned case studies of African national agricultural research systems (NARS), and discussions with donors and international development agencies closely involved in the current reforms.

The following five major areas dominate the current NARS reform agenda:
1. *redefinition of the role of government in agricultural research*: application of a stricter public-good argument (privatize when possible); separation of research funding, priority setting, and implementation;
2. *decentralization of agricultural research*: geographically and in terms of decision making;
3. *stakeholder participation*: by consultation, joint implementation, controlling budgets, and cofinancing;
4. *emerging funding instruments*: more emphasis on (co)financing by direct beneficiaries (surcharges, matching grants, etc.); competitive research funds;
5. *strengthening of system linkages*: between research agencies (national, regional, and international); between researchers, extension workers, and farmers (the agricultural knowledge and information system [AKIS] model); and between all possible partners in agricultural innovation processes, including civil organizations, traders, and input and processing industries (the national system of innovatio [NSI] model).

Although specific details of the reforms differ between countries, the themes are the same, and they all seem to move towards greater stakeholder participation in order to make agricultural research more responsive, client oriented, and demand driven. There is a strong body of opinion indicating that without visible positive impacts (i.e., innovations that contribute positively to the well-being of millions of poor farmers and consumers), public support for agricultural research will erode even further.

There is serious concern, however, that with stronger stakeholder participation, research will only reach the better-organized, market-oriented farmers and not the millions of poor, subsistence-oriented farmers. Helping the latter to organize themselves, which several donors see as a crucial component of the current reform agenda, may be a more demanding task than is generally assumed. There is ample reason to believe that the demand for new technology and knowledge in subsistence agriculture is underdeveloped, constrained as subsistence farmers are by their own production and learning routines. It is not until farmers move towards commercial agriculture that an agricultural innovation process can gain momentum and become self-perpetuating. The crux of the problem is how to help farmers to move from subsistence- to market-oriented farming. Until such a transition has taken place, many of the potential benefits of agricultural research will remain largely irrelevant. This study recommends a transition at both the supply and the demand side of agricultural innovation. Making the supply of agricultural research more demand driven may yield only very modest dividends if, at the same time, we do not try to stimulate and organize the demand for agricultural research from the farmers themselves.

The current reforms in agricultural research are not taking place in isolation—they are being shaped by broader, exogenous developments. For example, after a period of relative neglect, there are signs of renewed interest in rural development among national governments and donors. This is due in part to the increased emphasis on poverty reduction in recent years, since most of the poor in Africa live in rural areas and depend on agriculture. In contrast to the rural-development strategies

of the 1970s and 1980s (which relied heavily on state intervention), the new strategies rely more on markets and civil society.

Two schools of thought have been particularly influential in shaping the current reform agenda: (1) new public management and (2) systems analysis. The former represents a collection of ideas and concepts on how to make the public sector more effective and efficient by introducing businesslike management procedures and concepts, while the latter provides analytical tools for describing and analyzing complex processes involving many different actors. The NARS, AKIS, and innovation system concepts are all based on a systems analysis approach. The advantage of the all-inclusive innovation system perspective over the NARS and AKIS concepts is that it provides a more complete and realistic picture of the agricultural innovation process, covering all the various actors and how they depend on each other. This study therefore recommends the adoption of an innovation system approach by ASARECA and its members.

While most reforms have the potential to improve the relevance and efficiency of agricultural research and innovation, their net effect hinges on how well the reforms are implemented. The institutional innovations that are being promoted by the present NARS reform agenda are not of the ready-to-use type, but are critically dependent on *ad hoc* experimentation and "learning by doing." Sharing these learning experiences can result in important positive, cross-border spillovers of ideas. Hence the recommendation to ASARECA to explore (in collaboration with FARA, FAO, and ISNAR) the possibility of establishing a network that deals specifically with institutional innovation issues in agricultural research and innovation systems. There is also a pressing need for African agricultural research organizations to develop expertise in institutional innovation to complement their expertise in technological innovation.

Acronyms

AKIS	agricultural knowledge and information system
ANADER	Agence National d'Appui au Développement Rural (National Rural Development Agency)
ANCAR	Agence National de Conseil Agricole et Rural (National Agency for Agricultural and Rural Counsel)
ARDC	Agricultural Research and Development Center
ARF	Agricultural Research Fund
ARPC	Agricultural Research Policy Committee
ARTP	Agricultural Research and Training Project
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATIRI	Agricultural Technology and Information Response Initiative
CARGS	Competitive Agricultural Research Grant Scheme
CBO	community-based organization
CGIAR	Consultative Group on International Agricultural Research
CNCR	Conseil National de Concertation et de Coopération des Ruraux (National Rural People Council for Consultation and Cooperation)
CNRA	Centre National de Recherche Agricole
CORAF	Conférence des Responsables de la Recherche Agricole en Afrique de l'Ouest et du Centre (West and Central Africa Agricultural Research Coordination)
CRAC	Center Research Advisory Committee
CSIR	Council for Scientific and Industrial Research
DFID	Department for International Development
DRD	Department of Research and Development
DRT	Department of Research and Training
EARO	Ethiopian Agricultural Research Organization
EU	European Union
FARA	Forum for Agricultural Research in Africa
FAO	Food and Agriculture Organization of the United Nations
FNDA	Fonds National de Développement Agricole
FNRAA	Fonds National de Recherches Agricoles et Agro-Alimentaires
FTE	full-time equivalent
GDP	gross domestic product
HDI	human development index
IAR	Institute of Agricultural Research
ICT	Information and communication technology
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ISNAR	International Service for National Agricultural Research
ISRA	Institut Sénégalais de Recherches Agricoles (Agricultural Research Institute of Senegal)
ITA	Institut de Technologie Alimentaire (Food Technology Institute)
KARI	Kenyan Agricultural Research Institute
KIT	Koninklijk Instituut voor de Tropen (Royal Tropical Institute)
MOFA	Ministry of Food and Agriculture
MOAFS	Ministry of Agriculture and Food Security
NAADS	National Agricultural Advisory Services
NARF	National Agricultural Research Fund

NARC	National Agricultural Research Committee
NARI	national agricultural research institute
NARO	national agricultural research organization
NARS	national agricultural research system(s)
NEIP	National Extension Implementation Program
NEPAD	New Partnership for African Development
NGO	nongovernmental organization
NSI	national system of innovation
NPM	new public management
ODI	Overseas Development Institute
OPRI	Oil Palm Research Institute (Ghana)
PMA	Program for the Modernization of Agriculture
PPP	purchasing power parity
SACCAR	Southern African Center for Co-operation in Agricultural & Natural Resources Research and Training
SFI	Sustainable Financing Initiative
SG2000	Sasakawa Global 2000
SPAAR	Special Program for African Agricultural Research
SRO	subregional research organization
TARP	Tanzania Agricultural Research Project
T&V	training & visit
USAID	US Agency for International Development
USSR	Union of Soviet Socialist Republics
WFP	World Food Program
ZARF	Zonal Agricultural Research Fund
ZEC	Zonal Executive Committee

Introduction

Agricultural modernization is a key element in the development strategy of almost all African countries. Major improvements in agricultural productivity should free up resources (particularly labor) for other economic activities, keep food prices low, and improve the living standards of those who continue farming. Since technological innovation plays a key role in this modernization process, agencies that generate and facilitate such innovation or ensure their adoption by farmers are particularly important.

Recognizing the importance of technological innovation, both national governments and donor organizations have invested substantial sums in agricultural research in Africa over the past 30 to 40 years. During the 1990s, roughly a billion dollars were spent annually[1] on agricultural research in sub-Saharan Africa. While there was a major expansion of agricultural research capacity during the 1960s and 1970s, this growth halted during the 1980s and 1990s. Although this was partly a result of the financial and economic crises that have affected African countries so severely during the past 20 years, it was also due to the fact that past investments in agricultural research did not produce a robust increase in agricultural production and productivity. Improvements in agricultural production and productivity in Africa have persistently lagged behind those taking place in the rest of the world, and the Green Revolution seems to have bypassed most of the continent. With such a modest record of accomplishment at the macro level, it has been difficult to convince national and international policymakers that even more money should be spent on agricultural research in Africa. However, it would not be fair to single out agricultural research as the principal bottleneck limiting agricultural production and productivity; nor is it realistic to assume that if the problems of agricultural research were solved, then the productivity problem would automatically be solved as well. The rapidly deteriorating economic environment over the past 20 years and unfair competition from subsidized farmers in developed countries also play a role.

As a result of the changing circumstances mentioned above, the emphasis shifted from the expansion of agricultural research capacity during the 1960s and 1970s to a better use of existing research capacity in the 1980s and 1990s. Hence, in the last two decades, most African countries have consolidated (most of) their agricultural research capacity into a single organization and emphasized strong central coordination and leadership. At the same time, national agricultural research strategies and plans were developed to streamline and focus the national agricultural research agenda. In addition, efforts were made to introduce sound management practices to agricultural research organizations, including planning, monitoring and evaluation, financial management, and management information systems. Given that the reform and restructuring of African agricultural research has been an ongoing process for some time, why, then, is a new study warranted at this time?

A major new dimension in the overall focus of the reform agenda that has emerged in recent years is the shift from *centralization* to *decentralization*. Moreover, the new reform agenda forces agricultural research to be more outward looking, client oriented, and impact driven. It is not sufficient to produce good science: research organizations are being urged to ensure that their knowledge and technology are being applied, preferably by resource-poor, subsistence-oriented farmers in hitherto neglected areas. Client orientation has always been strongest in commercial agriculture; in subsistence agriculture, which includes the large majority of African farmers, the demand for agricultural research and innovation is more diffuse and less well articulated.

---

1 Expressed in constant 1985 PPP dollars (Pardey, Roseboom, and Beintema 1997).

This study describes and analyzes the major themes of the new reform agenda, their feasibility, and the role of the development community at large (i.e. national governments, NGOs, bilateral donors, the World Bank, and other international agencies such as FAO, IFAD, and ISNAR) in pursuing the new reform agenda.

More specifically, the objectives of the study were to
1. improve understanding of the origins and rationale of the new approaches to the organization of agricultural research;
2. establish the scope and depth of implementation of these approaches;
3. identify their major conceptual strengths and weaknesses;
4. establish the feasibility of the various approaches;
5. specify implications for the various actors in agricultural research;
6. propose options for action for ASARECA, other SROs, and FARA.

The report is structured in five sections. The first describes our analytical framework and gives an overview of the five major reform themes in national agricultural research systems (NARS) identified by this study: (1) redefining the role of government, (2) decentralization of agricultural research, (3) stakeholder participation, (4) emerging funding mechanisms, and (5) system linkages. The pros and cons associated with each reform theme are discussed in section 2 using material drawn from case studies on different countries. Section 3 provides an overall evaluation of the current NARS reform agenda and section 4 discusses the implications of the reform agenda for the various actors involved: national governments, research managers, donor agencies, etc. In the final section, the principal conclusions of the study as a whole are summarized.

Chapter 1. The NARS Reform Agenda in Africa

Janssen and Braunschweig (2002), in their study of trends in the organization and financing of agricultural research in developed countries, introduced a conceptual framework of three steps to analyze institutional changes in agricultural research:

1. an exploration of exogenous changes in the agricultural research context;
2. an exploration of modifications or reforms in research systems;
3. an evaluation of the quality and effectiveness of research systems based on quality criteria.

A fourth step that has been added to the current study is an exploration of the schools of thought that are shaping the type of modifications attempted in response to changes in the exogenous context and the evaluation of past performance (figure 1).
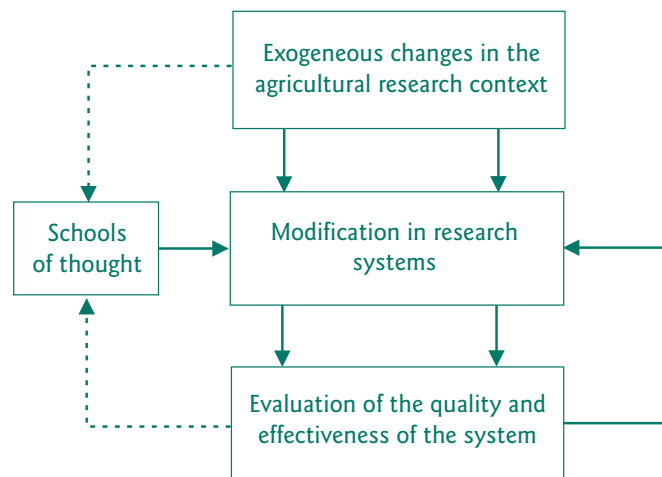
Note: The arrows indicate the direction of causality between the different steps.

Figure 1: Conceptual framework for describing trends in the financing and organization of agricultural research

In section 1.1, we explore the changes that have taken place in the exogenous context of African agricultural research. Our impression is that although these exogenous changes have had some influence on the (proposed) modifications in African NARS, concern over the weak performance of most African NARS (the feedback loop) has been the principal driving force for reforms. In section 1.2, we briefly summarize the available evidence regarding the past performance of agricultural research in Africa, while in section 1.3 we discuss the principal reforms that are currently being implemented or contemplated in African NARS. The underlying schools of thought that have shaped the current reform agenda are reviewed in section 1.4 and conclusions are drawn in section 1.5.

1.1   Exogenous changes in the context of agricultural research

An important suggestion arising from our analytical model is that agricultural research systems are context specific and historically determined: they reflect many years of evolution, during which

they adapted, as best as possible, to changing circumstances and demands. Hence, understanding the changes in the external context of NARS may help us understand and assess NARS reforms. On the other hand, the more agricultural research systems understand exogenous changes and developments, the better they can respond and adapt themselves to those changes.

An often-heard complaint is that African NARS are bombarded by suggestions for reform that are borrowed from elsewhere but that neglect the context specificity of such reforms. Although such ideas and concepts can be useful (since it is not necessary to reinvent the wheel), a considerable amount of caution and critical evaluation is required before any are adopted. Janssen and Braunschweig (2002), for example, showed that various changes in the financing and guidance of agricultural research that have taken place in developed countries (and that are currently being promoted in developing countries) were the consequence, not the genesis, of agricultural modernization.

Four broad categories of exogenous trends affecting the development of agricultural research systems can be identified: (1) changes in the political and socioeconomic context, (2) changes in the demand for agricultural research services, (3) changes in research technologies, methodologies, and approaches, and (4) changes in the institutional context.

1.1.1   Changes in the political and socioeconomic context

Market liberalization, democratization, and decentralization are increasingly important issues in the political and socioeconomic domain of a growing number of African countries. They provide the present context and driving force for institutional innovations, including enhanced accountability and the reconfiguration of the public sector to create opportunities for private-sector development. The current NARS reforms are very much part of this agenda. However, several African countries are affected seriously by political strife and civil war—not a particularly conducive environment for institutional innovation.[1]

The complete derailment of predominantly state-run economies in the late 1970s was followed by two decades of harsh structural adjustment policies, which tried to get African economies back on track by reducing government intervention and creating a more market-driven environment. However, after a substantial period of government withdrawal and neglect, we are now seeing a revival of government policies that take a more proactive stance by setting out clear development goals such as poverty reduction and agriculture-led development within a market-led economy. For example, in recent years, about half of the African countries have developed poverty-reduction strategies in close collaboration with the World Bank. Although these strategies seldom address agricultural research specifically, they could have an impact on the demand side of agricultural research by giving greater weight to the needs of poor farmers.

Thus, after many years of relative neglect, agriculture seems to be back on the economic policy agenda in several African countries. It is becoming increasingly apparent that modernization of the agricultural sector is a critical precondition for modernization of the economy in general. Ethiopia, for example, has now adopted an agriculture-led development strategy, while Uganda has adopted a rather ambitious "Program for the Modernization of Agriculture." These initiatives adopt a holistic approach, recognizing that various aspects of the agricultural sector have to be improved simultaneously in order to modernize the sector as a whole.

---

1   Nevertheless, countries that have gone through a period of political unrest and civil war tend to be more open to institutional innovation. Hence, we could find no evidence that politically stable African countries have outperformed politically unstable countries in an economic sense.

The New Partnership for Africa's Development (NEPAD), which brings together African governments and the donor community, also attaches a high degree of importance to the development of Africa's agriculture as reflected in its Comprehensive Africa Agriculture Development Program (NEPAD 2002). The latter proposes the following four broad, mutually reinforcing development pillars for Africa's agriculture: (1) extending the area under sustainable land management and reliable water control systems, (2) improving rural infrastructure and market access, (3) increasing food supply and reducing hunger, and (4) promoting agricultural research and technology dissemination and adoption.

Despite recognition of the importance of agriculture, however, the option preferred by most African governments is to leave agricultural innovation as far as possible to market forces and only resort to government intervention when such forces fail (for example, where markets are nonexistent, underdeveloped, or unattractive to the private sector). This attitude is partly the result of the severe budget deficits and debts of most African governments (which have forced them to be extremely selective in the tasks that they can take on), and partly due to the more skeptical attitude towards the role of government in society that has become widespread throughout the world during the past decade or so.

1.1.2   Changes in the demand for agricultural research services

Agricultural research organizations have to adapt themselves continuously to changing demands for new agricultural technology and knowledge, which in turn reflect changes in the agricultural sector and the broader economy. The focus of public agricultural research in developed countries, for example, has clearly shifted in recent years from productivity enhancement to more general, societal concerns such as food safety and environmental issues (Roseboom and Rutten 1998; Janssen and Braunschweig 2002). Directly after World War II, developed countries provided intensive public support for productivity research in order to achieve food self-sufficiency and security. However, once those policy goals were reached (by the 1970s), further stimulation of production and productivity was no longer considered a major public concern, but a private one. It has taken most developed countries some time to adjust their public research agendas accordingly.[2]

In contrast, in most African countries, enhanced production and productivity will continue to be primary goals for both public and private agricultural research for some time to come. In most African countries, food security is still very precarious, agricultural incomes are extremely low, and the economic transformation process is only in its very early stages. Moreover, pressure on the land has increased sharply over the past 40 years, imposing major stresses on the natural resource base and requiring significant attention from agricultural research organizations. In addition, the HIV/AIDS epidemic may have consequences for the types of technology that are most needed in the future.

The demand for agricultural research in most African countries expanded quite dramatically after independence, as the research focus shifted from a limited group of colonial farmers and plantations producing export crops (often occupying the best land) to encompassing all farmers, including a very large group of predominantly subsistence farmers producing food crops under very diverse (and often harsh) agroecological conditions. This shift in the demand for agricultural research reflected new political realities and was initiated by the topmost levels of government. However,

---

2 Public support for productivity-enhancing agricultural research has increasingly come under attack as the surpluses it creates are costing taxpayers billions of dollars in terms of agricultural subsidies. Moreover, these subsidies are imposing major negative externalities on developing countries. Development agencies, led by Oxfam, are currently conducting a major campaign in developed countries to mobilize public and political support for reduction, if not elimination, of agricultural export subsidies, because of their damaging impact on farmers in developing countries. The World Bank has also recently spoken out against the massive use of agricultural subsidies by most developed countries. The developed countries together spend an estimated $350 billion per annum on agricultural production and export subsidies compared to an estimated $50 billion on development aid.

given the limited improvement in agricultural productivity in Africa over the past 30 years, one has to conclude that most governments (and their development partners) grossly underestimated the magnitude of this agenda. The sheer number and diversity of subsistence farmers relative to service providers (and the poor organization of the latter) virtually guaranteed poor service.

The current emphasis on decentralization and stronger stakeholder participation in formulating the demand for agricultural knowledge and technology (see sections 1.3.2 and 1.3.3) is an attempt to improve the match between the supply of, and the demand for, agricultural research. Stakeholder participation should shift the supply more towards the needs of resource-poor, subsistence-oriented farmers, and ideally would be implemented concurrently with broader poverty-alleviation policies (see section 1.1.1). However, egalitarian and participatory processes do not necessarily result in egalitarian outcomes (Hood 1999). Ultimately, stakeholder participation may favor the better-organized, market-oriented farmers rather than the less-organized subsistence farmers. If smallholders are to be empowered and helped to influence the transformation of African economies, they need to be supported by policies and investments that will make them active participants in national economies and politics.

1.1.3   Changes in research technologies, methodologies, and approaches

Over the past 10 to 20 years, extensive experimentation with participatory and farming-systems research has been conducted in Africa. Attempts are now being made to scale up these approaches so that they become central to African agricultural research. In Tanzania, for example, it has been specified that at least 50% of research trials should be conducted in farmers' fields (World Bank 1997).

Multidisciplinary research approaches are also increasingly being promoted, often bringing together researchers from different institutions, backgrounds, and disciplines. Included in this general trend are more holistic production-to-consumption approaches to innovation, which usually require multiple partners and institutions and which often result in new modes of (research) collaboration.

Globally, emerging technologies (e.g., biotechnology and ICT), are having a major impact on agricultural research. However, most African countries lack the infrastructure and human resources required for cost effective utilization and adoption of these technologies.

1.1.4   Changes in the institutional context

As we will argue in section 1.4.1, agricultural research systems can be viewed as one component of broader system concepts such as the agricultural knowledge system (including agricultural research, extension, and education) and the agricultural innovation system (including all agencies that are involved in the generation, diffusion, and application of agricultural knowledge). Agricultural research organizations are in a state of considerable flux, as are many of their partners in the agricultural innovation process. In many African countries, for example, agricultural extension services are in complete disarray, and plans are underway in several countries to completely overhaul the public agricultural extension system. The coalition of partners that agricultural research organizations have to interact with is not only changing, but is also becoming more diverse; NGOs and CBOs, for example, have become increasingly important players in the agricultural innovation system of most African countries over the past 10–20 years, and the private sector is also slowly becoming a more significant partner. A clear division of labor between these different actors is often lacking—arguably a predictable consequence of the increased emphasis on demand-driven processes.

In addition to institutional changes at the national level, there are important changes taking place at the supranational level. Regional collaboration in agricultural research has intensified considerably in recent years as a result of the establishment of various agricultural research networks and the efforts of regional coordinating agencies such as ASARECA and FARA. At present, most of this collaboration is limited to the exchange of information, but it has the potential to develop into truly regionally defined research programs and country specialization, provided that mutual trust can be established and maintained. To some extent, these trends can be viewed as a return to the systems of regionalized research established during the colonial era but abandoned after independence (Eicher and Rukuni 2002).

