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A CRITICAL REVIEW OF KEY ISSUES AND RECENT EXPERIENCES IN REFORMING AGRICULTURAL RESEARCH IN AFRICA

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Foreword

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Abstract

This study tries to provide an evaluation of on-going efforts to restructure and reform national agricultural research systems in Africa. While there is a crying need to make African agricultural research more relevant and efficient, it is not evident *a priori* that the current reforms are contributing sufficiently to this objective. A literature review, seven commissioned case studies of African NARS, and discussions with donors and international development agencies closely involved in the current reforms provided the information and impressions for the current analysis.

The study identified the following five major reform areas dominating the current 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*: geographically and in terms of decision making;
(3) *Stakeholder participation*: by consultation / by joint implementation / by controlling budget / by co-financing;
(4) *Emerging funding instruments*: more emphasis on (co-)financing by direct beneficiaries (surcharges, matching grants, etc.); competitive research funds; and
(5) *Strengthening of system linkages*: between research agencies (national, regional, and international), between research-extension-farmers (the AKIS model), and between all possible partners in an agricultural innovation process, including civil society organizations, traders, and input and processing industries (the NSI model).

Although specifics of the reforms differ across countries, the themes are the same and they all seem to move in the same direction of greater stakeholder participation in order to make agricultural research more responsive, client-oriented and demand-driven. There is quite a strong notion that without impact to show for (i.e., innovations contributing positively to the well-being of millions of poor farmers and consumers), public support for agricultural research will even further erode.

The current reforms in agricultural research do no take place in isolation – they are 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 in part due to the increased emphasis on poverty reduction in recent years – most poor people 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 are more market and civil society oriented.

Two schools of thought stand out as rather influential in shaping the current reform agenda, namely: (1) new public management; and (2) system analysis. The former school represents a collection of ideas and concepts of how to make the public sector more effective and efficient by introducing business-like management procedures and concepts. The latter school provides an analytical tool to describe and analyze complex processes involving many different actors. The NARS, AKIS, and innovation system concepts are all three based in the system analysis approach. The all-inclusive innovation system perspective has the advantage

of casting a more complete and realistic picture of the agricultural innovation process, covering all the various actors and how they depend on each other.

While most reforms have the potential to improve the relevance and efficiency of agricultural research and innovation, it very much hinges on how (well) the reforms are being implemented. There is serious concern that with stronger stakeholder participation only the better-organized, market-oriented farmers will be reached 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 not be sufficient. 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. As long as this transition has not taken place, much of what agricultural research could offer will remain largely irrelevant to them.

What this study recommends is a double transition at both the supply and the demand side of agricultural innovation. Making agricultural research more demand-driven may only yield very modest dividend if we not, at the same time, try to stimulate and organize the demand-side.

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*
ITA	*Institut de Technologie Alimentaire* (Food Technology Institute)
KARI	Kenyan Agricultural Research Institute
KIT	*Koninklijk Instituut voor de Tropen* (Royal Institute for the Tropics)
MOFA	Ministry of Food and Agriculture
MOAFS	Ministry of Agriculture and Food Security
NAADS	National Agricultural Advisory Services Project
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
NEIP	National Extension Implementation Program
NEPAD	New Partnership for African Development
NGO	Non-governmental 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	Sub-regional 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

1. Introduction

Modernization of agriculture is a key element in the development strategy of almost all African countries. A major enhancement in agricultural productivity should free up resources (in particular labor) for other economic activities, keep food prices low, and improve the living standards of those who continue farming. Technological innovation plays a key role in this modernization process and hence the importance of