1.2   Performance criteria to evaluate agricultural research systems

There are various performance criteria for evaluating agricultural research, ranging from aggregate to project-specific measures. Conceptually, there is a broad division between economic evaluations, such as rate-of-return studies and productivity analyses, and more qualitative evaluations, which are more holistic, multidisciplinary, and participatory in their approaches. However, economic evaluations still dominate the S&T impact literature and hence the available evidence. In this section, we discuss various types of economic evidence on the impact of S&T on African agriculture (sections 1.2.1 and 1.2.2). In section 1.2.3, we discuss more qualitative performance criteria, including a set of desirable characteristics of a well-performing agricultural research system as suggested by Janssen and Braunschweig (2002).

1.2.1   Productivity trends

The economic impact of S&T can be evaluated at different levels of aggregation. At the macro level, for example, it is quite common to examine aggregate agricultural productivity trends. Figure 2 shows land and labor productivity trends covering the past 40 years for the major regions of the world and for the ASARECA region in particular.[3] The lines indicating productivity trends all start in the lower left-hand corner and generally move towards the upper right-hand corner of the graph. The dotted diagonal lines indicate constant land-labor ratios. In general, the longer the plotted line (the productivity locus), the greater, on average, the percentage change in productivity.

Clearly, in contrast to most other regions in the world, agricultural productivity in sub-Saharan Africa has made little progress over the past 40 years in terms of labor productivity. While land-labor ratios have steadily declined, they have not been offset by a sufficient increase in land productivity to increase labor productivity in any substantive manner. The trend is even worse in the ASARECA region—labor productivity has declined steadily since 1970.

The two-dimensional productivity graph considers only two inputs: land and labor. All other inputs (such as fertilizers and machinery), changes in the quality of land and labor, or other possible explanatory factors for productivity changes, are neglected. Multifactor productivity analysis allows a more complete coverage of the various inputs used in agricultural production as well as the inclu-

---

3   These are based on agricultural production indices and land and labor statistics as derived from FAOSTAT (2002). To convert them to comparable units, the production indices were scaled by the value of agricultural output as measured in the base year period (1989–91) by using agricultural purchasing power parity indices taken from Rao (1993). The production indices cover both crop and livestock production, but not forestry and fisheries. Agricultural land includes arable land, permanent cropland, and permanent pastures. This measure of agricultural land is rather crude, since it does not capture the shortening of fallow periods, the adoption of double cropping, permanent pastures being turned into cropland, or investments made in land improvement, such as terrace building, irrigation, and drainage. Agricultural labor is defined as the economically active population in primary agriculture. By definition, this would also include those employed in forestry and fisheries. There is therefore a slight mismatch between output and labor.

Legend: (1) USA   (2) Europe   (3) Japan   (4) Australia and New Zealand   (5) Latin America and the Carribean
(6) West Asia and North Africa   (7) Asia   (8) Sub-Saharan Africa   (9) ASARECA
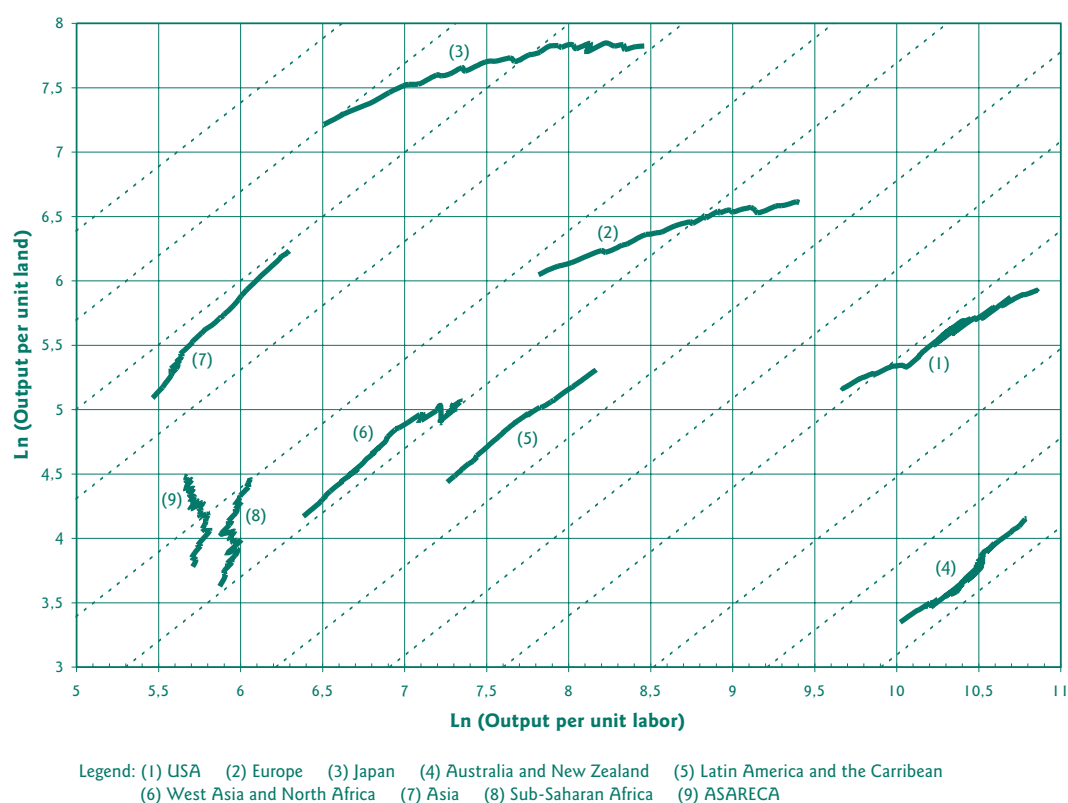
Figure 2: Agricultural productivity trends, 1961–2000

sion of potential productivity shift factors such as policy environment and investments in infrastructure and S&T. In a review of the most recent cross-country, multifactor productivity analyses for sub-Saharan Africa, it was found that the R&D investment elasticity (i.e., the share of output growth that can be attributed to R&D) did not exceed 5% in any of the studies and was often barely significant.[4] A similar study, including 88 developed and developing countries, reported R&D elasticity in the range of 10% (Craig, Pardey, and Roseboom 1997). When developed countries were eliminated from this sample, the R&D elasticity dropped to 9%. Trueblood (1991), reviewing earlier studies on intercountry productivity differences, reported an R&D elasticity range of 9–13%.

Overall, then, intercountry, multifactor productivity analyses suggest that S&T makes a small positive contribution to agricultural productivity in Africa. Its contribution is smaller, however, than that reported for other parts of the world.

1.2.2   Rate-of-return evidence

Some have taken the very modest growth or even decline in agricultural labor productivity in a large number of African countries (and hence a continuation or even deepening of hunger and poverty) as an indication that investments in agricultural S&T have not paid off (e.g., McCalla 1999). They seriously question whether further investment in S&T should be continued, let alone that investments should be increased.

---

4   Frisvold and Ingram (1995); Thirtle, Hadley, and Townsend (1995); Lugisi and Thirtle (1997); Chan-Kang *et al* (1999).

There is less aggregated economic evidence in the form of rate-of-return studies that suggests a far more positive impact of agricultural S&T. Although somewhat lower than for the other regions of the world, the median rate of return on public agricultural research in Africa stands at 36% (table 1).[5] Very few other investments command such a high rate of return. Based on these impressive median or average rates of return, many have argued that there is widespread underinvestment in agricultural R&D, including in Africa. Others have been very skeptical about the rate-of-return evidence and have pointed to two important weaknesses: (1) the sample of rate-of-return results is biased towards the successful cases and ignores failures, and (2) rate-of-return methodologies are seriously flawed (Roseboom 2002). Although the defenders of the underinvestment hypothesis tend to share these concerns, they argue that the median or average rate of return is so high that even after adjusting for the various uncertainties the evidence still holds.[6]

Table 1: Rates of return to agricultural research by geographical region

Region	Number of observations	Median	Average	Lowest	Highest	Percentage > 20% IRR*
Africa	163	36.3	46.6	−100.0	188.0	77.9
Asia & Pacific	197	51.0	76.4	9.9	526.0	97.0
Latin America & Caribbean	262	42.9	53.2	3.0	325.0	91.2
Developed countries	961	47.4	95.9	−1.3	5645.0	81.4

Source: Alston et al. (2000).
*IRR= internal rate of return

How can these two important but apparently contradictory pieces of evidence be reconciled? Perhaps agricultural productivity would have stagnated or declined even further if no agricultural R&D had been undertaken. Overall, there has been a positive contribution of S&T (hence positive rates of return), but not enough to offset the pressure on the land due to high population growth and limited alternative economic opportunities.

The rate-of-return data presented above are not statistical proof that investments in S&T have commanded lower returns in Africa than in other regions of the world because we do not know how well the sample represents the total population of research projects. Nevertheless, the somewhat lower rates of return are consistent with the more aggregate productivity trends discussed in the previous section. Possible explanations for the lower rate of progress in agricultural productivity in Africa include: (1) poor performance of agricultural research, (2) insufficient investment in agricultural research, (3) very diverse production systems, which lead to relatively small application domains for new technology, (4) slow diffusion of technology, (5) weak integration of farmers in the market, (6) rapid population growth, (7) deteriorating economic production conditions, (8) deficiencies in the infrastructure, education and health, (9) lack of political support, (10) political instability, and (11) unfair competition from subsidized Western farmers.

With regard to the first explanation, there is broad agreement that more could have been achieved with the same resources and that there is an urgent need to make African NARS more relevant and efficient. At the same time, however, there is also a strong lobby for more investment in African agricultural research that argues that the slow progress in African agriculture is primarily a symptom of

---

5 Most rate-of-return distributions for investments in agricultural research show a wide spread from very low or negative to very high. The distributions tend to be normal, but skewed to the right (i.e., the median < mean).

6 See, for example, Evenson (2001).

underinvestment and not of low rates of return (World Bank 2002a; NEPAD 2002). The evidence for the latter argument is not very convincing.

1.2.3   NARS quality criteria

One of the disadvantages of economic impact analyses is that they provide information about the overall performance of the NARS in the past, i.e., some 10 to 30 years ago. Other than providing an overall impression, they do not provide much insight into how to improve today's agricultural research systems. Input from other social sciences, such as organizational and managerial theory and political science, may provide more insight into the performance of NARS (rather than their economic impact) and provide concrete suggestions for factors that could be improved. In the mid-1980s, ISNAR developed a list of 12 critical factors that determine the effectiveness and efficiency of a NARS (table 2).

While ISNAR has rewritten its strategy several times since 1987, the 12 critical factors are as relevant today as they were 16 years ago. Every (research) organization has to deal with these standard issues. If they are not properly addressed, then the performance of organizations and hence the system as a whole will be suboptimal.

Table 2: Critical factors in building effective NARS

The policy context of agricultural research
- Interactions between national development policy and agricultural research
- Formulation of agricultural research policy: priority setting, resource allocation, and long-term planning

Structure and organization of agricultural research
- Structure and organization of research systems
- Linkages between NARS and policymakers
- Linkages between NARS, the technology transfer system, and users
- Linkages between NARS and external sources of knowledge

Management of agricultural research
- Program formulation and program budgeting
- Monitoring and evaluation
- Information management
- Development and management of human resources
- Development and management of physical resources
- Acquisition and management of financial resources

Source: ISNAR (1987).

It is interesting to compare this list of critical factors with the set of eight quality criteria proposed by Janssen and Braunschweig (2002), which they adapted from Byerlee and Alex (1998) and Pineiro (1999):
1. separation of financing and implementation of research;
2. pluralistic structure;
3. focus on public goods and diversification of financing;
4. complementarity between the public and private sectors;
5. institutional autonomy;
6. stakeholder participation;
7. capacity for technology transfer;
8. presence of adequate legal frameworks.

Janssen and Braunschweig (2002) argued that these eight quality criteria are characteristic of efficient and effective NARS. One wonders, however, to what extent these desirable characteristics should be taken as universal: they may represent the latest trends in the more advanced NARS, but that does not imply that they are the correct solutions for all NARS, since each may be at a different stage of development, or experiencing different problems. In systems with only very limited capacity, for example, a pluralistic structure does not make much sense, and it is important to keep in mind the fact that more than half of the African NARS employ less than 100 FTE agricultural researchers. Another problem with these criteria is that they lack objective measurement scales, making it very difficult to use them to compare NARS or to measure progress.

In summary, one can conclude that the feedback loop in our model gives rather mixed signals regarding the past performance of agricultural research in Africa. The poor overall performance of the agricultural sector and the life-threatening consequences of this in terms of hunger and poverty are obvious. Improvements in performance evaluation (both quantitative and qualitative) are essential if agricultural research systems are to become more effective and efficient.

1.3 Five major reform themes

The poor performance of the agricultural sector in Africa in recent decades has raised major questions and concerns regarding the performance of African NARS. Despite many years of NARS reforms, the need to improve their performance is stronger than ever. Furthermore, as detailed in section 1.1, NARS may be forced to reform because of changes in the external environment.

The NARS reform agenda in Africa has changed significantly in recent years. After two decades of consolidation and enhancing central control over national agricultural research activities (usually driven by a need to economize on resources), the new reform agenda proposes a more decentralized approach to agricultural research and one which is more outward looking, client oriented, and impact driven. While the old reform agenda, implemented with the concurrence of donors, can be typified as one of "centralization," the new reform agenda is best typified as one of "decentralization."

Table 3 summarizes the principal characteristics of the two agendas. Although the issues are perhaps not as clear-cut as indicated here, there is nevertheless a significant shift in focus between the two.

Table 3: Shift in focus in the NARS reform agenda

Old reform agenda	New reform agenda
Tendency towards a blueprint approach, one format fits all	Diversity in institutional arrangements considered an advantage rather than a handicap
Inward looking, little attention to context	Outward looking, emphasis on context
When focused on development, it was remote from stakeholder	Strong focus on innovation and stakeholders
Supply driven	Demand driven
Consolidated funding mechanisms	Diversification of funding sources and allocation mechanisms
Emphasis on planning	Emphasis on market
Emphasis on central control	Emphasis on delegation and decentralization

The centralization period was characterized by the introduction of national agricultural research strategies and plans, centralized priority setting, and a strong trend towards consolidation of agricultural research capacity either under a strong governing body or a single national agricultural research institute.[7] To finance such a centralized agricultural research plan, all resources (including those of donors) had to be combined into a single "consolidated" funding mechanism. The dominant system concept was that of a narrowly defined NARS (see section 1.4.1), often consisting of an all-embracing institute (NARI). With the encouragement of development partners and international service organizations, the emphasis was on how to improve and optimize the internal organization and management of agricultural research. External linkages were relatively neglected and often restricted to public extension. The focus of agricultural research was more on research than on development, and any "development" activities were usually remote from farmers. Often the public extension service was considered the primary stakeholder, not the farmers, agribusinesses, or consumers. Moreover, innovation was often seen as a linear process of technology generation, dissemination, and adoption, for which research was only responsible for the first part.

In contrast, the new reform agenda supports much greater institutional diversity and tries to make research organizations more outward looking so that they interact with a much broader clientele. Conducting good research is not sufficient: the research undertaken must also be relevant, and applied by target farmers. Rather than focusing exclusively on research, the emphasis now is on innovations that are actually adopted and applied by farmers or other research clients. Partnerships in this process are far more diverse than has traditionally been the case. It should also be recognized that on a continent with one of the most diversified farming systems in the world and with large numbers of smallholder farmers (50–80% of the population), the challenge of reaching farmers is easily underestimated: the best way of reaching a significant percentage of such farmers is an issue yet to be addressed by the development agenda.

Based on a review of the literature, five principal themes have been identified as dominating the current NARS reform agenda in Africa:
1. a redefinition of the role of government;
2. decentralization of agricultural research;
3. stakeholder participation;
4. emerging funding mechanisms;
5. strengthening of system linkages.

These five reform themes largely overlap with the ones identified by Janssen and Braunschweig (2002) for developed countries.[8] The exception is the emphasis on decentralization and stakeholder participation in the African reform agenda—topics that are of relatively minor importance to developed countries. In the following section, each of these five themes is discussed in detail.

1.3.1   Redefining the role of government in agricultural research

Since the collapse of the former USSR and its allies in the late 1980s, the worldwide influence of neo-liberal economic policies has led to a considerably more critical attitude towards the performance, and hence the role, of government in society. The role of government—including its role in agricultural research—is increasingly being questioned. It has been claimed that a considerable part of the research traditionally undertaken by government bodies could be performed as well (if not better)

---

7   In practice, consolidation of all agricultural research activities into a single organization never took place in any African country. Research on export commodities, forestry, and fisheries often continued to operate separately, as did research undertaken by universities. Nevertheless, Roseboom, Pardey, and Beintema (1998) noted a decline in the fragmentation index of African NARS between 1971 and 1991.

8   They identify the following major changes in the means of producing knowledge and technology (1) guidance of research systems, (2) emerging financing models, and (3) emerging implementation models.

by the commercial private sector (e.g., by agricultural input industries or commodity boards) or by civil organizations (e.g., NGOs, CBOs, or farmers' organizations). Whether this is true or not depends on whether the research is likely to generate a clear commercial advantage and on the relative strengths of markets or civil organizations. Moreover, while the government has a responsibility for funding research that is for the public good, it does not necessarily follow that the government itself should implement the research: such activities could be subcontracted to third parties.

Figure 3 shows a decision tree that tries to identify whether government intervention is warranted or not and suggests that direct government intervention is only needed in the last instance. Alston and Pardey (1996) argue that governments all over the world have had a tendency to assume responsibility for agricultural research (as well as many other activities) without exploring whether other approaches could be at least as effective.[9]
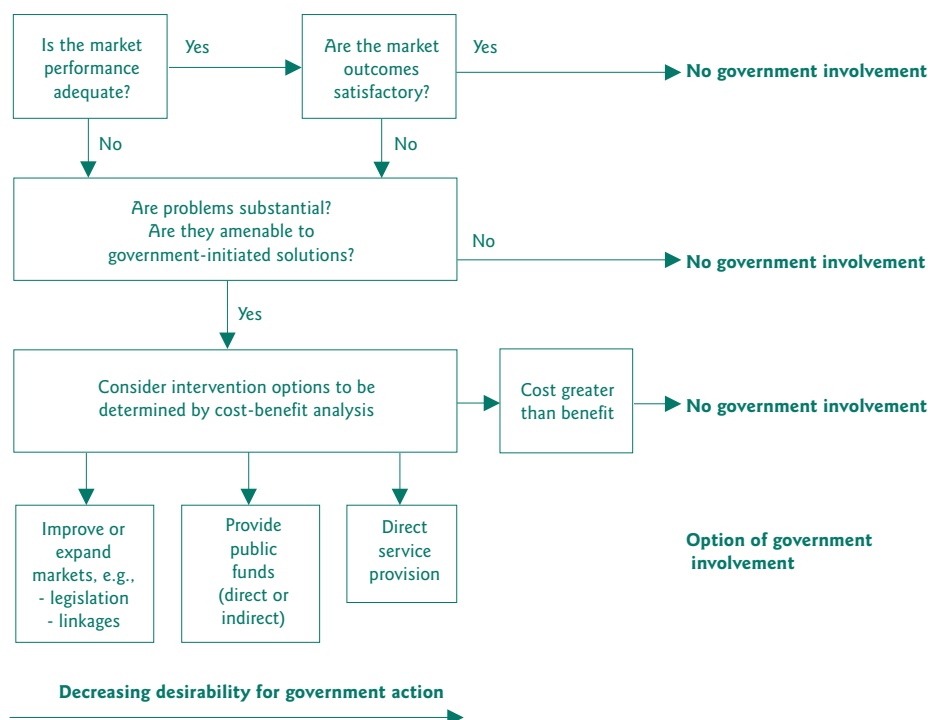
Figure 3: A decision tree to determine the need for government intervention in cases of market failure.

In subsistence agriculture, government intervention in the provision of new agricultural technology through markets is not a viable option, since such markets are largely absent. Under these circumstances the decision tree in figure 3 suggests government intervention of the more direct type. However, the story is quite different for commercial commodities—more indirect methods of solving the problem of technology provision are possible and increasingly implemented.

Under the new reform agenda, African governments are being advised to differentiate the agricultural research agenda more carefully into activities with strong and weak public-good characteris-

---

9 Governments are encouraged in this, of course, by the fact that the World Bank and most other development partners provide the bulk of their assistance only through governments.

tics. In the case of the latter, privatization of agricultural research or shared responsibility for funding (where this is not already being practiced) is called for. This should free up resources for the truly public-good part of the agricultural research agenda (Byerlee and Alex 1998) as well as encourage stakeholders to scrutinize research activities more carefully, since their own resources will be involved.

The redefinition of the role of government has also led to an important institutional innovation: a clear separation between funding, priority setting, and implementation functions. In traditional government bureaucracies, such functions are usually closely integrated, but separating them enables each function to be executed independently without being compromised by the others. This can help government agencies avoid becoming completely supply driven and out of touch with the needs of their clients. It requires new ways of organizing and managing agricultural research. The establishment of autonomous or semi-autonomous agricultural research organizations in Africa during the past 25 years, for example, has resulted in a *de facto* separation of research funding from priority setting and implementation. The latter responsibilities were in most cases handed over to the new organizations, while funding remained the responsibility of central government. The current emphasis on stakeholder participation will transfer some, if not all, of the responsibility for priority setting from the agricultural research organizations to farmer groups or district councils. Similarly, competitive research funding provides an example of the merger of funding and priority setting functions, reducing the role of research organizations to that of implementation only. There are many possible variations on this theme and there is no *a priori* preference for one approach or another.

1.3.2   Decentralization of agricultural research

One way of making agricultural research more outward looking, client oriented, and impact driven is to bring agricultural researchers closer to their clients—the farmers. Decentralization of agricultural research has thus become one of the major themes of the new reform agenda. Decentralization can be approached in four ways:
1. geographic decentralization of agricultural research capacity from headquarters to subnational centers (also known as deconcentration);
2. decentralization of decision-making within agricultural research organizations based on the principle of subsidiarity—i.e., decisions should be taken at the lowest level possible in the organization;
3. delegation of at least some of the responsibility for agricultural research funding to specific client groups (i.e., encouraging stronger stakeholder participation [section 1.3.3] and private funding [section 1.3.4]);
4. devolution of the responsibility for agricultural research to lower levels of government.

The last type of decentralization is usually the result of a more generic decentralization policy, which many developing countries have adopted in recent years. Such decentralization has its own dynamic and logic, and is not necessarily consistent with the most appropriate mode of organization for agricultural research. For example, a decentralized agricultural research system would be better off adopting agroecological boundaries rather than the political boundaries of provinces and districts.

Decentralization of agricultural research at the national level results in a tiered research system, with local research focusing on adaptive research, and national research more on the more upstream applied, strategic, and basic research. A clear division of responsibilities between the local and national research entities is needed, as well as reciprocal exchange of information and knowledge. In practice, such a tiered research system often already exists, but decentralization results in a further differentiation of the research focus in different parts of the system. At the national level, agricultural research is usually organized according to disciplinary or commodity lines, while at the

subnational level it is usually more production-system oriented and multidisciplinary in character. Hence, the shift in balance has major repercussions in terms of research approach, research staffing (more generalists rather than specialists), types of outputs generated, etc.

Whatever type of decentralization is implemented, it is important to achieve a good balance between centralization and decentralization. A strong center is a prerequisite for successful decentralization, since without it, organizations will tend to fragment into a number of isolated entities.

1.3.3 Stakeholder participation

Perhaps the most challenging of the five reform themes is that of making agricultural research more client oriented and client driven through stakeholder participation. Three types of stakeholder participation in setting the research agenda can be identified:
1. stakeholders are consulted in the selection of research priorities (and often also in the research process itself);
2. stakeholders control the allocation of the agricultural research budget;
3. stakeholders contribute to the funding of agricultural research and hence have a strong incentive to carefully control the allocation of the research budget.

Most stakeholder participation is of the first type, i.e., voluntary consultation. This can be quite effective, but there are no guarantees that researchers will actually follow the suggestions made by stakeholders, or that stakeholders will actively participate in the consultation.

The second type of stakeholder participation is still relatively rare, but is increasingly being promoted by the World Bank and a few other donors. By giving stakeholders control over the budget, they may effectively force researchers to follow stakeholder preferences. Nevertheless, since the money being allocated is not their own, stakeholders may still not select research priorities very carefully. It is also important to note that the stakeholders do not usually control the size of the research budget.

The third type of stakeholder participation is quite common in Africa for research on commercial (export) crops. The World Bank sees important advantages in the (co)financing of agricultural research by stakeholders. Besides the argument that those who benefit should pay, it is also an effective way to secure close involvement by stakeholders in the selection of research priorities.[10] One of the general lessons from political organizations is that the smaller and more uniform the group, the easier it is to organize effective participation and collaboration.

In most instances, farmers are seen as the primary beneficiaries of agricultural research, and so most of the stakeholder discussion focuses on their participation. But there are other important stakeholders, such as commodity and input traders, exporters, processors, consumers, and society in general. These stakeholders may need their own mechanisms to express their research needs. As part of the evolving research paradigm, governments should see it as their responsibility to ensure that each legitimate interest group participates in defining the agricultural research agenda. Consumers, for example, may be more interested in food-safety issues, the government in research to support policy measures, and society in general in environmental issues.

Stakeholder participation takes place not only in the problem identification and priority-setting phase of agricultural research, but also increasingly during the implementation and evaluation phases. Participatory research approaches are gradually becoming standard practice. However, one

---

10 Major and often unresolved conflicts over the research agenda may nevertheless exist in these commodity-specific research schemes between, for example, smallholders and large plantation owners.

should keep in mind that such approaches are no substitute for technology transfer mechanisms—only a very small proportion of the farmer population is reached directly through participatory research, and the spillover effect is usually disappointingly low.

1.3.4 Emerging funding mechanisms

In the early 1990s, SPAAR, USAID, and the World Bank formed a coalition to promote new ways of financing agricultural research in Africa through the Sustainable Finance Initiative (SFI). Initially, the emphasis of this initiative was on identifying alternative sources of funding for agricultural research. Debt swaps, endowment funds, and generating additional income through commercialization of research results were some of the ideas that were contemplated. However, the idea that has attracted most attention has been that of competitive research funds for agricultural research.[11] In recent years, this new funding mechanism has received significant support from various donors and the World Bank. A competitive research fund is now included in (basically) every World Bank project dealing with agricultural research in Africa. Competitive research funds are becoming increasingly fashionable, not only at the national level, but also at the regional level.

Possible advantages of a competitive research fund include (1) closer alignment of research activities with regional, national, or subnational research priorities, (2) increased effectiveness by directing resources by merit (peer review), (3) increased efficiency by reducing costs and increasing accountability, (4) facilitating cross-institutional or cross-national collaboration, and (5) mobilizing under-utilized capacity.

On the other hand, possible disadvantages of competitive funds include the following: (1) in Africa, most such funds lack a secure, local funding basis (i.e., are heavily dependent on donors); (2) given the small size of most funds, transaction costs can be high, particularly in the early stages; (3) competitive funds may be suitable for a (specific) part of the research agenda, but not for its entirety; (4) they require relatively mature research organizations that can handle research contracts; and (5) they do not work well in small research systems due to a lack of capacity and competition.

Another, somewhat less-noted innovation in the management and organization of public agricultural research is the increased use of contracts (a market tool) between funding and implementing agencies. Such contracts not only play an important role when public agricultural research agencies interact with private companies, but also increasingly in the interaction between public sector agencies themselves. Competitive research funds, for example, use contract arrangements all the time. Financial resources are provided for given objectives, which are to be monitored closely. Even within public agricultural research agencies, there is a tendency towards a more businesslike management style where research managers commit themselves informally (but also increasingly formally) to targets and expected outputs.

In addition to completely new funding mechanisms, there has also been a shift in existing financing instruments. For example, research-specific surcharges (either voluntary or legally enforced) are making a comeback because of the increased emphasis on the private financing of agricultural research. Private financing mechanisms (e.g., cess, levies, or voluntary contributions) work best when there is a close correspondence between research costs and benefits. In these instances, financers have a clear incentive to invest in research, set priorities, and monitor progress. This is also true for financing by local governments or farmer groups.

---

11 See Abt Associates (2001a–e) for a series of case studies into competitive funding schemes conducted for USAID, and Gill and Carney (1999) for a study of competitive agricultural technology funds in various developing countries conducted for DFID.

1.3.5 Strengthening of system linkages

The fifth reform theme included in almost every agricultural research reform program is that of strengthening system linkages. Two types of linkages can be identified, one dealing with linkages between research, extension, and farmers, and the other with linkages between research activities that differ in

1. focus (commodity, factor, discipline, farming system);
2. geographical coverage (local, national, regional, or international);
3. orientation (adaptive, applied, strategic, or basic);
4. the aspects of the production-to-consumption chain that are addressed.

The current reform agenda focuses in particular on research-extension-farmer linkages. A major concern is that these linkages are generally weak and impeding innovation. Various approaches are being used to facilitate these linkages, including farming systems research, farmer research groups, and research-extension liaison offices and committees.

A complicating factor in the African context is that most African NARS have very few scientific staff. Of the 48 countries in the region, 25 had less than 100 FTE researchers in 1991 and only five systems employed more than 400 FTE researchers (Roseboom, Pardey, and Beintema, 1998). The percentage of farmers actually reached by the research and extension services tends to be disturbingly low. It is clear that with such limited capacity relative to the number of scattered smallholders, most African NARS are not in a position to cover the whole range of agricultural innovation issues and will therefore have to depend on technologies developed elsewhere (both inside and outside Africa), or on technologies produced by supranational research entities. While the CGIAR has been an important player at the global and regional level, new modes of regional collaboration have emerged in recent years that have the potential to dramatically alter the division of labor between the various research partners. New ways of organizing agricultural research may therefore require new linkages to be established, not only at the local level, but also at the supranational level. For example, more intense regional collaboration may result in specialization among the participating research organizations and hence increased interdependency.

1.4 Schools of thought shaping the current reform agenda

Two schools of thought have strongly influenced the current reform agenda: new public management and systems analysis. The first four reform themes are very much part of the new public management school of thought, which nowadays plays a dominant role in government reform all over the world. Reforms focusing on system linkages are based on the ideas and concepts associated with systems analysis. There are no less than three system concepts that have influenced current discussions concerning agricultural research and innovation: (1) national agricultural research systems (NARS), (2) agricultural knowledge and information systems (AKIS), and (3) national systems of innovation (NSI). These concepts are discussed in section 1.4.1, and the new public management ideas and concepts in section 1.4.2.

1.4.1 The three "system" concepts: NARS, AKIS, and NSI

The NARS, AKIS, and NSI concepts are all rooted in systems theory and analysis. Any system under study is usually part of a larger system and consists of interlinked subsystems; a systems perspective can help analyze complex phenomena through simplification (Hartwich and Meijerink 1999). Since there is specialization (hence interdependence) in a system, a system is more than the sum of its subsystems.

Systems analysis emphasizes four different dimensions of a system: (1) system elements and structure, (2) system environment, (3) system linkages, and (4) system performance. In order to improve the latter, one can try to (a) improve the performance of system components (unit performance), or (b) improve internal and external system linkages. The current reform agenda focuses particularly on the latter.

Systems can be classified as "hard" or "soft." Table 4 summarizes the principal differences between the two. Since systems analysis has its origin in the "hard" sciences, most people are more familiar with the hard version than with the soft version. A soft system is a social construct that does not physically exist but that is nevertheless the more relevant concept when studying social phenomena such as research, knowledge, or innovation systems. A soft system is an analytical concept that we use to describe a loose conglomerate of different agencies that perform a similar task or work towards a common goal. Such a system is not a real entity, although we often talk about it as though it really does exist (e.g., the education system, the legal system, and the financial system). For many reasons, people often treat a soft system as a more tangible, hard system. For example, there are endless discussions concerning which agencies or activities should or should not be considered part of a certain system, because there is neither a hard boundary to begin with, nor necessarily common objectives.

Table 4: Hard versus soft systems

	Hard systems	Soft systems
System objectives	Predefined	Variable, according to the purpose of the system
System elements	Fixed	Variable, according to the purpose of the system
System environment	Not relevant	Relevant and, due to focus, arbitrary
System boundaries	Fixed	Variable, according to the purpose of the system
System relations	Fixed linkage mechanisms	Chaotic variable interaction
System performance	Fixed through input-output relation	Determined through structure and objectives

Source: Hartwich and Meijerink (1999).

The NARS concept is a soft system concept for which no watertight definition exists despite it having been in existence for some 25 years. It is essentially a loose conglomerate of agencies or actors involved in conducting national agricultural research. Trying to define the NARS concept more precisely leads only to a whole series of rather arbitrary borderlines. In many African countries there is still a tendency to equate the NARS with the dominant national agricultural research organization or institute. The idea of a more pluralistic NARS is only gradually being accepted by the key players in agricultural research.[12]

The AKIS concept is slightly less well known than the NARS concept, but has gained popularity in recent years. AKIS combines agricultural research, extension, and education in one system (also known as the knowledge triangle—see figure 4) and focuses on how the three activities generate

---

12 Within ASARECA, for example, there is an ongoing discussion as to who should be considered part of the NARS.
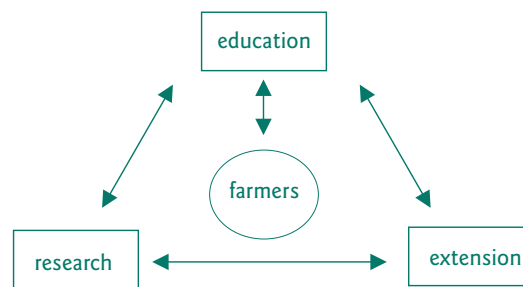
Figure 4: The AKIS model

new knowledge and information for farmers. The emphasis in this model is very much on the linkages between the different components. While some would argue that it is an old concept already applied by the US land-grant universities in the late 19th century, the linkage problem is still acute in most countries.

Nagel (1979) was the first to describe the properties of an agricultural knowledge system (AKS) in detail.[13] Röling further developed and popularized the concept during the 1980s (Röling 1986, 1988; Blum, Röling, and Engel 1990). More recently, the FAO and the World Bank joined forces in promoting the AKIS concept with the publication of "strategic vision and guiding principles" on the topic in 2000. This document gives the following definition of an AKIS:

> "[An AKIS] links people and institutions to promote mutual learning and generate, share, and utilize agriculture-related technology, knowledge and information. The system integrates farmers, agricultural educators, researchers, and extension personnel to harness knowledge and information from various sources for better farming and improved livelihoods." (FAO and World Bank 2000)

The term NSI was first mentioned in the literature on industrial innovation in the late 1980s, and is still relatively unknown in the development literature. With the OECD as an early proponent of the concept, it has entered the vocabulary of national and international policymakers in the industrialized world remarkably quickly.

The study of NSI started with relatively simple descriptive analyses of innovation systems that tried to explain differences in innovation activity and performance between countries. More recently, the theoretical underpinning of the NSI approach has been substantially improved by the addition of insights from various streams of (economic) thinking, including evolutionary economics, institutional theories, theories of learning, and systems theory.

Metcalfe (1995) defines a national system of innovation as follows:

> "… that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store, and transfer the knowledge, skills, and artifacts, which define new technologies. The element of nationality follows not only from the domain of technology policy but from elements of shared language and culture which bind the system together, and from the national focus of other policies, laws and regulations which condition the innovative environment." (Metcalfe 1995)

---

13 It is only recently that 'information' has been explicitly added to the AKS concept and the name changed to AKIS.

19

As might be expected with such a young field of study, definitions of NSI have not yet been agreed, and the analytical emphasis varies between authors. Some interpret NSI narrowly and regard it as a specific sector of the economy (e.g., universities and R&D organizations) supported by specific institutions (e.g., patent rights), while others view it more broadly as a specific aspect of the economic process located in almost every part of the economy (Johnson 1997). Lundvall (1992), for example, emphasized that the everyday learning experiences and activities of engineers, sales representatives, and other employees, as well as of consumers make important contributions to innovation. Such learning is most intense where economic actors interact. Hence, innovation is strongly embedded in the prevailing economic structure, which largely determines what is going to be learned and where innovations are going to take place.

Four broad categories of learning and knowledge accumulation that help to shape innovation processes can be identified: (1) learning as a joint product with other activities involving the production and use of technology (Arrow's [1962] "learning by doing"), (2) learning as a result of using a product, which feeds back into product design and development (Rosenberg's [1982] "learning by using"), (3) learning as a result of interaction with other organizations (Lundvall's [1992] "learning by interacting"), and (4) learning as a result of a formal internal discovery process, typically organized around a directed R&D program. All four learning processes usually operate together, although their relative importance varies between firms, industries, and economies as well as over time.

The NSI approach focuses primarily on the differences between the various systems rather than treating them as abstract entities. It usually takes a strong historical perspective because differences in today's institutions and organizations have their origins in each country's economic and sociopolitical history. A unique, optimal NSI therefore does not exist; rather, there are multiple NSIs with varying strengths and weaknesses.

Andrew Hall and his colleagues at ICRISAT are pioneers in applying the NSI concept to agricultural research in developing countries. A recent paper (Hall and Yoganand 2002), highlighted the following features that an innovation system perspective may provide:

1. It focuses on innovation (rather than research) as its organizing principle. The concept of innovation is used in its broad sense, i.e., the activities and processes associated with the generation, production, distribution, adaptation, and use of new technical, institutional, organizational, or managerial knowledge.
2. By conceptualizing research as part of the wider process of innovation, it helps identify the scope of the actors involved and the wider set of relationships in which research is embedded.
3. By recognizing the importance of both technology producers and technology users, and by acknowledging that their roles are both context specific and dynamic, it escapes the polarized debate between proponents of the theories of technology "push" versus demand "pull."
4. It recognizes that the institutional context of the organizations involved (and particularly the wider environment that governs the nature of relationships) promotes dominant interests and determines the outcomes of the system as a whole. This aspect is enormously important for introducing a focus on poverty. The framework provides a means of examining and revealing which agendas are being promoted, highlighting those arenas in which the voice of the poor can be promoted.
5. It recognizes that innovation systems are social systems. In other words, it focuses not only on the degree of connectivity between the different elements, but also on the learning and adaptive processes that make such systems dynamic and evolutionary.

While each of the three system concepts has its own strengths and weaknesses, they are essentially interlinked in that the NARS concept focuses on research, the AKIS concept on the output of research (knowledge and information), and the NSI concept on the application of that knowledge and information. Graphically one can depict these connections as in figure 5a.

Figure 5a, however, still depicts research as the sole source of innovation. A better way of depicting the link is shown in figure 5b, in which the NARS is no longer seen as the epicenter of innovation but one of a variety of sources. Knowledge and information may enter the NSI from sources other than the NARS, and, perhaps even more crucially, knowledge and information may emerge from outside the realm of formal research (e.g., through both on-farm and off-farm learning as a result of learning by doing, using, or interacting with other elements of the system).
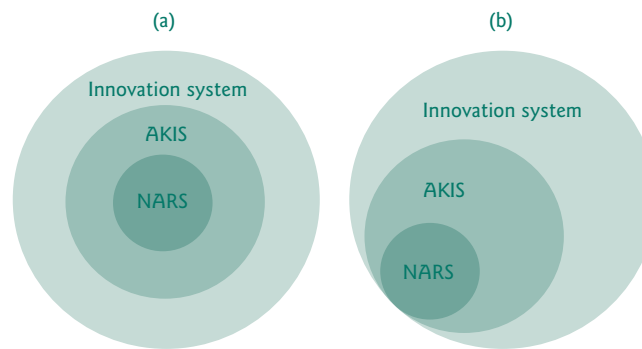
Figure 5: Linking NARS, AKIS, and NSI

1.4.2 New public management ideas and concepts

Since the 1980s, a reform movement in public management known as the "new public management" (NPM) school has spread around the world. This reform movement, which aims to foster a performance-oriented culture in a less-centralized public sector, has six core characteristics:

1. *productivity*: finding ways of generating more services from the same or smaller revenue base;
2. *marketization*: contracting out the implementation of policies to the private sector or to semi-autonomous, nonprofit agencies and replacing traditional bureaucratic command-control mechanisms with market strategies;
3. *service orientation*: making government programs more responsive by changing the focus of the service delivery system. Instead of designing programs from the point of view of service providers and managing them through existing bureaucratic structures, reformers are trying to put citizens (as service recipients) first;
4. *decentralization*: transferring more service-delivery responsibilities to local governments and front-line managers;
5. *policy*: separating government's role as a purchaser of services from its role in providing them;
6. *accountability for results*: focusing more on outputs and outcomes instead of processes and structures. Replacing top-down, rule-based accountability systems with bottom-up, results-driven systems (Kettl 2000).

Although NPM has often been associated with antigovernment sentiments, it is concerned with improving the performance of the public sector rather than with reducing the role of government in the provision of public services.

Australia, New Zealand, and the United Kingdom adopted and experimented with NPM ideas and concepts in the 1980s.[14] In recent years, such ideas and concepts have become increasingly popular, spreading quickly around the globe and being adopted by many developing countries. Hence, expe-

---

14 Other relatively early adopters include Canada, Chile, the Netherlands, South Africa, Sweden, and the USA.

riences with NPM approaches in both developed and developing countries have accumulated rapidly. To date, the approach has resulted in both great successes and major failures. Overall, it would appear that the NPM approach can improve government performance somewhat, but not to the extent claimed by some of its advocates. Many of the proposed changes either have disadvantages (such as negative side effects that reduce the positive gains, or extremely high adjustment costs), or they fail to materialize at all as a result of unexpected complications. One of the reasons why NPM may be less successful in developing countries than in developed countries is that in developing countries, governments themselves may not be trustworthy partners in contract arrangements, either due to inconsistent policies or to late payment or nonpayment of bills. Under these conditions, service providers do not feel obliged to fulfill their side of the contract either.

Batley (1999) studied a series of NPM interventions in developing countries and produced some insightful observations that are also relevant here:

1. Indirect (regulatory, contracting, financing, and enabling) roles of government are usually weakly developed.
2. Experience in contracting should be developed progressively, focusing first on cases where services are less critical and can be specified and measured.
3. Managerial autonomy needs to be set within a clear policy framework and matched by *ex post* managerial accountability to users or elected representatives. If the accountability mechanism fails to work properly, decision-making power eventually ends up with the service managers.
4. Where radical reforms to service delivery mechanisms are externally imposed under crisis conditions they are rarely implemented effectively.

1.5   Summary

In an attempt to summarize and provide insight into the current NARS reform agenda in Africa, five major reform themes have been identified: (1) a redefinition of the role of government, (2) decentralization of agricultural research, (3) stakeholder participation, (4) emerging funding mechanisms, and (5) strengthening of system linkages.

The underlying forces shaping these reforms can be grouped into three categories: (1) changes in the external context, (2) unsatisfactory performance (the feedback loop), and (3) emerging schools of thought on how to improve the organization and management of government services. The current reforms are a response to the latter two forces rather than a response to changes in the external context.

The two schools of thought that shape the current reform agenda both have their roots in a variety of economic and social theories, including, for example, institutional economics, contract theory, and evolutionary theories. However, further analysis both of these areas and of the external factors shaping the NARS reforms in Africa are beyond the scope of the current study.

The five reform themes are explored in further detail in the next chapter in the form of seven case studies.

Chapter 2. Country Case Studies

To obtain a better understanding of the NARS reform agenda and how it works in practice, case studies were conducted in seven African countries: four ASARECA members (Ethiopia, Kenya, Uganda, and Tanzania), and three West African countries (Côte d'Ivoire, Ghana, and Senegal). These seven countries were selected because they are currently reforming their NARS with assistance from the World Bank. As such, they can be considered some of the more dynamic NARS in the region and are therefore not necessarily representative of the rest of the NARS in sub-Saharan Africa.[1] Nevertheless, the case studies may provide important insights useful to the African countries that are contemplating reforming and strengthening their NARS. The present study also benefited from a series of recent studies (covering six of the seven case-study countries) conducted by Abt Associates (Abt Associates 2001a–e; Brinkerhoff, Gage, and Gavian 2002).

Appendix 1 details some selected characteristics of the seven case-study countries. The World Bank classifies all seven as highly indebted, low-income countries. Nevertheless, Ethiopia and Tanzania are considerably poorer than the West African countries in our sample in terms of GDP per capita. On the Human Development Index scale, however, Côte d'Ivoire and Senegal are lower than Tanzania. The contribution of agriculture to GDP ranges from 18% in Senegal to 52% in Ethiopia, while agricultural employment ranges from 49% of the economically active population in Côte d'Ivoire to 82% in Ethiopia. The growth of agricultural output has lagged behind population growth by a considerable margin in the East African countries and in Senegal. In 2000, agricultural output per capita in these countries ranged between 60 and 80% of the level 30 years earlier. In contrast, output per capita in Côte d'Ivoire has slightly improved, while that of Ghana is more or less the same as it was 30 years ago. During the past 30 years, agricultural labor productivity improved only in Côte d'Ivoire. In Senegal, Tanzania, and Uganda, agricultural labor productivity was about 20% lower in 2000 than it was in 1971. Four of the seven countries have experienced various periods (up to 25 years) of military dictatorships accompanied by severe economic and institutional disruptions. Surprisingly, the countries that have been politically stable (Kenya, Senegal, and Tanzania) have not outperformed the politically unstable countries in any significant way.

Table 5 summarizes the types of reforms that have been, or are in the process of being implemented in each country. The numbered headings correspond to the five reform themes. Details of the main NARS reforms in each country are summarized in appendix 2. The main findings relating to the five themes are discussed in sections 2.1 to 2.5.

2.1   Redefining the role of government

The following three aspects of the governance of agricultural research were identified across the seven case-study countries: (1) granting agricultural research organizations a degree of administrative autonomy by freeing them from restrictive civil service regulations, (2) separation of research funding, priority setting, and implementation, and (3) stricter application of the public-good argument, leading to an increase in cost sharing and public-private partnerships or to the complete transfer of certain parts of the research agenda to the private sector.

---

1   The category of small countries with a population of less than 5 million (comprising 22 of the 48 African countries) is not represented in the current sample. Capacity problems in these countries are often complicated by insufficient scale to warrant specific research programs.

Table 5: Summary of NARS reform efforts in the seven case study countries

NARS Reform	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Senegal	Tanzania	Uganda
1. Governance							
1.1. Institutional autonomy	Boards	Boards	Boards	Boards	Boards	Civil service	Boards
1.2. Separation of priority setting from implementation	Major effort	Minimal	Planned	Minimal	Major effort	Modest	Contemplated
1.3. Endorsement of public-private partnerships in research	Strong	No	Modest	Strong	Modest	Modest	Modest
1.3. Privatization	Planned	No	Minimal	Modest	Planned	Modest	Minimal
2. Decentralization							
2.1. Physical	Ecoregional	Federal	Ecoregional	Ecoregional	Ecoregional	Ecoregional	Ecoregional
2.2. Decision making	Unclear	To some extent	Unclear	Unclear	Unclear	Practiced	Unclear
3. Stakeholder participation							
3.1. Consultation	Practiced	Practiced	Practiced	Practiced	Practiced	Practiced	Practiced
3.2. By controlling budget	Planned	No	Implemented	No	Implemented	Partially	Planned
3.3. Cofinancing	Planned	Minimal	Minimal	Commercial commodities	Planned	Commercial commodities	Horticulture
3.4. Research implementation	Encouraged	Encouraged	Encouraged	Encouraged		Highly encouraged	Encouraged
4. Emerging financing mechanisms							
4.1. Competitive research fund	Planned	Planned	Ongoing	Ongoing	Ongoing	National and zonal	Delayed start
4.1. Surcharges (levy/cess)	No	No	Cocoa	Commercial commodities	No	Commercial commodities	Commercial commodities
4.2. Voluntary contributions	Planned	No	No	No	No	Combined with matching grant	No
4.3. Private contracts	Modest	No	Modest	Modest	Modest	Limited	Limited
4.4. Own income	Dominant	No	Some	Some	Some	Some	Some
4.5. Endowment funds	No	No	No	Planned	No	No	No

5. System linkages

5.1. Multi-institutional collaborations	Planned	Limited	With university	Limited	Supported by competitive fund	Limited	Limited
5.2. Role of universities	Growing	Growing	Growing	Limited	Growing	Growing	Growing
5.3. Research-extension linkages	Being remodeled	Being remodeled	Being remodeled	Problematic	Being remodeled	Close links at zonal level	Being remodeled
5.4. Novel outreach models	ANADER	NEIP / SG 2000		ATIRI; Shifting focal area approach	ANCAR		NAADS pilot

The granting of a degree of autonomy from civil service regulation by placing research under governing boards (with members drawn from a wide variety of stakeholders and institutions) is now general practice and was observed in all seven countries—even in Tanzania, where research is nominally a civil service department. The latter was the only case of autonomy regression, i.e., the reversal of semi-autonomous agricultural research organizations back to the civil service. Nevertheless, this more restrictive administrative arrangement does not seem to have affected the capacity of the Tanzanian NARS to adopt many aspects of the current reform agenda.

All seven countries are experimenting with the separation of research funding and priority setting from research implementation in one way or another. Côte d'Ivoire and Senegal (and, in a more tentative way, Ghana) have embarked on the most radical version of this separation since they intend in the medium to long term to consolidate all funding for the agricultural research system into one competitive research fund.

The separation of research funding and priority setting from research implementation also leads to a move away from the traditional block grant (specifying which inputs can be purchased) to an increase in the use of contract arrangements (which specify expected outputs and impacts).

In all of the study countries except Ethiopia, explicit attempts are underway to privatize certain parts of the public agricultural research agenda. The most common method is to introduce or strengthen the financing (either fully or partially) by direct beneficiaries of publicly executed research on commercial commodities. KARI, for example, has cost-sharing arrangements for research on pigs, malting barley, oil seeds, pyrethrum, sugar, and horticultural crops. In some instances, attempts are underway also to transfer the responsibility for research implementation to the private sector (e.g., sugar in Kenya, and coffee, tea, and tobacco in Tanzania). In five of the seven countries, however, private financing *and* implementation of agricultural research is not a new phenomenon, but has a long tradition dating back to colonial times (e.g., cacao in Ghana and coffee and tea in Kenya). Overall, African NARS are gradually becoming more pluralistic, with more private-sector involvement. Nevertheless, there is still much to be achieved in strengthening and developing the agricultural private sector in Africa, particularly in the smaller and poorer countries.

Proponents of stronger private-sector involvement in agricultural research financing argue that it should help to free up government resources for research relevant to resource-poor, subsistence-oriented farmers. On the other hand, others have expressed concern that diversifying the funding base for agricultural research may lead researchers to work largely, or even exclusively, with those who can contribute to research funding. For example, the models developed for Côte d'Ivoire and Senegal propose a large degree of privatization of the research service, in that farmers' associations, the agribusiness community (exporters, processors, input suppliers, commodity

traders, etc.), and other beneficiaries are called upon to finance the research program. Moreover, the intention is to pay incentives to researchers according to their proven contribution to farming profitability. A likely outcome of these proposals is that peasant farmers engaged in low-value subsistence food production and livestock keeping will be relatively neglected. Even if the government is able to step in and provide funding for the research needs of the resource-poor subsistence farmers, there will be relatively little incentive for researchers to work in these areas. There is a danger that a two-track research system may emerge, with a reduced number of researchers, drawing low salaries, conscripted to the war against poverty, while the best researchers work on those commodities for which there is private funding.

A contrasting example comes from the Tanzanian southern agroecological zone, which is the country's most important cashew nut growing area. When research led to a reversal of a long-term downward trend in cashew nut yields, producer organizations (with active support from the local government, the Ministry of Agriculture, and the World Bank) decided to increase the surcharge on cashew production and use a part of these funds to finance research on other commodities that are also important to the local community (Abt Associates, 2001e). In this case, the producers (with government agreement), used part of the surcharge to provide incentives for researchers and their support staff in the form of additional income packages over and above their normal but very low government salaries. This appears to be a viable formula for wealth creation all round, but it is important to realize that in this example there is a direct connection between those paying for the research and those benefiting from it. It would be far more difficult to convince producers of a commercial commodity to subsidize agricultural research that would benefit anyone other than their own community.

2.2   Decentralization of agricultural research

Decentralization of research by physical dispersal of research facilities has been accepted in principle in all the seven African countries, although it is an expensive exercise to start *de novo*. This physical decentralization is seen as an important step towards more adaptive research and increasing farmer participation. In six of the study countries, the intention is for ecoregional centers to be the lowest limit for research decentralization. However, the (proposed) decentralization of general agricultural administration (including extension) often goes further down to district (four of the six countries) or lower levels (one country). In the one remaining country, Ethiopia, the stimulus for decentralization was more political, being driven by a desire to establish a federal system of government. Each state or province was encouraged to have, wherever possible, its own research centers, and six new research stations are going to be built as a result.

A decentralized research infrastructure is more or less in place and operational in all of the seven countries, except for Ethiopia and Uganda. In Uganda, 12 existing facilities have been designated to become "agricultural research and development centers" and are being refurbished. In both Ethiopia and Uganda, research staff will have to be transferred to the new regional centers, or new staff will have to be hired. In Côte d'Ivoire, Ghana, and Senegal, some relocation of research staff to regional centers is considered necessary. However, relocating staff to regional centers is often problematic due to the lower living standard in such locations as well as safety issues. In addition, poor communication facilities and weak management systems severely hamper access to information and exchange of ideas and experiences with colleagues in other locations. To make a decentralized research system work properly, additional investments in physical infrastructure are needed, as well as increased funding for operational expenses. Such additional costs are warranted only if they are exceeded by the additional benefits of a decentralized approach.

As mentioned previously, perhaps a far more limiting factor in the decentralization of agricultural research is the small number of researchers employed relative to the farmer population. With agricultural labor-to-researcher ratios ranging from 10,000 to 35,000 (appendix 1), it is clear that there is

a limit to how close to the farmers one can bring research. For comparison, the agricultural labor-to-researcher ratio in developed countries was about 400 to 1 in the early 1980s (Pardey, Roseboom, and Anderson 1991) and has probably declined even further in recent years.[2] Moreover, interactions between farmers and researchers in developed countries are completely different to those in African countries. Farmers in developed countries are relatively few in number (2–5% of the working population), are well organized, make use of the latest communication and information technologies, can be reached easily through the market or their own professional organizations, and can articulate their technology needs very well. In contrast to the situation in African countries, most developed countries are moving towards consolidation of agricultural research in fewer locations because being physically close to the farmers is no longer considered as essential as in the past.

The principle of decentralization of responsibility for research design, implementation, and evaluation to subnational levels appears to have been accepted in at least six of the study countries, although in all cases the mechanics of devolving financial responsibility are still evolving. In Kenya, all research centres (national and regional) have the authority to spend certain types of funds, such as locally generated revenues. In Ethiopia, provincial research centers answer to their respective states or provinces but not to national headquarters. In Tanzania, wide responsibilities for both regular research programs and zonal competitive funds have devolved to the zonal centers. Zonal executive committees, with substantial stakeholder representation, have been established in each of the country's seven agroecological zones and have been granted financial and operational responsibility for agricultural research in their respective zones. They are also responsible for ensuring that details of their expenditures are regularly communicated to headquarters and that all transactions are conducted according to standard government regulations. There was considerable debate in Tanzania as to whether overall administrative power should devolve to districts or stop at the level of the agroecological zones. The efficiency of the zonal system as practiced by agricultural research convinced many that it was more viable than the untested district administrative system. In the end, however, dominant development partners, perhaps with the all too frequent mind set of "one model fits all" carried the day.

Despite efforts towards decentralization in most African countries, government services are still highly centralized compared to other developing regions.[3] There is no clear evidence, however, that decentralization makes government more efficient or effective (Farrington 2002a, b) or makes government services more pro-poor. This may partly be explained by the difficulties encountered in accurately assessing the views and needs of unorganized populations and by the fact that at both local and national levels, a small elite often controls decision making (Crook and Sverrison 2001). In addition, decentralization can be impeded by the refusal of central authorities to relinquish power and resources. Even when the latter have nominally been transferred to local governments, they are vulnerable to attempts by central authorities to recapture them (Wunsch 2001). However, while such "power plays" are always a possibility, they were not reported to be an important issue in this study.

2.3 Stakeholder participation

One of the major criticisms of African agricultural research is that it is not meeting the needs of millions of resource-poor, subsistence-oriented farmers for new agricultural knowledge and technology. In all seven countries, stakeholder participation is strongly promoted as a way of articulating those needs and of mobilizing the demand for agricultural research. However, while stakeholder

---

2 These figures do not include researchers employed by private agricultural input and processing industries. Their inclusion would increase the contrast in research capacity still further.

3 In a recent study on government decentralization in Africa by the World Bank, all seven case-study countries scored above average in a ranking of 30 African countries on an overall decentralization scale (Ndegwa 2002).

participation is an improvement on the old supply-driven research models, it tends to work best for those farmers who are well organized, integrated into the market, and capable of articulating their needs. However, such farmers are a small minority in Africa, although often an economically important one. The majority of African farmers are dispersed, poorly organized, and not integrated into the market.

In many donor-supported programs there is now a conscious effort to include support for farmer organizations. This must be viewed as a long-term undertaking, however, since experience in countries such as Kenya (where farmers' organizations have been promoted for several decades) indicates that maintaining such organizations after their formation is difficult. This is even the case for farmers' organizations that focus on commercial commodities, whose long-term viability appears to be closely tied to economic and political stability. Farmers' cooperatives and smallholder organizations for growers of food crops (or for noncommercial, livestock-keeping pastoralists) have generally not been a success in Africa (Hussi et al. 1993). Coherent stakeholder participation in research aimed at subsistence agriculture will therefore likely remain elusive.

Where farmer participation does occur, the interests of farmers must be carefully balanced according to their economic or social standing, gender, and/or commodities produced. Of the seven study countries, Côte d'Ivoire and Senegal have adopted the most far-reaching plans for involving farmers and farmers' groups in agricultural research. Although these plans have not yet been fully implemented, it is revealing that the proposed models include no prominent roles for the poorest stratum of farmers, i.e., those engaged in subsistence food production and livestock keeping.

This exclusion of resource-poor, subsistence farmers might be a tacit admission that, even at this time, when poverty alleviation is a strong focus, working with "the better-endowed farmers" could be a viable strategy. The West African models appear to suggest a two-track research guidance system, with one system for commercially oriented commodities guided and (co)financed by organized trade-oriented groups, and a second system, for the poor and unorganized producers, which will continue to rely on a "civil service" structure that is yet to be fully planned or explained. Byerlee and Alex (1998) differentiated the latter group of farmers into one with a possible future in commercial agriculture and one for which such a future is unlikely, due to unfavourable production conditions. For this latter group, diversification out of agriculture is the only opportunity of escaping permanent poverty. However, since the absorption capacity of the mining, industrial, and service sectors is weak in most African countries, diversification out of agriculture is a very difficult proposition.

In all seven countries, there is a tendency to equate "stakeholder participation" with "farmer participation" and, more specifically, with participation by the better-organized, commercial farmers. Other potential stakeholders, such as agricultural traders, input suppliers, transporters, processors, consumers, CBOs, and NGOs (as well as the large majority of subsistence farmers) are often neglected. If stakeholder participation is really to deliver better-articulated demands for agricultural knowledge and technology, then a substantially wider and more balanced set of stakeholders must be involved.

In recent years, more decentralized stakeholder participation models have emerged as part of the decentralization agenda. In these models, local (rather than national) farmers' organizations interact directly with researchers at local research stations, for example through farmer-research groups or as part of farming-systems research. In Uganda, ways are being sought to induce farmers to form strong, sustainable local groups and then to give such groups control over the research budget and hence over the local research agenda. Another option is to vest this power in local district councils (as is being attempted through the zonal system in Tanzania), thereby building upon existing government structures and mechanisms. This may be a preferred option where farmers' organizations are weak or nonexistent. Local district councils, however, are usually poorly equipped to perform the research formulation and priority-setting task delegated to them: further research may be required to address this issue. Another concern (that usually remains unresolved) is what to do if

local constituencies use the available resources for purposes other than research. The greater the restrictions on the use of resources, the further the results are likely to deviate from those of a demand-driven process.

While considerable experience with farmer participation methods has accumulated in recent years, the major difficulty at present lies in scaling-up such approaches to form a nationwide system of farmer participation in agricultural research. Mobilizing farmers' groups or local authorities and turning them into active stakeholders in agricultural research requires a stronger civil society structure than presently exists in most parts of the region. The assumption that the required levels of civil society structure are present or will emerge when responsibilities and authority are transferred has to be seriously questioned.

2.4   Emerging funding mechanisms

In all seven study countries, government research funds are disbursed mainly in the form of block grants—a common method in traditional government bureaucracies. Depending on the autonomy of the implementing research agency, the use of these grants is more or less specified in terms of the inputs that can be purchased (number of positions, salary levels, operating expenses, etc.). However, how those inputs are used and what they will produce is usually *not* specified: the emphasis is on input financing rather than output financing. Other providers of resources (donors, the private sector, etc.), generally place much more emphasis on the outputs expected from the research that they finance, and normally specify such outputs in their contracts.

In all seven countries, there is considerable pressure to diversify the funding of agricultural research away from government (block) grants. In addition to donor funding, which is of major importance in most countries, additional funding is being mobilized by expanding the use of surcharges (e.g., cess, levies), voluntary contributions, private contracts, own income, or by introducing new forms of funding such as endowment funds and competitive research grants.

While endowment funds have not been established in any of the case-study countries,[4] competitive research funds have been set up in all seven countries and are notable as a new and innovative way of disbursing research funding. Several experiments with competitive research funds have taken place in the case-study countries since the early 1990s.[5] Recent evaluations of these experiments indicate that most of the early competitive research funds either experienced a rather slow and uncertain start or failed to start at all.[6] During the 1990s, most funds had a modest turnover (generally less than 3% of the total agricultural research budget), but rather high management costs (25–50% of the budget).[7] They have often been viewed as exogenous and have been almost wholly dependent on donor funding. National governments have generally failed to regularly honor their modest financial commitments to these funds. Competitive research funds will probably continue to struggle unless they are consciously internalized by the host governments and become instruments of clear public policy.

---

4   Kenya is still contemplating setting up an endowment fund.

5   The earliest of these schemes were set up in Kenya (1990) and Senegal (1991) with support from USAID. About the same time, the World Bank also promoted such schemes as part of national agricultural research projects in Ghana and Tanzania.

6   See Chema (1999a–c), Dufaut (1999), Gill and Carney (1999) and Abt Associates (2001a–e).

7   Actual transaction costs are even higher if one includes the time spent by researchers on developing proposals that were later rejected. Introducing a staged selection procedure (i.e., submitting an initial project idea before developing a full proposal) can reduce such transaction costs, while a higher turnover may significantly reduce management costs.

The more recent competitive research funds proposed for Senegal and Côte d'Ivoire are much larger, more ambitious and embrace a wider spectrum of stakeholders. However, they appear to be dominated by the interests of commercial producers, who are well represented on their governing boards. In contrast, subsistence-oriented smallholders have a fairly low chance of influencing the priorities set by these funds due to their low rate of organization. At present, the funds appear to be largely externally induced and funded, and not adequately supported by policy changes and concrete financial commitments by the two national governments. Hence neither of these funds is fully operational even though they were set up several years ago.

In the longer term, the proposed schemes in Senegal and Côte d'Ivoire are also supposed to consolidate all public and private agricultural research funding. However, a disadvantage of such a consolidated funding mechanism is that private interest groups cannot target their financial contribution specifically to their preferred commodities or subject matter. This could lead to a loss of interest in contributing to the fund on the part of both the private sector and donors. Although a research system that assumes a diversity of funding sources and priorities may not be the theoretical ideal, it could be more realistic in practice.

Another concern related to the apparent attempt to make competitive research funds the only source of financial support is that they are not designed to support recurrent costs, infrastructure, and long-term training (Abt Associates 2001c). Thus it has been argued that although such funds are a valuable complement to institutional funding, they should not be viewed as a substitute (Elliott 2000).

Initially, the selection of research projects for competitive funding was considered to be primarily a scientific task, but stakeholders have gradually been given a greater opportunity to influence this selection. This is particularly true in Côte d'Ivoire and Senegal (and to a lesser extent in Ghana), where the competitive research funds are expected (at least in theory) to consolidate most, if not all, research funding. In the other four study countries the schemes are conceived as just one of a range of funding mechanisms targeting a particular component of the research agenda (e.g., natural resources) or a particular attribute (e.g., cross-institutional collaboration).

The use of surcharges on commercial (export) commodities for financing agricultural research has a long tradition in most African countries and is currently undergoing something of a revival. Such funds can be collected through various channels, including marketing boards, processing industries, or by customs offices at national borders. In most former French colonies, however, no surcharges were collected. Instead, the money for research was paid directly by monopsonistic marketing boards or processing industries. The breakdown of these monopsonies under structural adjustment programs during the 1990s eliminated an important source of funding for research on export crops, which, as far as we know, has not yet been replaced by an alternative mechanism.

Research organizations that are financed and controlled by producer organizations tend to be less prone to common public-sector ills such as periodic shortfalls in operational funding, lack of transparency in budgeting, cumbersome procedures, overstaffing relative to funding levels, low salaries, and poor links between performance and rewards (Elliott 1995). In a study of producer-funded research schemes in three African countries, Kangasniemi (2002) found a clear positive correlation between the level of client control and performance and argued that producer-driven research schemes are no less pro-poor than alternative supply-driven schemes, which may claim to be more pro-poor but perform badly.

One of the problems that most NARS encounter when they try to introduce or expand the use of surcharges for financing agricultural research is that ministries of finance, supported by the fiscal experts of IMF and the World Bank, often vehemently oppose the introduction of such tax instruments. Another option, a system of voluntary contributions, only works reasonably well in subsectors with few producers, since "free riders" can be a serious problem that undermines the whole

mechanism. Côte d'Ivoire is therefore taking a major risk in assuming that the private sector will voluntarily provide the majority of the funding for agricultural research.

Using a carrot (in the form of a matching grant scheme) rather than a stick (taxation) is another way of supporting a voluntary contribution scheme. Matching grant schemes are often promoted in the financing literature as instruments that can facilitate public-private collaboration in agricultural research. In Tanzania, a matching grant scheme financed by a World Bank loan has been an effective instrument in mobilizing funding from local districts and NGOs for the Zonal Agricultural Research Funds. However, we did not find any other matching grant schemes in the remaining study countries.[8] Nevertheless, simple implicit matching grant schemes do exist in most countries, whereby the government pays for salaries and infrastructure, while a third party (commodity boards, farmers' organizations, NGOs, or donors) pays for all operating costs.

Funding by third parties (donors, private companies, producers' organizations, or NGOs) is increasingly being managed through research contracts. Given the low remuneration of research staff in most African countries (covering only 20–40% of what could be considered a reasonable living wage), such contracts often include (implicit) provisions for topping-up the salaries of researchers and their technicians. In one country, for example, the scientists winning contracts (and their technicians) were permitted by the government to keep a substantial part of the fee (up to 60%). In other countries, per diems and travel allowances are frequently used to compensate for low salaries, although they can introduce distortions since they may encourage unnecessary travel.

2.5   Strengthening of system linkages

Three types of system linkages dominate the current reform agenda: (1) linkages between research and extension, (2) linkages between national agricultural research agencies, and (3) linkages between national, regional, and international research.

Research-extension linkages are considered problematic and are being remodeled in all seven study countries. In part, this is due to the poor performance or even collapse of the extension services in these countries. The training and visit (T&V) system, which at one time was very popular and which was strongly endorsed by the World Bank, has been a disappointment in almost all of the countries in which it was adopted. The percentage of farmers reached by the T&V approach on a regular basis never exceeded 10% in most countries, leaving the vast majority of subsistence farmers without help or advice. A recent study of the Kenyan T&V system concluded the following:

> "The most striking finding is that, even with a monthly meeting [instead of the prescribed twice a month] only about 7 percent of the contact farmers meet with extension agents as planned—that is, regularly, in either their own or a neighbor's fields, and at least once a month. [I]n the entire sample, however, only about 2 percent of the farmers met regularly with extension agents. Considering that extension concentrates on a few chosen farmers, this low level of contact is highly unsatisfactory." (Gautam 2000)

Attempts to revitalize extension by adopting radical new approaches are currently underway. Côte d'Ivoire and Senegal, for example, are privatizing their extension services, whose financing will depend largely on contributions from producers' organizations, which tend to be dominated by commercial farmers. There is thus a great risk that resource-poor farmers and groups in marginal areas will be further marginalized in this process. In Uganda, privatization is predicated on "doing away with subsistence farming," a central theme of the Plan for Modernization of Agriculture (PMA).

---

8   It has been brought to our attention by an anonymous reviewer that matching grant schemes have been proposed for cotton, oil palm, and pineapple research in Ghana.

Again, this plan focuses on tradable commodity surpluses and on improving all the necessary postharvest arrangements (infrastructure, local and external markets, processing or value adding, etc.). Alternative extension providers (NGOs, CBOs, farmers' organizations) are being considered for subsistence farmers, but it should be remembered that such organizations are stable only as long as they receive external support. It is also difficult to imagine that they will find an effective way of reaching the large numbers of subsistence farmers.

The difficulty of servicing widely scattered farmers is well illustrated by Kenya's experience, where 15 years of World Bank-mediated T&V left public extension in a situation indistinguishable from that prevailing in the preceding 15 years. Even with thousands of widely distributed extension agents, farmer contact remained very low (Gautam 2000) and the project was not renewed after it expired in 1997. In recent years, KARI has expanded its outreach program through the Agricultural Technology and Information Response Initiative (ATIRI), a competitive program that is considered quite innovative. Within the first 15 months of the launch of this project, contracts were established with 170 NGOs, CBOs, and other intermediaries, reaching about 22,000 farmers (Muturi 2002). However, from its inception, ATIRI has been viewed more as a means of inducing experimentation by farmer groups than as a substitute for extension services. The Kenyan Ministry of Agriculture is currently exploring ways in which elements of the ATIRI approach, as well as the FAO-supported Farmer Field Schools, might be scaled-up to provide extension services to significantly larger numbers of farmers. As mentioned previously, effective networking with the majority of unorganized, scattered farmers is going to be extremely challenging and its feasibility in terms of personnel, financial resources, and likely payoff has never been properly examined. This issue needs urgent study, since feasible solutions are critical to the overall impact of the NARS reform agenda.

National forums for agricultural research have been established in most countries in order to improve linkages between the different agricultural research actors and stakeholders, as well as to coordinate a division of labor among them. In Ghana and Senegal, these forums have been formalized into system-wide policy and coordination bodies, while they have remained more informal in the other study countries. There are also various component-specific linkage mechanisms that have emerged in recent years, such as joint ventures with the private sector, use of various types of networking (particularly cross-border), closer integration of universities into the NARS, and, finally, the use of multi-institutional and multidisciplinary teams in major programs.

Joint research ventures with the private sector are sought after in all the countries with a tradition of commercial agriculture. It is common, for example, for public-research institutions to conduct field trials or provide laboratory services for private companies (provided that trade secrecy and quality control can be maintained). In Kenya, however, it has been found that such joint ventures are often transitory, since companies eventually tend to develop their own in-house research or laboratory capability. In such instances, the companies often entice collaborating scientists away from the public institution, thereby further reducing public-research capacity.

Regional research networks play an important role in agricultural research in most African countries. They facilitate information exchange and provide access to both donor funding and international expertise. However, cross-institutional and cross-border research projects are not yet very common, although this may change in the future. Two of the three subregional research organizations in Africa were specifically set up to coordinate research networks. ASARECA, for example, currently oversees 18 such networks. In addition, countries may participate in research networks that are pan-African or global.

In five of the seven study countries, universities (in particular faculties of agriculture) play but a minor role in the agricultural research system. Only in Tanzania has an agricultural university been given a specific zonal research mandate with some supporting finance. In Ghana, universities participate actively in commodity research (coordination) committees, but in all of the other countries, the universities tend to set their own priorities and operate at the periphery of the agricultural

research system. Some of the competitive research funds are trying to address this situation by specifically inviting proposals from university staff and students. While this is a step in the right direction, the amount of available funding is very limited however.

Multi-institutional programs are still rare in African countries, and where they occur they are usually exogenous and instigated in response to the availability of funds specifically for that purpose. This is in direct contrast to the situation in developed countries, where multi-institutional programs are rapidly increasing in importance (Janssen and Braunschweig 2002). However, policies are now emerging that will promote such multi-institutional programs in Africa.

System linkages between national, regional, and international research are currently being widely reassessed as important reforms are contemplated. Further integration of these three levels may lead to more research specialization, greater interdependence, and stronger linkages. The expected outcome of this integration is that more will be achieved with the same resources. But such an approach requires a substantial amount of mutual trust, since appropriate ways must be found to share both research costs and recognition.

While the economic gains of cross-national collaboration are often very clear, the political reality is that they are very difficult to achieve. The introduction of competitive research funds at the regional level is a good example of the strengthening of research collaboration across national borders. Its weakness is that it depends completely on donor funding: very little national commitment has materialized to date.

Chapter 3. Assessing the Reform Agenda: Suggestions for Improvements

The previous chapters have outlined the major components of the NARS reform effort that is now spreading throughout Africa, and they examined experiences with the application of the reforms in seven African countries. The reforms reflect general trends in development thinking that are very much in the ascendancy, notably greater roles for the private sector, decentralization, stakeholder participation, new funding arrangements, and stronger linkages between development partners. As a long-term goal, there seems to be broad support for the reforms among stakeholders. At the same time, however, serious questions must be addressed regarding the operational feasibility of various aspects of the new reform agenda in the social, political, and economic context of the countries of the region.

Before making a general assessment of the NARS reform agenda, it is important to keep the following in mind:

1. While the underlying ideas and concepts may have been quite similar, the way in which specific NARS reforms have been implemented and how successful they have been differ quite substantially across the seven study countries.
2. The seven countries represent the more advanced, medium-sized NARS in the region, each employing some 150–800 FTE researchers. Most African countries, however, have rather small NARS with fewer than 100 FTE researchers and are often substantially weaker in terms of organizational and managerial capacity.
3. The new reform agenda builds upon the old one, but involves different orientations and skills. It assumes that agricultural research organizations function reasonably well and that basic processes like strategic planning, priority setting, monitoring and evaluation, fund raising, financial reporting, and proper management of research contracts are in place. The skills associated with each of these activities are required by the new reform agenda, but their orientations and the specific techniques associated with each may need to be revised.
4. Strictly speaking, most of the reforms are not "new," since elements of virtually all of the agenda items have featured in projects and programs in several countries in the region for more than a decade. In other words, the shift in the NARS reform agenda is more evolutionary than revolutionary. It is therefore realistic to expect gradual rather than radical improvements in the performance of research services. Nevertheless, there is perhaps now a greater sense of urgency for reform than in the past.

In this chapter, we make a general assessment of the reform agenda (sections 3.1 and 3.2) and present some suggestions for improvement (section 3.3).

3.1　Do the reforms contribute to a more relevant and efficient NARS?

Although this is not an easy question to answer, we believe that the current NARS reforms are a positive step forward. Overall, they could contribute to better performance of NARS. Whether improvements actually materialize is critically dependent on how well the proposed reforms are implemented and adopted. We have identified several areas where we have doubts concerning the feasibility or impact of the proposed reforms and these are listed below.

Redefining the role of government. Privatization of agricultural research has been a feature of commercial and export-oriented agriculture in a number of countries and is gaining momentum. It is

unlikely to occur in subsistence farming, which is the dominant farming system in sub-Saharan Africa. All indications are that private-sector involvement in agricultural research will grow in inverse proportion to the decline of subsistence agriculture. Among the seven case-study countries, Uganda stands out as having a clear long-term policy and commitment to commercializing agriculture and realigning all relevant government instruments in order to achieve this end. Even so, shifting some of the responsibility for (financing) agricultural research to the private sector requires careful institutional engineering on the part of the government. Research areas to be privatized have to be carefully selected and, in practice, opportunities for privatization may be limited.

Decentralization. Physical decentralization of research facilities has been accepted in principle in all seven countries. However, finding the right balance between centralization and decentralization in agricultural research remains a pertinent issue. While centralization of research capacity may increase its efficiency, decentralization may increase its relevance. This is a difficult trade-off, for which there is no easy solution. Research capacity itself is a major constraint on the level of geographic decentralization, as is the unwillingness of staff to relocate to remote areas. It is unrealistic to assume that research can be decentralized in a similar way to extension services. It is also important to remember that decentralization of decision making not only requires major changes in responsibilities and procedures, but also in culture, an aspect that is often neglected.

Stakeholder participation. Stakeholder participation is being pursued in all seven countries and is the most complex of the five reform themes. Not only is there a variety of stakeholders, but also a variety of mechanisms that can facilitate their participation. The almost exclusive emphasis on farmer participation in most countries makes one wonder how other legitimate stakeholders (e.g., traders, input suppliers, and consumers) are supposed to influence the public agricultural research agenda. Moreover, farmer participation tends to be dominated by the better-organized, commercial farmers: the millions of subsistence farmers are usually poorly represented.

The sheer numbers of subsistence farmers relative to researchers, their lack of organization, the diversity and complexity of their farming systems, and their unarticulated needs for technology guarantee them a place at the periphery of the agricultural innovation system. To address this problem, not only is funding required but also new thinking on the linkages between research and extension, which, as currently conceived, reach at best only 10–20% of the farmers. Although farmers' needs remain largely unknown, they are likely to transcend productivity technologies and information and will probably require a mix of skills currently unavailable in the narrowly defined R&D armory.[1] It is axiomatic that an essential step in solving the problem is to improve the level of organization of farmers. Ways in which this can be achieved remain to be determined. Innovative policies and linkage mechanisms, both national and international, are needed to help smallholders move from subsistence to commercial farming.

Giving emerging farmers' organizations control over a part of the research budget, which is being attempted in several countries, is not without problems either. It can radically change power relationships, since farmers are then no longer passive recipients of technology but clients in a research market. This research "market" is usually a very peculiar one, with unique products and a limited range of research suppliers and buyers. The analogy with an anonymous, competitive market for standard products is therefore rather weak. Close consultation between research suppliers and buyers is needed to identify innovation needs and formulate research projects. Hence the strict separation of research supplier and client, as is being pursued in several countries, may not be the appropriate solution to priority setting. Since information costs are high, a "preferred" supplier situation

---

1 During the past 20 years, considerable experience has accumulated with farming-systems research, farmer-research groups, etc., and these approaches are strongly promoted by the current NARS reforms in the seven case-study countries. What is lacking in most instances, however, is a feasible plan of how to scale-up such approaches so that they can be adopted nationwide. In practice, such attempts may well be limited by resource and staffing problems.

may be more appropriate. Even if alternative suppliers are only checked occasionally, this may be sufficient to keep preferred research suppliers competitive.

Emerging funding mechanisms. In six of the seven countries, there is a strong effort to move away from the traditional government block grant by diversifying the funding base of public agricultural research. But most of the new sources of funding are tied to specific private-sector interests, be they private companies or commodity organizations. There is a risk that these new sources of funding force the public research agenda even further down the road of private interests, and that, in so doing, they marginalize the interests of resource-poor, subsistence-oriented farmers. Despite the cashew nut example from Tanzania, there is considerable naivety in the current proposals that the commercial sector will be prepared to pay for research on subsistence agriculture in any substantive way.

The competitive research funds currently being implemented in the three West African countries are envisioned as consolidating all agricultural research funding in the medium to long term. In terms of costs and benefits, however, both the feasibility and desirability of this consolidation have to be seriously doubted.

System linkages. It is difficult to strengthen system linkages between research, extension, and farmers when both research and extension organizations are in a state of flux. The imminent privatization of the extension service in several countries is likely to have major repercussions on the relationship between research and extension; the future nature of that relationship is difficult to predict but should be of major concern to all involved.

3.2   Do the reforms solve the problem?

While the current reform agenda seems to be a step in the right direction, we are not convinced that it is enough. We can double our investments in agricultural research and adopt all the good practices discussed in this document and elsewhere but still not get to the heart of the problem of how to reach the millions of African subsistence farmers, unlock their potential, integrate them into the market, and get them on a path of self-perpetuating innovation. Without breaking this gridlock, there will be little effective demand for agricultural research from this large group of subsistence farmers. We can continue to fine-tune the existing research and innovation systems, yet still not reduce poverty and hunger. Since the existing agricultural research and innovation systems in Africa have not met our expectations in the past 30 years, how can we expect them to do so in future with only minor modifications? A far more radical approach is needed to the problem of increasing the availability of improved technology to the millions of subsistence-oriented farmers in Africa. The solution may lay not so much in enhancing the supply of new technologies, but in creating the right conditions for using improved technologies.

Are the current NARS reforms a waste of time? We do not think so. Once the effective demand for new technologies expands and accelerates, supply will be crucial. There are certainly elements in the reforms that can make agricultural research and innovation systems more effective and efficient. In addition, the more holistic perspective provided by the innovation system approach can help us analyze and understand how a whole range of interventions is needed to facilitate the shift from subsistence to market-oriented farming and hence accelerate the demand for technology. For this shift to occur, new linkages will be needed between technology providers, transmitters, and users. Moreover, the technology providers should be equipped not only with the traditional productivity-enhancing research expertise, but also with expertise that allows them to deal with the pre- and postproduction constraints of the wider agricultural sector.

We are not alone in our conviction that there is an urgent need to reform African agriculture. Numerous initiatives to address this need have been launched during the past two to three years by

African governments, donors, and international agencies,[2] but they are all merely scratching the surface: no comprehensive answer to the problem has yet emerged.

3.3   Suggestions for improvement

While we have doubts as to whether the proposed reforms will really lead to improvements under all conditions (and be sufficiently great to accelerate growth in agricultural productivity), we do not have an alternative "magic" solution to all problems, and nor do we believe that there is one. Instead, we provide some suggestions for improving the current reforms in the hope that they will be implemented carefully and adapted intelligently to local circumstances.

3.3.1   Adoption of an innovation system perspective

The NARS reforms are necessary but not sufficient to enhance the impact of technological innovation in African agriculture. As noted above, the main problem is how to reach the millions of resource-poor farmers that are only weakly integrated into the market. With the present numbers of research and extension staff, only a small fraction of the total farming population can be reached effectively. By adopting an innovation system perspective (rather than the more limited NARS and AKIS concepts), a better understanding can be achieved of the whole innovation process along the production-to-consumption chain with all its different partners. Such analysis of the agricultural innovation process should not be restricted to the formal agricultural research, extension, and education organizations, but should also include farmers, traders, transporters, processors, retailers, consumers, exporters, and their respective organizations, as well as NGOs and CBOs. An innovation system perspective highlights the fact that making agricultural research more client oriented and demand driven must be complemented by efforts to organize the clients of agricultural research and to help them articulate their demand for new technologies. Without such additional efforts, the current reforms will be largely ineffective.[3]

Another aspect that may be clarified by an innovation system perspective is that economic progress depends as much on institutional as on technological innovation. Most technological innovations require a counterpart in terms of institutional innovation. For example, the impact of improved plant varieties depends as much on plant breeding as on the development of a properly functioning seed market with sufficient quality control mechanisms, plant-variety rights legislation, etc. The introduction of genetically modified crops is another example where institutional issues (e.g., biosafety, IPR) have become critical bottlenecks in the adoption of the technology. More generally, the increased use of external inputs, which is inherent to many of the new technologies, requires well-functioning markets for farmers to sell their surpluses and buy their inputs. The slow technological progress of African agriculture can be attributed in part to the lack or underdevelopment of markets. In contrast to agriculture, innovations in areas like natural resource management are often more institutional than technological in character. The African Highland Initiative, for example, has developed ample experience with institutional change and innovation at the local level. Most agricultural research organizations, however, focus exclusively on technological innovation. It is important that they give more attention to institutional innovation and develop the necessary capability in this area.[4]

---

2   See FARA (2002), NEPAD (2002), USAID (2002), and World Bank (2002ab).

3   Some argue, and probably rightly so, that the strengthening of farmer organizations is outside the realm of responsibilities of agricultural research organizations. Nevertheless, it is important to point out that the ultimate impact of agricultural research organizations is critically dependent on the relative strength of farmer organizations.

4   One should keep in mind, however, that institutional, organizational, and managerial types of innovation have their origins in on-site learning processes rather than off-site, formal research. In contrast to technological innovation, one cannot experiment and fine-tune institutional innovations off-site.

An innovation system perspective may also help us understand and appreciate the underlying economic transition processes (such as the intensification of land use and diversification out of agriculture) and to develop greater consistency between the various policies that affect such transition. Economic analysis, for example, has revealed that differences in agricultural productivity can in part be attributed to differences in macroeconomic policies, investments in rural infrastructure, education and health, and the level of market development.

Adopting an innovation system perspective is not a goal in itself. The issue is not that of competing concepts, but the level of analysis that is the most appropriate for analyzing the problem. Our argument is that the relatively low impact of agricultural technology in sub-Saharan Africa is due not only to weak performance of the NARS or AKIS in most countries, but to the weakness of the whole innovation system, including the production sector.

3.3.2 More careful implementation of the NARS reforms

The institutional innovations as promoted by the current NARS reforms are not of the "ready-to-use" type but require substantial on-the-spot experimentation and "learning by doing." It is therefore important to provide sufficient time and resources to facilitate implementation.

The success of the new reform agenda is also critically dependent on a variety of facilitating conditions. If these are not met, the reforms are unlikely to be implemented successfully and the expected improvements will not be achieved. Hence, creating the appropriate conditions for reform can be as important as the reforms themselves. The sequencing of the reforms is also important—if certain critical prerequisites are not in place, the reforms may not succeed. For example, it is counterproductive to give farmers' organizations the responsibility for setting agricultural research priorities until such organizations are relatively strong and well established.

Table 6 (see next page) summarizes what we consider to be some of the most critical facilitating conditions for each of the reform themes.

As we mentioned earlier, the current reform agenda builds on an older reform agenda that emphasized the improvement of basic organizational and managerial processes, such as financial and personnel management, strategic planning, priority setting, and monitoring and evaluation. The current reform agenda assumes that these processes are in place and function reasonably well. If not, it is necessary to focus first on improving these basic competencies and processes before considering further NARS reforms.

3.3.3 Building consensus for reform

Whatever reforms are being contemplated, building consensus for reform is a critical precondition for success. This is particularly true for the new reforms, which involve many more stakeholders in a far more active way than did the previous reforms.

There are major differences within and between groupings of agricultural research and development agencies with respect to capacities, orientations, and attitudes towards the reform agenda and to one another. Elements of the reforms are largely internal to each organization, but the major thrust of the reforms is that these groups must interact effectively in a fashion that to date they have rarely, if ever, experienced. Furthermore, they must do so largely voluntarily. Although organizations will continue to compete with each other in the context of an increasingly market-driven environment, they will also develop and depend upon various partnerships that will enable them to complement each other's strengths. In short, the reform agenda assumes a major convergence of interests among organizations (and their staff) that will stimulate and sustain collaboration. Since

Table 6: Conditions that facilitate implementation of NARS reforms

Reform theme	Facilitating conditions
Redefining the role of government	Relative strength of both the private business sector and civil society (farmer groups, NGOs, etc.).
	Acceptance of a pluralistic agricultural research system with multiple funding and research implementing agencies.
	Capacity and commitment of government to design and implement appropriate policy.
	Capacity and commitment of government to manage by contract rather than by command.
	Democratic consensus: proposed changes are understood and supported by most stakeholders.
Decentralization	Consensus is reached on the right balance between geographical coverage (equity) and innovation opportunity (efficiency, i.e. concentrating research in high-potential areas). For areas in which agricultural modernization is unlikely to take place, alternative poverty alleviation policies are to be developed.
	Consensus is reached on what is to be decentralized.
	Devolvement of responsibility should be accompanied by control over resources.
	Local organizations are strong enough to assume new responsibilities or are supported in acquiring the necessary capability to do so.
Stakeholder participation	The political culture supports stakeholder participation.
	Stakeholders, especially smallholders, are organized, interested, and capable of playing a leading role in research priority setting and project selection.
	Care has been taken to ensure that the poorer stakeholders can also express their needs and influence the research agenda.
Emerging funding mechanisms	The newly adopted funding mechanisms are transparent, effective, and efficient.
	Research organizations have financial management capacities in place that are capable of reporting to multiple funding sources.
System linkages	Agreement is reached on adopting an innovation perspective, which will lead to (1) a more inclusive set of stakeholders participating in agricultural research priority setting and funding, and (2) to a more comprehensive agricultural research agenda, by including pre- and postproduction issues.
	Adoption of instruments to facilitate system linkages (e.g., facilities for funding joint research projects, cofinancing of research, farming system research).

this is relatively unfamiliar territory for many of the organizations, it will be a major challenge to facilitate this collaboration and ensure that the benefits exceed the risks and effort required.

In spite of the fact that the new reforms intend to make the research system more participatory and demand driven, they are largely imposed from above, being generally "donor driven" and emerging from discussions between governments, donor representatives, and NARI leadership. The rank-and-file NARS agencies are usually not involved, although major changes in the performance and orientation of the research staff is critical to the success of the reform process. Other stakeholders are also rarely consulted in a systematic way. When they have been, their reactions have often been a mixture of indifference and negative perceptions regarding the utility of the research services. Some feel that the performance of the services has been inadequate (for a variety of reasons), while others question whether investment in research (as opposed to development activities, technology transfer, and policy reforms) is really a high priority. There is often a history characterized by a somewhat adversarial relationship between public-sector agricultural research and various stakeholders, including development service providers (extension services, NGOs, and commercial organizations)

and other parts of the research system (e.g., universities and regional and international agricultural research organizations). For this reason, reforms may be resisted and undermined. Building a consensus for reform is therefore a particularly important first step where there are negative perceptions of the research service among key stakeholders and where donor agencies provide the major impetus for the reform agenda.

More critical still is the fact that key decision makers in national governments are themselves often ambivalent about agricultural research. While they may express support for agricultural research at the national and regional levels, such statements are rarely translated into budgets that enable research agencies to operate effectively (hence the stagnant or declining trend in national government support for research over the past decade [Beintema 2003]). National leaders understandably have higher priorities and are under serious pressure to economize their public sectors. Moreover, when given a choice, national leaders often select other sectors in preference to agricultural research to be the recipients of donor funds made available for general budgetary support.[5]

A critical initial stage in building a consensus for reform in a country or subregion is for donors to find effective (and credible) ways of sharing leadership in the effort. The World Bank is actively attempting to build a coalition for regional reform through presentations at recent conferences hosted by NEPAD and other agencies. These efforts offer significant opportunities for ASARECA and other research agencies to influence the character and course of the reform effort.

3.3.4 Pay attention to staffing and remuneration issues

In most African countries, salaries in the public sector have greatly eroded over the past 30 years to levels that are often below a reasonable standard of living. Salary payments are frequently late, and in many instances government employees are more or less forced to mobilize additional sources of income to support their families. Under these circumstances, it is unrealistic to expect full commitment from staff and so both absenteeism and "moonlighting" are common. In Africa, overstaffing and low pay are widespread phenomena within the public sector and seriously hamper its proper functioning. Many agricultural research organizations are struggling with these problems. One of the arguments for creating autonomous agricultural research organizations back in the 1980s and 1990s was that such agencies would no longer be bound by civil service regulations and could reduce staffing and improve salaries.[6] Such improvements often quickly eroded, however, and autonomy has not proven to be an adequate answer to the problems of overstaffing and underpayment. Correcting for this imbalance is a major challenge.

3.3.5 Pay more attention to the specific problems of small NARS

This study has focused on the larger and stronger African NARS, as represented by the seven case studies. For the many smaller and weaker African NARS, however, the new reform agenda may place too great a demand on their often weak organizational and managerial capabilities. Under these circumstances, introduction of the new NARS reform agenda may be counterproductive. A modified agenda, adapted to the circumstances and problems of the smaller African NARS, is clearly needed.[7] Such a modified reform agenda may, for example, place more emphasis on regional (i.e., supranational) rather than national research services.

---

5   This situation, combined with the strong perception within the World Bank that agricultural research in the region is seriously underfunded, has led to the proposal for a special facility that would set aside funds to support agricultural research. To an important degree, the reform agenda has grown out of the need to provide a strong rationale for the creation of such a special facility (World Bank 2002a,b).

6   Recent examples are the creation of NARO in Uganda and INERA in Côte d'Ivoire.

7   The specific problems of small countries in developing their agricultural innovation capacity were studied by ISNAR during the 1990s (see Gilbert, Matlon, and Eyzaguirre [1994] and Eyzaguirre [1996]).

Chapter 4. Implications for Different Partners

The new reform agenda has important implications for the various partners in the agricultural innovation process. In this section, we consider the implications for five distinctive participants in this process: (1) agricultural research policymaking entities, (2) agricultural research implementing agencies, (3) agricultural research stakeholders, (4) donors, and (5) subregional, regional, and international agricultural research agencies.

4.1   Agricultural research policy-making entities

The new reform agenda challenges African governments to think more strategically about their role in agricultural research and innovation. It calls for a stricter separation between agricultural research policy and implementation so that the ministry responsible for agricultural research (usually the Ministry of Agriculture but in some instances the Ministry of Science and Technology) can concentrate exclusively on agricultural research policy and delegate the implementation of agricultural research to either public or private agencies.[1] Such a ministerial policy-making entity has to define the broad outline of the agricultural research system, the roles of the various agencies involved, and develop an overall research strategy that is in line with the development goals of the country. It also has responsibility for making sure that the linkages within the agricultural innovation system function properly. Effective linkages are critical to the success of the reform agenda, notably to maintain the integrity of the NARS/AKIS/NSI in the face of increased decentralization, private sector (and other stakeholder) participation, and the proliferation of service providers. Within the government, the policy-making entity is also responsible for negotiating the overall public-sector agricultural research budget. It may set targets for private-sector contributions for certain parts of the research agenda (commercial export crops in particular), while for some parts of the agenda, it may decide that no public funding is necessary. In order to facilitate private-sector contributions, the government may assist the private sector in establishing (usually commodity-specific) collective funding schemes.

The formulation of a long-term strategy for the agricultural sector is necessary to create cohesion between the various more specific policies (e.g. for research, extension, and agricultural services). The Ugandan Plan for the Modernization of Agriculture provides a good example of such a strategy.

While the Ministry is responsible for defining the overall agricultural research strategy and budget allocation, it may delegate research project selection to (1) the implementing agencies, or (2) a separate entity representing agricultural research stakeholders. The first option is still the current practice in most countries: the implementing agency may consult stakeholders in the process of project selection, but it sets its own research priorities. The new reform agenda recommends the second option, namely that stakeholders select the research projects to be funded.

Selection responsibility could be delegated to democratically elected bodies like the parliamentary committee for agriculture or, in the case of a highly decentralized agricultural research system, local district councils. Another option is to delegate the selection process to special committees that bring together representatives of the various stakeholders. These committees are usually less democratic, and their composition requires careful consideration in order to make them as representative

---

1   The argument for such separation is that in many instances ministries pay insufficient attention to policy making because they are too involved in the day-to-day problems of implementation.

as possible. When they are carefully constituted, they may have the advantage of bringing more expertise to the decision-making process. Such committees could operate at both the national and subnational level, depending on the degree of decentralization of the decision-making process.

Clearly, democratically elected bodies or appointed priority-setting committees would still have to rely on research proposals formulated by the agricultural research organizations. Although they may influence the type of research proposals submitted by initially defining problem areas, they are ultimately dependent on the creativity and imagination of the researchers. It is therefore unrealistic to assume that a radically different research agenda will be generated simply by shifting the responsibility for priority setting from the implementing agencies to the stakeholders.

Agricultural research policy-making entities will also to some extent be affected by the decentralization of agricultural research as promoted under the new reform agenda. Under the old reform agenda, all policy decisions were taken in a highly centralized manner, whereas under the new agenda, decision making will be delegated to local levels of government or local stakeholder groups wherever possible. This delegation requires a careful delineation of responsibilities between national and subnational government agencies. Since tax collection and budget allocation is still highly centralized in most African countries, local governments or stakeholder committees do not decide on the allocation for agricultural research as such, but only influence how the agricultural research budget is to be spent.

In the context of a decentralized system with substantive stakeholder participation, it is likely that research project selection will tilt toward "downstream" or adaptive research projects and technology transfer activities. A key responsibility of policymakers and national research agencies is therefore to ensure that the "upstream" research requirements and linkages are given adequate attention, even in the face of pressure from stakeholders for more attention to local concerns. These upstream activities and linkages are critical to maintaining the flow of improved technologies and practices without which the entire innovation process could quickly come to a halt.

4.2   Agricultural research implementing agencies

The new reform agenda has important implications for the agencies responsible for implementing agricultural research. The institutional pluralism proposed by the new agenda attempts to move away from government-supported agricultural research oligopolies. Agricultural research funding will no longer be channeled automatically to a few public-research organizations, but will be opened up to further competition from nontraditional agricultural research providers (universities, NGOs, etc.). The intention is not to break up the existing national agricultural research organizations (since the consolidation arguments of the old reform agenda are still valid), but to reduce monopolistic behavior and institutional inertia. Under this approach, nontraditional research agencies will be eligible for more funding and hence may start to play a more active role in agricultural research.

The switch from core to special-project funding is likely to result in even more financial instability for agricultural research implementing agencies. At present, most of the project-based research funding is associated primarily with donors. However, as government funding becomes more competitive and project specific, research organizations will be faced with the dilemma that, while their financing becomes less predictable, they will still be committed to many long-term obligations (e.g., lifetime employment). There is a trend among agricultural research organizations to eliminate lifetime employment (by removing civil service status) and adopting fixed-term-employment contracts instead. The price of this flexibility is higher salaries that conform to the market. More competition in the funding of agricultural research not only creates benefits (i.e., better and more relevant research), but also costs in the form of higher risks on the part of the implementing agencies. These

risks must be compensated for in one way or another if agricultural research organizations are to survive financially.

Under the new reform agenda, agricultural research implementing agencies will increasingly have to share the responsibility for priority setting and project selection with their clients and stakeholders. The introduction of competitive research funds is a good example of how governments (in close collaboration with donors) have tried to enhance stakeholder participation in these processes. Some countries even intend to channel all their funding through such a mechanism in the future.[2]

New procedures have to be established and fine-tuned if the responsibility for priority setting and project selection is shifted away from the implementing agencies. As discussed in the previous section, the mechanism underlying such a shift can take various forms. In all cases, however, the development of research proposals becomes an even more important activity than it has been in the past. While the traditional internal selection process (usually by scientific committees and peers) tended to focus primarily on the scientific merits of each proposal, the proposed external selection by stakeholders should give greater weight to the socioeconomic relevance of the research projects. Researchers will therefore have to address the expected economic impact of their proposed research more explicitly than they have in the past. However, this type of expertise is underdeveloped in most African agricultural research organizations. There is also the danger that political and/or ethnic considerations will figure more prominently in decision making to the possible detriment of the quality and potential impact of research projects. This is a particular concern in those parts of the region in which the basic features of a civil society are weak or nonexistent.

Greater stakeholder participation in the selection of agricultural research projects is one way of increasing the relevance of agricultural research. Another way is to involve farmers directly in the implementation of agricultural research. The new reform agenda strongly promotes participatory research methods, such as farming-systems research and farmer-research groups. In combination with the pressure for better geographical coverage, this will affect the composition of research teams in terms of both research skills (more holistic, less discipline or commodity specific) and research focus (more applied, less strategic).

Decentralization may affect agricultural research implementing agencies in two ways: (1) a shifting of research capacity from headquarters to the regions, and (2) decentralization of decision-making responsibility to lower levels in the organization. The latter, invisible part of the decentralization process is the more problematic. The rather limited experience so far accumulated in this area is not specific to agricultural research organizations, so that finding the right balance between central and delegated responsibility remains a challenge.

4.3   Stakeholders

One of the major objectives of the new reform agenda is to enhance stakeholder participation in agricultural research at all levels—funding, priority setting, selection, and implementation. In most African countries, farmers are seen as the primary stakeholders in agricultural research followed by agroindustries, rural NGOs, and extension services; consumers and other civil interest groups are largely ignored. This contrasts greatly with the situation in developed countries, where consumers and civil society in general have gained more control over the public agricultural research agenda in recent years and have campaigned for more research on environmental, food safety, and animal welfare issues. Another stakeholder in agricultural research that is often ignored is the government

---

2   Obviously the extent to which the NARIs manage the competitive grants schemes and receive support in the form of grants has a considerable influence on the degree to which such schemes serve to broaden participation in agricultural research.

itself: governments usually depend heavily on agricultural research in order to formulate sound agricultural policies and regulatory measures.

With regard to farmer participation in agricultural research in Africa, there are three major concerns:

1. In most countries, local farmers' organizations are weak or nonexistent and therefore not in a position to play an active role in agricultural research priority setting.
2. Where farmers' organizations do exist, they are usually dominated by the more advanced farmers. Poor and less advanced farmers are less well represented.
3. Farmers' organizations often show little interest in agricultural research and do not fully appreciate the potential benefits of agricultural research. The role of stakeholders is being imposed on them without giving due consideration to this problem.

The proposed reforms assume strong stakeholder commitment to agricultural research. If, for whatever reason, this commitment does not materialize, then managers of the research implementing agencies will most likely set research priorities by default. Cofinancing is seen as an important way of enhancing stakeholder commitment. Even for food crops, for which private financing of research is unlikely, small stakeholder contributions may help convince governments that the primary stakeholders consider the proposed investment in agricultural research to be worthwhile.

One element of stakeholder participation that is often rather weak is the follow-up of selected research projects. Selection procedures seldom include monitoring and evaluation (M&E) as a standard activity, which weakens the learning cycle.

4.4   Donors

Donors provide a substantial part of the funding for agricultural research in Africa. The World Bank, in particular, is a major source of funding (usually via long-term, low-interest loans), but bilateral donors also support African NARS through various funding facilities. Such facilities usually target specific research topics (e.g., environment or biotechnology), research approaches (e.g., farming systems research), client groups (e.g., women or poor farmers), or facilitate North-South collaboration. Donors frequently try to influence national agricultural research agendas and often pull in different directions depending on their particular interests. Recently, however, some donors have started to move away from micromanaging their development activities. Instead of funding specific projects, they have opted to provide budget support to governments with a record of good governance. The European Union, the World Bank, and some bilateral donors (e.g., the Netherlands) have all adopted this policy. Within both the EU and the World Bank, there is some concern however that agricultural research may lose out under this new funding regime because national governments tend to give such research low priority. The World Bank is considering counteracting this by substantially increasing its investment in African agricultural research through a Multi-Country Agricultural Productivity Program (MAPP) for Africa. This program, which was not yet approved at the time of writing, proposes to double investment in African agricultural research in the next 10 years, with a substantial part of the funding being provided by World Bank loans and grants (World Bank 2002a). Unfortunately, in most countries this would lead to a further increase in the already high degree of dependency on donor funding for agricultural research. Excluding Nigeria and South Africa, both of which receive relatively little donor funding, African NARS depend on donor funding or loans for about 40%, on average, of their financing (Beintema 2003). In the long term, this is not sustainable; national governments and donors alike should give high priority to reducing this dependency (Eicher 1999, 2002). For example, donors could disburse more of their financial support in the form of matching grants and gradually limit their support to a smaller proportion of total research costs.

Although donors do not have a direct stake in the agricultural innovation process (other than their own reputation), they play two very important roles in the background of the proposed reforms. First, the donor community constitutes an important, if not the principal source of ideas and proposals on how to improve the agricultural innovation systems in Africa. The World Bank, DFID, and USAID, for example, all appear to have a clear idea of what is needed to improve agricultural innovation in Africa. The new reform agenda reflects a great deal of consensus among different donors. Individual donors may emphasize different elements (e.g., DFID promotes stakeholder participation, while USAID favors private-sector involvement), but they tend to agree on the overall direction of the reform agenda towards more decentralized, client oriented, and pluralistic agricultural research systems. Second, donors have the means to facilitate institutional innovation since their reform ideas and proposals are backed by money—a difficult combination for receiving countries to refuse. The World Bank in particular can leverage institutional reform through its lending program. Bilateral donors usually have less influence, although they can introduce new ideas and approaches on a smaller and more experimental basis. The first competitive funding schemes, for example, were pioneered by USAID and DFID. Participatory research approaches are another area in which bilateral donors have stimulated experimentation. In the end, however, national ownership of the reform agenda is crucial if reform is to succeed.

One of the concerns identified in the course of this study is that the new reform agenda is seen by many national stakeholders as donor-driven and imposed on them from outside. The proposed reforms may be sound, but many national stakeholders feel that they have been denied the opportunity to make them their own and adjust them where necessary. A more open dialog between the donor community and recipient countries is certainly needed. It is important to involve national stakeholders very early on in the discussions on reform, and to make them part of the learning processes regarding institutional innovation in agricultural research.

4.5   Subregional, regional, and international agencies

National reform agendas largely ignore the implications of supranational collaboration in agricultural research. Regional or subregional specialization in agricultural research on specific commodities or topics is not usually included in national agendas. It is a strange omission, but it reflects the fact that most NARS are rather inward looking. Contracting research across national borders is thus very much an exception, and contributing national resources to address supranational research problems is not generally a policy option.

Nevertheless, in recent years, ASARECA has emerged as a strong subregional entity that manages a set of subregional agricultural research networks. Donors usually finance the operating costs of these research networks, while national governments pay the salaries of the participating researchers. At best, these research networks result in strong supranational collaboration on a particular research theme (joint formulation of research, some division of labor between participating countries), but often do not get further than an exchange of results of nationally defined research projects.

A recent but important institutional innovation is the establishment of subregional competitive research funds. The European Union has promised some € 29 million to ASARECA, € 20 million to CORAF, and € 21 million to SADDC to establish such funds, each lasting four to five years. Other donors may join this initiative, and if the results are positive, the European Union may replenish these funds in the future. In addition, FARA aims to establish a Global Challenge Program[3] on

---

3   Global Challenge Programs are a new institutional innovation introduced by the CGIAR in 2001. They are time-bound, independently-governed programs of high-impact research, that target the CGIAR goals in relation to complex issues of overwhelming global and/or regional significance (and global impact), and require partnerships between a wide range of institutions in order to deliver the required outputs.

"Improving Livelihoods and Natural Resource Management in sub-Saharan Africa." Funding requirements, to be provided by the World Bank and other donors, are anticipated to be around $25 million per year, for a period of five years. Funding will be distributed primarily on a competitive basis to consortia of NARS, IARCs, ARIs, NGOs, farmers' groups, and private enterprises.

The objective of these supranational funds is to support cross-border research issues, rather than specific national ones. Research proposals should be developed jointly by national agricultural research organizations from different countries, taking advantage of the relationships already formed through the existing regional research networks. Most such networks employ a full-time coordinator who can take the lead in project development. For new initiatives, however, establishing cross-border contacts in order to develop a joint research project can be time consuming and costly, since cross-border travel and communication in Africa is often expensive. The experience with competitive research funds within the European Union indicates that obtaining funding for research proposals becomes easier over time as the different partners involved learn how to collaborate and interact with the competitive research fund. One problem in Africa is that the relative strength of agricultural research organizations differs substantially between countries. In a competitive scheme, the weaker research organizations may lose out. This may be an undesired political outcome, which the manager of the fund may wish to address.

Another interesting institutional innovation is that the African Development Bank (ADB) has asked the subregional organizations to advise on the allocation of the bank's contribution to the international agricultural research centers. This adds a new role to the subregional organizations, namely that of research purchaser. This new mode of funding could integrate the activities of the international agricultural research centers more closely with the needs of national agricultural research. There are no indications, however, that other CGIAR donors are contemplating a similar approach.

Organizations such as ASARECA, CORAF, SACCAR, and FARA could provide important platforms for NARS managers to share their experiences in reforming agricultural research and innovation systems. What works and what does not? What can they learn from each other? If organized properly, the benefits of this collective learning could easily exceed its costs by a considerable margin.[4]

In summary, the organization of supranational agricultural research is in a state of considerable flux. In recent years responsibility for setting the supranational research agenda has shifted toward national agricultural research leaders united in the various (sub)regional organizations. A frequently heard complaint, however, is that the membership of these organizations is too limited. Increased participation by stakeholders other than the directors of the principal agricultural research organizations is called for. Not only other research agencies are poorly represented (e.g., faculties of agriculture), but extension services, farmers' organizations, agroindustries, NGOs, and CBOs are not represented at all. While the inclusion of these stakeholders in research priority setting and implementation is high on the reform agenda at the national level, there are few signs of such participation at the supranational level. In part, this is because these stakeholders have rarely organized themselves beyond the national level (with the possible exception of a few international NGOs). Nevertheless, this lack of participation constitutes a serious legitimacy problem for the (sub)regional organizations.

---

4   Among the developed countries, the Organization for Economic Cooperation and Development (OECD) plays an important role in benchmarking government activities across its members, ranging from tax systems to education and S&T systems.

Conclusions

The "typical" African NARS was a rather centralized, supply-driven research system formed from a few public agencies supported almost exclusively by grants, projects, and budget allocations from central government and donors. The new or emerging NARS reform agenda is promoting the conversion of this type of system to a more decentralized, demand-driven model with broad stakeholder participation in the control, support, and implementation of the agricultural research agenda.

The poor performance of the agricultural sector for more than three decades (particularly in the ASARECA region) has cast serious doubts on the adequacy of the agricultural research and innovation systems in Africa. Hence the urgent need in most African countries to reform NARS (as well as extension and other partners involved in the agricultural innovation process). Other factors that have shaped the present NARS reform agenda include (1) changes in the socioeconomic and political context of agricultural research such as market liberalization, democratization and decentralization, (2) changes in research technologies and methodologies, (3) new public-management and systems-analysis concepts, and (4) interventions by foreign/international development agencies backed by significant resources. The influence of the World Bank has been particularly significant in all seven study countries.

Five major reform themes dominate the present NARS reform agenda:
1. *A redefinition of the role of government in agricultural research*: application of a stricter public-good argument (privatize when possible); separation of research funding, priority setting, and implementation.
2. *Decentralization of agricultural research* both geographically and in terms of decision making.
3. *Stakeholder participation* by consultation, joint implementation, controlling budgets and/or cofinancing.
4. *Emerging funding instruments*: more emphasis on (co)financing by direct beneficiaries (surcharges, matching grants, etc.); competitive research funds.
5. *Strengthening of system linkages* between research agencies (national, regional, and international), between research, extension and farmers (the AKIS model), and between all possible partners in an agricultural innovation process, including civil organizations, traders, and input and processing industries (the NSI model).

Elements of these five reform themes were identified in all seven study countries, although the specifics of the reforms differed in each case. However, they all seem to be moving towards greater stakeholder participation in both financing (on a modest level) and in setting research priorities. The ultimate aim in each case is to make agricultural research more responsive, client oriented, and demand driven. There is a fairly strong belief that without visible positive impacts (i.e., innovations contributing positively to the well-being of millions of poor farmers and consumers), public support for agricultural research will erode still further.

Overall, we believe that the current reforms make reasonable sense but that much of their success will depend on how well they are implemented and adapted to local circumstances. The institutional innovations as promoted by the current reforms are not of the ready-to-use type but require substantial on-the-spot experimentation and learning by doing. It is therefore important that sufficient time and resources are made available to facilitate the implementation of these institutional innovations. One should keep in mind, however, that in a number of African countries, the circumstances are not very conducive to NARS reforms. For example, decentralization and stakeholder par-

ticipation are difficult to implement under repressive regimes or at times of civil war. The reforms also require a reasonable level of organizational and managerial capacity as well as financial stability if they are to succeed. Salaries that are too low to provide a reasonable standard of living may also be a significant obstacle to whatever reforms are being proposed.

The reforms imply a shift from generating knowledge to applying knowledge. Links with extension and farmers are therefore becoming increasingly important, as are efforts to restructure and strengthen the extension services themselves. At the national level, the reforms may also lead to a relative shift in research focus from strategic and applied work to more adaptive research. This raises the question of who will fill the resulting void: regional networks, CGIAR institutes, or others?

An innovation system perspective (rather than the more limited NARS and AKIS system concepts) may help us better understand and analyze the various participants in an innovation process that are jointly responsible for its ultimate outcome and impact. The responsibility of agricultural research organizations does not end with the production of new knowledge or technology: only when their innovations are being disseminated, adopted, and used can they claim success. They have no choice other than to actively collaborate with all the other partners in the innovation process. This more holistic approach to agricultural innovation is gradually being accepted both by some national governments and by various development agencies.

For members of ASARECA, CORAF, and SADDC, the question is whether to adopt this more inclusive (but more complex) innovation system perspective, or retain the narrower view provided by NARS or AKIS, which focus on only one part of the agricultural innovation process. The advantage of the NSI perspective is that it allows a more complete picture of the agricultural innovation process, covering all possible participants and their interactions. Adopting such a perspective may have implications for ASARECA in that a far broader group of stakeholders would need to participate because they all have important roles in helping agricultural research to increase agricultural production and productivity.

One of the major problems with the strong emphasis on stakeholder participation in the new reform agenda is that the majority of African farmers is poorly organized. There is a significant risk that a demand-driven research strategy will result in a public agricultural research agenda completely dominated by the better-organized, market-oriented farmers, and that the needs of subsistence-oriented farmers will be ignored. Helping poor, subsistence-oriented farmers to organize themselves, which several donors see as a crucial component of the new reform agenda, may not be sufficient to balance this possible distortion. There is good reason to believe that the demand for new technology in subsistence agriculture is underdeveloped, since subsistence farmers are constrained by their own production and learning routines (Omamo and Lynam 2001). Only when farmers move towards market-oriented agriculture can the innovation process gain momentum and become self-perpetuating. The crux of the problem lies in helping farmers to achieve this transition, since until it has occurred, agricultural research will remain largely irrelevant to them.

For those farmers who have made the transition to market-oriented agriculture, agricultural research constitutes a crucial input into their production and learning routines. However, even for market-oriented farmers the supply and demand of agricultural research services is far from perfectly organized. This is reflected by the fact, for example, that the yields of many traditional African export crops have lagged behind those of competitors in other developing regions. Therefore, there is no reason for complacency or to assume that the commercial sector will take care of itself. Even when commercial farmers organize and finance their own research, they need a facilitating environment to help them to do so efficiently. Too often, politicization and mismanagement have resulted in commodity boards and producer organizations becoming constraints in themselves.

By organizing and mobilizing the demand-side of the agricultural innovation process (which is critically dependent on the development of smallholder organizations), one cannot only better target

the supply of agricultural innovations, but also obtain a clearer insight into the volume of effort that is needed. Political pressure by farmers and farmers' organizations on their own governments is the best way of achieving expansion of agricultural research and extension capacity. For this to occur, research has to clearly demonstrate a significant impact on the well-being of the farmer community.

The institutional innovations that are being promoted by the present NARS reform agenda are highly dependent on learning by doing. By sharing learning experiences, one could create important positive cross-border effects. Hence, we recommend that ASARECA (in collaboration with FARA, FAO, and ISNAR) explores the possibility of setting up a network specifically for institutional innovation issues in agricultural innovation systems.

The new NARS reforms will probably improve the efficiency and relevance of agricultural research (particularly for market-oriented farmers), but they will not solve the problem of how to reach the millions of African subsistence farmers, unlock their potential, integrate them into the market, and set them on a path of self-perpetuating innovation. Agricultural research cannot solve this problem on its own: it will require a concerted effort by many different agencies, leading to a complete overhaul of existing production systems and including, perhaps, the exodus of large numbers of rural families from primary reliance on agriculture. Such an overhaul depends far more on institutional innovations than on technical innovations. Since agricultural research organizations generally lack expertise in institutional innovation, they should give high priority to developing their capability in this area.

References

Abt Associates. 2001a. Reforming agricultural research institutions: Côte d'Ivoire's Centre National de Recherche Agricole. Sustainable Financing Country Study No. 1. Prepared for the United States Agency for International Development, Bureau for Africa, Office of Sustainable Development. Bethesda, MD: Abt Associates.

Abt Associates. 2001b. Commercialization of agricultural research in Ghana: the experience of the Council for Scientific and Industrial Research. Sustainable Financing Country Study No. 2. Prepared for the United States Agency for International Development, Bureau for Africa, Office of Sustainable Development. Bethesda, MD: Abt Associates.

Abt Associates. 2001c. Sustainable agricultural research: institutional and financing reform in Senegal. Sustainable Financing Country Study No. 3. Prepared for the United States Agency for International Development, Bureau for Africa, Office of Sustainable Development. Bethesda, MD: Abt Associates.

Abt Associates. 2001d. Reforming agricultural research funding in Tanzania: toward a demand-driven agenda. Sustainable Financing Country Study No. 4. Prepared for the United States Agency for International Development, Bureau for Africa, Office of Sustainable Development. Bethesda, MD: Abt Associates.

Abt Associates. 2001e. Opening avenues for private sector funding of agricultural research in Uganda. Sustainable Financing Country Study No. 5. Prepared for the United States Agency for International Development, Bureau for Africa, Office of Sustainable Development. Bethesda, MD: Abt Associates.

Alston, J.M. and P.G. Pardey. 1996. Making science pay: the economics of agricultural R&D policy. Washington, DC: The AEI Press, 1996.

Alston, J.M., C. Chan-Kang, M.C. Marra, P.G. Pardey, and T.J. Wyatt. 2000. A meta-analysis of rates of return to agricultural R&D. IFPRI Research Report 113. Washington, DC: International Food Policy Research Institute.

Arrow, K.J. 1962. The economic implications of learning by doing. *Review of Economic Studies* 28(80): 155–173.

Batley, R. 1999. The new public management in developing countries: implications for policy and organizational reform. *Journal of International Development* 11: 761–765.

Beintema, N.M. 2003. Recent developments in African agricultural R&D investments. Paper presented at the Second FARA Plenary, Dakar, 19–20 May 2003.

Blum, A., N. Röling, and P.G.H. Engel. 1990. Effective management of Agricultural Knowledge Systems (AKS): an analytical approach. *Quarterly Journal of International Agriculture* 29(1): 27–37.

Brinkerhoff, D.W., J.D. Gage, and S. Gavian. 2002. Sustainable agricultural research systems: findings and lessons from reforms in Côte d'Ivoire, Ghana, Senegal, Tanzania, and Uganda. Bethesda, MD: Abt Associates.

Byerlee, D. and G.E. Alex. 1998. Strengthening national agricultural research systems: policy issues and good practice. Washington, DC: The World Bank.

Chan-Kang, C., P.G. Pardey, S. Wood, J. Roseboom, and M. Cremers. 1999. Reassessing productivity growth in African agriculture. Paper presented at the AAEA annual meeting, Nashville, Tennessee, August 1999.

Chema, S. 1999a. The centrally administered Agricultural Research Fund of the Department of Research Development, Ministry of Agriculture and Cooperatives, Tanzania. Nairobi, Kenya: Agricultural Research Fund.

Chema, S. 1999b. The Agricultural Research Fund of the Kenya Agricultural Research Institute. Nairobi, Kenya: Agricultural Research Fund.

Chema, S. 1999c. The Agricultural Technology Transfer Fund of the Association for Strengthening Agricultural Research in East And Central Africa (ASARECA). Nairobi, Kenya: Agricultural Research Fund.

Chema, S. 2002. Ghana Country Report. Unpublished. The Hague, The Netherlands: ISNAR.

Chema, S. and J. Roseboom. 2002. Current reforms in the Ethiopian agricultural knowledge system. Country case study report. Unpublished. The Hague, The Netherlands: ISNAR.

Craig, B.J., P.G. Pardey, and J. Roseboom. 1997. International productivity patterns: accounting for input quality, infrastructure, and research. *American Journal of Agricultural Economics* 79: 1074-76.

Crook, R.C. and A.S. Sverrison. 2001. A comparative analysis of decentralisation and poverty-alleviation in developing countries: is West Bengal unique? IDS Working Paper 130. Brighton, UK: Institute for Development Studies.

Dufaut, A. 1999. Agricultural Technology Fund under the Natural Resource Based Agricultural Research Programme of the Institut Sénégalais de Recherche Agricole (Senegalese Institute for Agricultural Research). London, UK: Overseas Development Institute.

Eicher, C.K. 1999. Institutions and the African farmer. Third Distinguished Economist Lecture presented at CIMMYT, Mexico City, 15 January 1999.

Eicher, C.K. 2002. Africa's unfinished business: building sustainable agricultural research systems. In *Proceedings of the first ASARECA Committee of Directors Retreat* held at the Mombasa Continental Resort, Mombasa, Kenya, 19–22 February 2001. Entebbe, Uganda: ASARECA.

Eicher, C.K., and M. Rukuni. 2002. The CGIAR in Africa: past, present and future. Draft chapter for an independent meta-evaluation of the CGIAR by the Evaluation Department of the World Bank.

Elliott, H. 1995. The financing dilemma for African agricultural research systems: new evidence and policy challenges. In *Proceedings of the Roundtable on Research Policy and Financing in an Era of Adjustment*. The Hague, The Netherlands: ISNAR.

Elliott, H.E. 2000. Competitive grants in the new millennium: the devil is in the details. In *Competitive Grants in the New Millennium: a Global Workshop for Designers and Practitioners*, edited by F.J.B. Reifschneider, D.R. Byerlee, and F.B. de Souza. Brazil: EMBRAPA/IBD/World Bank.

Evenson, R.E. 2001. Economic impacts of agricultural research and extension. In *Handbook of Agricultural Economics*, edited by B.L. Gardner and G.C. Rausser. Amsterdam, The Netherlands: North Holland/Elsevier.

Eyzaguirre, P. 1996. Agriculture and environmental research in small countries: innovative approaches to strategic planning. Chichester, UK: John Wiley & Sons Ltd..

FAO and World Bank. 2000. Agricultural knowledge and information systems for rural development: strategic vision and guiding principles. Rome, Italy: FAO and World Bank.

FAOSTAT. 2002. FAOSTAT database. Available at: www.fao.org (accessed 21 November 2002).

FARA. 2002. Improving livelihoods and natural resource management in sub-Saharan Africa – securing the future for Africa's children. Pre-proposal for a CGIAR Challenge Programme. (draft) Accra, Ghana: FARA.

Farrington, J. 2002a. Decentralization and governance. Key sheets for sustainable livelihoods No. 11. Available at: www.odi.org.uk/keysheets

Farrington, J. 2002b. Decentralization and political accountability. Key sheets for sustainable livelihoods No. 12. Available at: www.odi.org.uk/keysheets

Frisvold, G. and K. Ingram. 1995. Sources of agricultural productivity growth and stagnation in sub-Saharan Africa. *Agricultural Economics* 13(1): 51–61.

Gautam, M. 2000. Agricultural extension—the Kenya experience, an impact evaluation. Washington DC: Operations Evaluation Department, World Bank.

Gilbert, E., P. Matlon, and P. Eyzaguirre. 1994. New perspectives for vulnerable institutions: agricultural research systems in small countries of West Africa. ISNAR Discussion Paper No. 94-17. The Hague, The Netherlands: ISNAR.

Gill, G.J. and D. Carney. 1999. Competitive agricultural technology funds in developing countries. Research Study. London, UK: ODI.

Government of Uganda. 2000. Plan for modernisation of agriculture: eradicating poverty in Uganda. Government Strategy and Operational Framework. Kampala, Uganda: Government of Uganda.

Hall, A. and B. Yoganand. 2002. New institutional arrangements in agricultural R&D in Africa: concepts and case studies. Paper prepared for conference on Targeting Agricultural Research for Development in the Semi-Arid Tropics of Sub-Saharan Africa, Nairobi, 1–3 July 2002.

Hartwich, F. and G. Meijerink. 1999. An alternative view on the generation of agricultural knowledge: revising the systems approach to national agricultural research. ISNAR Discussion Paper No. 99-4. The Hague, The Netherlands: ISNAR.

Hood, C. 1999. The art of the state: culture, rhetoric, and public management. Oxford, UK: Clarendon Press.

Hope, K.R. 2001. The new public management: context and practice in Africa. *International Public Management Journal* 4: 119–134.

Hussi, P., J. Murphy, O. Lindberg, and L. Brenneman. 1993. The development of cooperatives and other rural organizations: the role of the World Bank. Washington, DC: World Bank.

ISNAR. 1987. Working to strengthen national agricultural research systems—ISNAR and its strategy. The Hague, The Netherlands: ISNAR

Janssen, W., and T. Braunschweig. 2002. Trends in the organization and financing of agricultural research in developed countries. The Hague, The Netherlands: ISNAR and PROCISUR (Mimeo).

Johnson, B. 1997. Systems of innovation: an overview and basic concepts. In *Systems of Innovation: Technologies, Institutions and Organizations*, edited by C. Edquist. London, UK: Pinter Publishers.

Kangasniemi, J. 2002. Financing agricultural research by producers' organizations in Africa. In *Agricultural research policy in an era of privatization*, edited by D. Byerlee and R.G. Echeverría. Wallingford, UK: CABI International.

Kettl, D.F. 2000. The global public management revolution: a report on the transformation of governance. Washington, DC: The Brookings Institution.

Lusigi, A. and C. Thirtle. 1997. Total factor productivity and the effects of R&D in African agriculture. *Journal of International Development* 9(4): 529–538.

Lundvall, B.-Å. 1992. National systems of innovation: towards a theory of innovation and interactive learning. London, UK: Pinter Publishers.

McCalla, A. 1999. Keynote address presented at the "Impact assessment of agricultural research workshop" organized by ASARECA. ASARECA, Entebbe, Uganda.

Metcalfe, S. 1995. The economic foundations of technology policy: equilibrium and evolutionary perspectives. In *Handbook of the economics of innovation and technological change*, edited by P. Stoneman. Oxford, UK: Blackwell.

Muturi, S.N. 2002. Structural changes in Kenya's NARS. Unpublished consultancy report. The Hague, The Netherlands: ISNAR.

Nagel, U.J. 1979. Knowledge flows in agriculture: linking research, extension and the farmer. *Zeitschrift für Ausländische Landwirtschaft* 18(2): 135–150.

Ndegwa, S.N. 2002. Decentralization in Africa: a stocktaking survey. Africa Region Working Paper Series No. 40. Washington, DC: World Bank.

NEPAD. 2002. Comprehensive Africa Agriculture Development Programme (CAADP). Pretoria, South Africa: NEPAD.

Ngategize, P. 2002. Agricultural research and development systems in Africa: a Uganda case study. Consultancy Report. The Hague, The Netherlands: ISNAR.

Omamo, S.W. and J.K. Lynam. 2002. Agricultural science and technology policy in Africa. ISNAR Discussion Paper No. 02-01. The Hague, The Netherlands: ISNAR.

Pardey, P.G., J. Roseboom, and J.R. Anderson. 1991. Agricultural research policy: international quantitative perspectives. Cambridge, UK: Cambridge University Press.

Pardey, P.G., J. Roseboom, and N.M. Beintema. 1997. Investments in African agricultural research. *World Development* 25(3): 409–423.

Pineiro, M. 1999. El desarrollo del sector agrícola y las demandas tecnológicas. In *Integración de demandas agroindustriales y ambientales en la investigación agrícola para el sigle 21*, edited by W. Janssen and J. Tola. The Hague, The Netherlands: ISNAR.

Rao, D.S.P. 1993. Intercountry comparison of agricultural output and productivity. FAO Economic and Social Development Paper No. 112. Rome, Italy: FAO.

Röling, N. 1986. Extension science; increasingly preoccupied with knowledge systems. *Sociologia Ruralis* 4(3-4): 269–290.

Röling. N. 1988. Extension science. Cambridge, UK: Cambridge University Press.

Roseboom, J. 2002. Essays on agricultural research investments. PhD Dissertation. Wageningen, The Netherlands: Wageningen University.

Roseboom, J., P.G. Pardey, and N.M. Beintema.1998. The changing organizational basis of African agricultural research. ISNAR Discussion paper 98-17. The Hague, The Netherlands: ISNAR.

Roseboom, J. and H. Rutten. 1998. The transformation of the Dutch agricultural research system: an unfinished agenda. *World Development* 26(6): 1113–1126.

Rosenberg, N. 1982. Inside the black box: technology and economics. Cambridge, UK: Cambridge University Press.

Sarr, C. 2002. Structural changes in the Senegalese agricultural research system. Unpublished consultancy report. The Hague, The Netherlands: ISNAR.

Shao, F. 2002. Restructuring agricultural research in Tanzania. Unpublished consultancy report. Dar es Salaam, Tanzania: FANRM Consultants.

Thirtle, C., D. Hadley & R. Townsend. 1995. Policy-induced innovation in sub-Saharan African agriculture: a multilateral Malmquist productivity index approach. *Development Policy Review* 13: 323–348.

Trueblood, M.A. 1991. Agricultural production functions estimated from aggregate inter-country observations—a selected survey. Washington, DC: USDA-ERS.

UNDP. 2002. Human Development Report 2002. New York, UNDP.

USAID. 2002. USAID agricultural initiative to cut hunger in Africa. Washington DC: USAID.

World Bank. 1997. Project appraisal document on a proposed International Development Association Credit in the amount of $21.8 million equivalent to the United Republic of Tanzania for an agricultural research project. Report No. 17175-TA. Washington, DC: World Bank.

World Bank. 1998a. Project appraisal document on a proposed credit in the amount of $60.0 million to the Federal Democratic Republic of Ethiopia for an agricultural research and training project. Report No. 17794-ET.Washington, DC: World Bank.

World Bank. 1998b. Project appraisal document on a proposed adaptable program loan credit in the amount of SDR 37.1 million ($ 50.0 million equivalent) to the Republic of Côte d'Ivoire for a second national agricultural services support project in support of the first phase of a national agricultural services support program. Report No. 18047. Washington, DC: World Bank.

World Bank. 1999a. Project appraisal document on a proposed credit in the amount of $ 27.4 million (SDR 20.2 million equivalent) to the Republic of Senegal for an agricultural services and producer organizations project in support of the first phase of the agricultural services and producer organizations program. Report No. 18554-SE. Washington, DC: World Bank.

World Bank. 1999b. Project appraisal document on a proposed credit in the amount of SDR 19.1 million ($ 26.0 million equivalent) to the Republic of Uganda for a second agricultural research and training project (ARTP II). Report No. 19114-UG. Washington, DC: World Bank.

World Bank. 2000. Project appraisal document on a proposed adaptable program credit in the amount of SDR 50.9 million ($ 67.0 million equivalent) to the Republic of Ghana in support of the first phase for an agricultural services subsector investment project. Report No. 20366-GH. Washington, DC: World Bank.

World Bank. 2001. Project appraisal document on a proposed credit in the amount of SDR 35.3 million ($ 45.0 million) to the Republic of Uganda for national agricultural advisory services project. Report No. 21742-UG. Washington, DC: World Bank.

World Bank. 2002a. A Multi-Country Agricultural Productivity Program (MAPP) for Africa. Draft Issues Paper. Washington, DC: World Bank.

World Bank.2002b. From action to impact: the Africa region's rural strategy. Washington, DC: World Bank.

Wunsch, J. 2001. Decentralization, local governance and 'recentralization' in Africa. *Public Administration and Development* 21: 277–288.

Appendix 1. Selected Characteristics of Countries Studied

Attribute	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Senegal	Tanzania	Uganda
Agricultural land ('000 km²)[1]	203.5	307.3	141.6	258.2	80.5	399.5	87.6
Population (millions) [2]	16.0	64.3	19.3	30.1	9.5	33.7	22.1
GDP/capita (purchasing power parity dollars) [2]	$1630	$668	$1964	$1022	$1510	$523	$1208
Human Development Index (1 = highest) [3]	144	158	119	123	145	140	141
Illiteracy rate [2]	53.2%	60.9%	28.5%	17.6%	62.7%	24.9%	32.9%
Political stability [4]	Military rule (1999–2000)	Military rule (1974–1991)	Military rule (1966–1992)				Military rule (1971–1985)
Share of agriculture in GDP [2]	29.2%	52.3%	35.3%	19.9%	18.2%	45.1%	42.5%
Share of population employed in agriculture [1]	49.2%	82.4%	56.9%	75.4%	73.7%	80.4%	80.1%
Economically active agricultural population [1]	3.2 million	22.9 million	5.4 million	11.9 million	3.1 million	14.6 million	9.1 million
Agricultural output per capita in 2000 (1971=100) [1]	108.1	81.7	97.5	84.0	67.1	70.4	62.7
Agricultural output per unit ag. labor in 2000 (1971=100)	168.4	99.0	98.4	89.0	80.2	81.1	76.1
FTE researchers [4]	157	742	475	833	205	542	250
Agricultural labor–researcher ratio	20,452	30,850	11,385	14,324	15,030	26,846	36,520
Research expenditure (1993 int. dollars) [4]	$32.5 million	$71.4 million	$52 million	$135.3 million	21.1 million	$25.9 million	$49.8 million
Agricultural research intensity ratio (expenditures as a % of GDP) [4]	0.67	0.38	0.43	2.55	0.92	0.38	0.50

Sources: (1) FAOSTAT (2002). (2) World Bank (2002a,b). (3) UNDP (2002). (4) Agricultural Science and Technology Indicators (ASTI) country briefs.

Appendix 2. Country case studies

The summary tables in this appendix were compiled in August/September 2002 and reflect the situation in each country to the best of our knowledge at that time. Since then, however, major changes may have taken place.

2.1   Côte d'Ivoire Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	The National Center for Agricultural Research (CNRA) was established in 1998 through a merger of IDESSA and IDEFOR. CNRA is a private company in which the government has a minority stake of 40%. Producer organizations and agroindustries own the other 60%. The country has a long tradition of (co)financing of export crop research. However, this financing collapsed in the 1990s due to the dismantling of the commodity boards, which directly financed research and many other services.	Establish a responsive, cost-effective and autonomous research agency, which is privately owned and managed by its main clients. Increase the participation of research beneficiaries in the funding of agricultural research.	CNRA is operational, but its funding base is rather weak, despite some income from its own plantations. The expected resurrection of private funding for research on export crops has not yet materialized. The producer contribution (40% of the budget) is expected to materialize through a state-facilitated, but farmer-mandated, voluntary levy on the main export crops, substituting for an equivalent amount of taxes currently taken by the Government on these commodities. It is the latter prerequisite that seems to be blocking progress.
Decentralization of agricultural research	The geographical spread of agricultural research facilities is adequate, but not that of staff. Decision making is still rather centralized.	Reallocate some staff from headquarters to regional centers. Organize CNRA along decentralized lines, with five regional directorates with broad management autonomy (financial and human resources, etc.).	
Stakeholder participation	Producer organizations and agroindustries have had a majority share in CNRA since 1998.	Producer organizations and agroindustries provide a major part of the budget of CNRA and are actively involved in research priority setting. Producer organizations should be strengthened in order to make them effective farmer representatives. Research on farming systems should be reinforced.	No progress to date.
Emerging funding mechanisms	No competitive funding mechanism operational as yet. No experience to date with contract arrangements between funding organization (FNDA) and implementer (CNRA and universities).	Create a National Agricultural Development Fund (FNDA), with contributions from farmer organizations, agroindustries, and government. This should finance both agricultural extension (ANADER) and agricultural research (CNRA, universities, etc.). A committee consisting of 24 members will govern the FNDA and select the extension and research programs to be financed. The intention is that in due course all funding will be channeled through FNDA.	The decree to establish the FNDA has not yet been signed by the President and hence implementation of the FNDA has been delayed. The private sector is only prepared to contribute to the FNDA when the Government lowers its taxes on agricultural commodities by an equivalent amount. The private sector prefers a cess to be collected by the government rather than voluntary contributions as proposed. Donors are pushing for the establishment of local development funds, to match the decentralization of agricultural research and extension.

System linkages	With the reorganization of both extension (ANADER) and research (CNRA) in the late 1990s, major efforts were made to develop functional linkages between the two. For example, specific research programs were linked to requests of beneficiaries through annual technical/funding contracts between ANADER and CNRA. Given CNRA's dominance, however, internal linkages within the NARS have been relatively poor.	Strengthen the collaboration between ANADER and CNRA and improve CNRA's responsiveness to client needs. Enhance collaboration of CNRA with universities and other relevant research agencies and support CNRA's participation in regional research initiatives.

Sources: Abt Associates (2001a); World Bank (1998b)

2.2 Ethiopia Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	EARO is an autonomous public agency. No active participation of private sector in agricultural research to date. Some emphasis on expected outputs, but not formalized in terms of contracts.	No change proposed at this time. Privatization of coffee research is not yet feasible. The idea of farmers paying for agricultural research has also been dismissed—they are too poor.	
Decentralization of agricultural research	The geographical spread of agricultural research capacity is incomplete. Since 1997, responsibility for the regional research centers has been gradually transferred to regional governments, but to date only four of the nine regions have actually taken up this responsibility.	Increase the geographic coverage of agricultural research by building six new regional centers. Further devolution of agricultural research responsibility to regional governments wherever possible.	Expansion of the research system will require major increases in research staff and budget. Involvement of regional governments makes the research system more difficult to manage. Researchers may not be keen to live in remote areas with poor facilities (e.g. schooling and medical care).
Stakeholder participation	Farmers are mainly seen as passive clients rather than as active partners.	Improve stakeholder participation at both the national and regional levels, primarily through consultation. Adopt a strong farming-systems research approach.	Illiteracy among farmers is high but land distribution is relatively equitable due to the land reforms of the 1970s. Ethiopia seems to lack a group of advanced entrepreneurial farmers that could take the lead in the modernization of agriculture. Currently, there are no provisions to strengthen farmer organizations to participate more effectively in research priority setting consultations, etc.
Emerging funding mechanisms	No competitive funding mechanism operational as yet.	Create an Agricultural Research Fund (ARF). This fund, to be managed by EARO, should involve nontraditional research partners in mainstream agricultural research and create an enabling environment for innovative and competitive research. The World Bank's Agricultural Research and Training Project (ARTP) will provide a budget of $ 1.5 million for the first five years.	The establishment of the ARF, its secretariat, etc. has taken some time. First call for proposals has just been issued.
System linkages	A department has been established within EARO to facilitate the formation of linkages between research, extension and farmers. The old Research–Extension Linkages Committees (RELCs) established under IAR were considered ineffective, with no clear authority and a high turnover of members.	Establish Research and Extension Advisory Councils (REACs) at three levels: federal, regional, and research center. Each should have its own form of organization, supervision, authority, function, and periodic meetings.	Emphasis is primarily on the creation of formal research–extension structures rather than on processes. The delegation of responsibility for regional research to regional governments has created new and more complex NARS linkages.

Sources: Chema and Roseboom (2002); World Bank (1998a)

2.3   Ghana Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	The Council for Scientific and Industrial Research (CSIR), the principal apex body for research in Ghana, oversees nine agricultural research institutes. Each of them operates relatively independently. In addition, the Ministry of Food and Agriculture (MOFA) operates a network of six regional service centers that, among other things, are responsible for technology diffusion. This responsibility may include conducting adaptive research, although MOFA's current capacity in this area is very limited. Cocoa is the only commodity that has its own research agency, financed by a cess. Since 1996, CSIR institutes have embarked on an ambitious scheme to generate about 30% of their own funding in the future.	Increase the participation of research beneficiaries in the funding and management of agricultural research. No privatization of agricultural research activities foreseen as such. The intermediate target is for the private sector and other stakeholders to cofinance at least 15% of adaptive research for commercial crops and livestock. The long-term target is 25–30%. The idea is to set up a matching grant scheme for commercial export crops such as cotton, pineapple, and oil palm.	To date, only the oil palm research institute (OPRI) has managed to significantly increase its income from commercialization activities. Several research institutes are unlikely to ever reach the 15% target, let alone the 30% target, because of their strong public research mandate.
Decentralization of agricultural research	Ghana has a two-layered research system with 10 commodity or topical research institutes at the national level and six regional service centers, primarily engaged in technology testing and diffusion, managed by MOFA. As part of a more recent, overall government decentralization strategy, MOFA is in the middle of a decentralization process.	Transfer the responsibility for agricultural extension, development, and adaptive research to 110 District Assemblies.	There is great uncertainty regarding how the decentralization of MOFA will work in practice. MOFA's research capacity is very limited at present.
Stakeholder participation	In the 1990s, a National Agricultural Research Committee (NARC) was set up to formulate the national agricultural research policy and define agricultural research priorities at the macro-level.	Reconstitute the NARC as the Agricultural Research Policy Committee (ARPC). Secure adequate and effective representation of farmer-based organizations and agribusinesses on the ARPC, the boards of the 10 research institutes, and on the five zonal research–extension linkage committees. Support the development of farmer-based organizations so that they can play an active role in research priority setting. District Assemblies are expected to play a role in setting the adaptive research agenda of MOFA.	The model adopted aims to have farmers and agribusiness influencing the agricultural research agenda at the highest level possible. Care must be taken to ensure that the farmers on these boards and committees are truly representative and that there are mechanisms in place for them to link back to their constituencies.
Emerging funding mechanisms	Experimentation with a competitive research fund under NARP (1991–99) was unsuccessful. A commercialization initiative by CSIR introduced a greater emphasis on the use of contracts with various partners.	Create a Competitive Agricultural Research Grant Scheme (CARGS). This scheme should foster partnerships with the private sector and the NGO community. Depending on its success, the operating budgets of core research programs should be increasingly shifted to CARG to promote excellence in research.	Operational since last year.

| System linkages | The restructuring and upgrading of the research and extension services during the 1990s has significantly improved links between research and extension. Five research–extension linkage committees (RELCs) have been established, one for each of the major agroecological zones in the country. Internal links within the NARS have improved in recent years. This has been partly due to the establishment of a National Agricultural Research Policy Committee (NARPC). | Strengthen farmer-based organizations so that they can participate more effectively in the NARPC and the RELCs. | MOFA is devolving the funding and responsibility for extension to the District Councils. This will affect research–extension linkages. |

Sources: Abt Associates (2001b); Chema (2002); World Bank (2000)

2.4   Kenya Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	The Kenyan Agricultural Research Institute (KARI) is the principal agricultural research agency. Research on coffee and tea are organized separately by foundations and funded through a cess and own income. KARI has cost-sharing arrangements with Kenya Breweries (malting barley), East African Industries (oil seeds), Farmers Choice (pig industry), the Pyrethrum Board, the Sugar Industry, and the Horticultural Crop Development Authority. The flower and tobacco industry conduct and finance their own research.	Transfer more of the responsibility for the financing of research on sugar, cotton, pyrethrum, oilseeds, rice, and horticultural crops to the respective industry associations. Explore opportunities to introduce shared funding arrangements for research on maize, sorghum, millet, and other staple crops.	Transferring the responsibility for research to industry associations has been a slow process. To date, none of the commodities targeted for privatization have actually done so, although arrangements are now in place for sugar. No mechanisms appear to be available to gradually phase in private financing for research on a particular commodity.
Decentralization of agricultural research	KARI consists of headquarters, 15 national research centers (in charge of commodity or factor research), 6 regional centers, and 7 subcenters. The geographical spread of agricultural research capacity is considered adequate. Decision making in KARI is relatively centralized, while research implementation is decentralized.	No major changes are foreseen in decentralization of research capacity or in decision making.	
Stakeholder participation	Center Research Advisory Committees (CRACs), comprising representatives from research, extension and farmers, have been established in all KARI centers. Stakeholder participation for commercial commodities is facilitated through shared funding arrangements. The participation of farmers in priority setting and resource allocation for noncommercial crops has so far remained weak, particularly at the regional level.	More active participation of stakeholders in the funding and formulation of agricultural research proposals.

Intensification of the use of farming systems research approaches. | Stakeholder participation depends heavily on cofinancing arrangements and hence covers mainly commercial export crops. However, stakeholder participation in noncommercial commodities is also considerable. |
| **Emerging funding mechanisms** | The Agricultural Research Fund (ARF) has been operational since 1991. An implicit matching grant scheme (in which the government pays for salaries and infrastructure, and the private sector for operating costs) and research contracts with third parties are also operational. | Further strengthening and expansion of ARF as well as the use of contract arrangements and implicit matching grant schemes. | Little thought has been given to ways of gradually increasing the contribution of the private sector. |
| **System linkages** | Links between research and extension have become problematical due to the poor state of the extension service. There are research–extension liaison officers at the district, regional, and national levels.

Links between research and commercial agriculture are quite good but links between research and small-scale farmers are generally weak. | Introduce stronger stakeholder participation in both extension and research (e.g. ATIRI).

Given limited resources, the extension service should adopt a shifting focal area approach.

ARF should further stimulate linkages between KARI and universities as well as between KARI and the private sector. | Reform of the extension service is in abeyance. |

Source: Chema (1999b); Muturi (2002)

2.5 Senegal Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	ISRA's status changed from a public agency to a public company in 1997. This gave ISRA more autonomy and the right to manage its internally generated resources through research contracts, consultancy services, and selling of vaccines, seeds, and byproducts. ITA and a few universities also conduct agricultural research, but there is no private sector activity of any significance. The Government only finances salaries: ISRA and ITA must find additional funding from donors or the private sector to cover their operational costs. The recently established National Fund for Agricultural and Agro-Industry Research (FNRAA) disburses funding provided by the World Bank on a competitive basis.	The long-term vision is to separate research funding and priority setting from research implementation. All research activities should be funded through FNRAA, which is to be managed separately from the research institutes. A scientific committee and a management committee (the latter with a majority representation of research users) will decide on budget allocation. It is expected that research users will increase their participation in the funding of agricultural research, contributing between 20% and 60% of the funds by 2006. In contrast to agricultural research, agricultural extension is in the process of being privatized. By 2006, users should fund at least 50% of the extension budget.	FNRAA seems to be viewed as both a consolidated and competitive funding mechanism at the same time. It remains to be seen whether this is a viable option. Others have argued against using a competitive funding scheme as the sole instrument for supporting agricultural research. It is not at all clear how private contributions to FNRAA will be organized. No mechanism (e.g. a commodity levy) has so far been suggested. Another problem is that producer organizations may not be interested in contributing to a central fund without knowing whether their money will be spent on their research priorities.
Decentralization of agricultural research	ISRA has recently been reorganized into eight regional research centers corresponding to the country's eight agroecological zones.	Reallocate a considerable number of the research staff from headquarters to regional centers.	For personal reasons researchers often resist relocation to regional centers.
Stakeholder participation	Stakeholder participation takes place mainly through consultation.	Create strong and effective producer organizations at the national, regional, and local levels, capable of having a say, technically and financially, in technology generation and transfer. Producer organizations should be able to participate in the financing of research and extension activities via, for example, the existing levies on agricultural production, which in future will be co-managed with the government.	The exact way in which producer organizations will gain access to existing levies on agricultural production is still unclear. An important question to be answered is the extent to which levies will be pooled.
Emerging funding mechanisms	Previous experience with a competitive funding scheme was gained under the USAID Natural Resource Based Agricultural Research Project between 1992 and 1998 (total budget $2 million). A new fund, FNRAA, was established in 1999 and provided with a budget of $4.5 million for 4 years by the World Bank and IFAD. The National Council of Consultation and Coordination of Rural Producers (CNCR) provides the chairperson of the Management Board of FNRAA. Research proposals have to be explicitly endorsed by stakeholders.	Mobilize at least two other donors providing at least 10% of the budget. Replenishment of the fund needed within a few years. About 30% of the operational budget for ISRA and ITA to be channeled through FNRAA by 2004. Ultimately all funding to be channeled through FNRAA.	The model adopted assumes that the FNRAA will succeed as a consolidated funding mechanism and therefore will become the only agricultural research funding and priority setting entity in the country. Two rounds of project selection have been completed and a third one launched. There has been criticism in the press of the projects selected, with certain areas not being covered. There are two possible explanations for this: either the selected priority areas do not correspond with those of the outside world or the quality of proposals in certain priority areas were not of a sufficiently high standard.

| **System linkages** | The extension service has been reconstituted as a public company (with the government holding 51% of the shares) but will eventually become a private company. Funding for the National Agency for Agricultural and Rural Counsel (ANCAR) will be provided through a separate competitive fund controlled by producer organizations. A National Committee exists to steer/coordinate the NARS. Collaboration across research and development agencies is being supported through FNRAA. ITA uses consultation forums to bring stakeholders in a particular production sector together to discuss production issues. | Create strong and effective producer organizations at the national, regional, and local levels, capable of having a say, technically and financially, in technology generation and transfer. |

Source: Abt Associates (2001c); Dufaut (1999); Sarr (2002); World Bank (1999a)

2.6 Tanzania Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	The research activities carried out under the old Department of Research and Training (DRT) have recently been divided between the Ministry of Agriculture and Food Security (MOAFS), the Ministry of Livestock and Water, and the Ministry of Cooperatives and Marketing. Tea and coffee research have been privatized to form the Tea Research Institute of Tanzania and the Tanzania Coffee Research Institute. The new Department of Research and Development (DRD) under MOAFS is the lead agency in agricultural research, in charge of most crop and factor research. DRD receives funding from industry for research on cashew, cotton, sugarcane, and pyrethrum. Under these arrangements DRD provides staff and facilities, while industry finances operating costs. Contracts are increasingly being used to allocate research resources, while zonal agricultural research funds have assumed some of the responsibility for setting research priorities.	Further delegation of responsibility for the financing of research on export crops to the private sector. The establishment of a Tobacco Research Institute of Tanzania is underway. Other commodities (cotton, cashew, pyrethrum, and sisal) are also being considered for privatization. Further expansion and strengthening of zonal agricultural research funding mechanisms.	A decentralized research system is emerging, which requires a rethinking of the role of research undertaken at the national level.
Decentralization of agricultural research	The geographical spread of agricultural research capacity is considered more than adequate. Zonal Agricultural Research Funds (ZARFs) have been established in four of the seven agroecological zones. They are considered a major breakthrough in the decentralization of agricultural research and in enhancing local stakeholder participation (e.g. mobilizing funding from District Councils).	Move towards a decentralized arrangement with empowered zonal research stations responding to demand-driven research needs and with headquarters having a limited role. Constitute Zonal Executive Committees (ZECs) with majority representation of stakeholders. Delegate financial and operational powers to these ZECs. Zonal research stations are being encouraged to mobilize their own resources. The ZARF model should be strengthened and expanded to other zones. Some rationalization of research facilities is considered necessary.	Recent reforms have focused mainly on zonal agricultural research. It is not clear how this may have affected the national agricultural research agenda. Is the latter now merely the sum of the zonal agendas? Or are there research topics that require national coverage? If so, how can duplication be avoided?
Stakeholder participation	Stakeholder participation takes place through consultation, but also to a considerable extent through cofinancing of agricultural research by commodity boards dealing with cash crops for which a cess or levy is collected.	Invite District Councils to contribute to Zonal Agricultural Research Funds and involve them in setting local research priorities. Further intensification of the farming systems' approach to research. At least 50% of the research trials/demonstrations should be conducted in farmers' fields.	

Emerging funding mechanisms	A National Agricultural Research Fund (NARF) was established in 1992. It experienced major start up problems and the turnover of the fund was far less than originally expected. TARP II, which started in 1998, proposed a continuation of a reconstituted NARF and, in addition, established Zonal Agricultural Research Funds (ZARFs). The latter should focus on applied adaptive research to resolve urgent zonal problems. To date, ZARFs exist in four of the seven agroecological zones and have so far succeeded in attracting funding from donors, NGOs, and district councils. The matching funds provided by the World Bank have been instrumental in mobilizing this support. NARF, however, has experienced problems in mobilizing support. It currently depends almost exclusively on Norwegian support, which has limited the geographical coverage of the fund to the Eastern and Southern Highlands.	Establish ZARFs in all zones. If sustainable, the ZARFs may result in a significant devolution of responsibility for agricultural research to local government and stakeholders. Expand the use of cess schemes to finance research on commercial export commodities.	The World Bank's TARP II matches every dollar contributed to the ZARFs. Hence, there is a relatively strong incentive for donors and local stakeholders (district councils, NGOs) to participate. The scheme may also help to consolidate all research resources into a single fund. It remains to be seen, however, what will happen when the contribution from the World Bank is phased out.
System linkages	Farming systems research is the main vehicle for bringing research, extension, and farmers together. Moreover, researchers and extension personnel meet on a regular basis in various committees (Zonal and National Technical Committees, Zonal and Regional Agricultural Committees, Regional Extension Coordinating Committees, pre-seasonal workshops, etc.). In addition, Zonal Research Extension Liaison Officers have been appointed to each zone.	Increase joint activities between research and extension, such as the strengthening of Zonal Technical Committees, workshops, on-farm research, field days, and demonstrations. Bring Sokoine Agricultural University into mainstream agricultural research.	The establishment of the Ministry of Water and Livestock Development and the Ministry of Cooperatives and Marketing as entities separate from the Ministry of Agriculture and Food Security has resulted in responsibility for agricultural research being divided between three different ministries. This has resulted in new and probably more complex linkages between agricultural research entities, and between research and extension. It may also negatively affect the farming systems approach.

Sources: Abt Associates (2001d); Chema (1999a); Shao (2002); World Bank (1997)

2.7   Uganda Summary Table

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	NARO is a semiautonomous public agency, which depends heavily on donor funding (65%). So far, it has received very limited support from producer organizations and private companies (<1%). Cess schemes exist for coffee, tea, and cotton, but little of the resultant funds are spent on research. NARO's coffee research institute received some modest financial support during the late 1990s. NARO has not yet undertaken any tea research, arguing that the tea sector should pay for it. The private sector (including the sugarcane, tea, tobacco, flower, and vegetable industries) undertakes a considerable amount of research on its own.	Shift the financial burden for research on commercial export crops to the private sector. Promote closer involvement of farmers/communities in priority setting, monitoring, and cofinancing of agricultural research on noncommercial crops. There is a proposal to give local communities, through district councils, direct control over research budget allocations, closely following a model currently being implemented by the National Agricultural Advisory Service (NAADS).	The proposal to give local communities direct control over research budget allocations has been heavily resisted by NARO management. The feasibility of the model is being questioned.
Decentralization of agricultural research	All NARO institutes are located close to the capital Kampala. The geographical spread of agricultural research capacity is considered inadequate. Management of NARO is still rather centralized.	Establishment of 12 Agricultural Research and Development Centers (ARDCs), strategically located in different agroecological zones. Initially the activities at the ARDCs will concentrate mainly on outreach and development, but research will gradually become more important. This will require a relocation of research staff from current locations around Kampala to the outlying regions.	For personal reasons researchers may resist relocation to regional centers. Relocation will have major implications for the existing research institutes, particularly when staffing levels and budget will remain more or less the same.
Stakeholder participation	Stakeholder participation takes place mainly through consultation.	Export commodity stakeholders are expected to take full responsibility for research on their commodities. Stakeholder participation for research on noncommercial commodities should be facilitated by giving local government control over priority setting and budget allocation. The farming systems approach, as developed under ARTPI, should be significantly expanded.	Changes currently in abeyance. Feasibility of the proposed stakeholder mechanisms is being questioned.
Emerging funding mechanisms	An Agricultural Technology Fund was established in 1998 with the assistance of DFID as part of the Client-oriented Agricultural Research and Dissemination Project. The fund provides grants for on-farm participatory research and technology dissemination.	Establish an Agricultural Research and Development Fund (ARDF), to be managed by NARO. The World Bank's ARTP II has provided a grant of $500,000.	Currently being implemented.
System linkages	NARO is setting up eight Agricultural Research Development Centers (ARDCs) in specific agroecological zones. The extension service is in the middle of a major transformation with the aim of forming a highly decentralized National Agricultural Advisory Service (NAADS).	The establishment of eight Agricultural Research Development Centers (ARDCs) should significantly strengthen NARO's links with both extension and farmers.	New modes of collaboration between NAADS and NARO need to be established.

Sources: Ngategize (2002); World Bank (1999b, 2001)

African agricultural research must become more relevant and efficient if it is to meet its goal of shifting millions of subsistence farmers out of poverty. The national research system is under reform in most African countries—but are these reforms working? This is the core question that this report addresses.

Drawing on a comprehensive literature review, seven specially commissioned case studies and extensive discussions with key stakeholders, this report identifies the five dominant themes on the current reform agenda—redefining the role of government; decentralization; stakeholder participation; changes in funding mechanisms; and strengthening system linkages—and looks at the internal and external environment that is shaping this agenda. The feasibility of reforms in these areas and the implications for stakeholders are discussed, together with suggestions for improvements. The authors show that reforms have the potential to bring about improvements, but it is how they are adapted to local circumstances that determines whether or not they are successful.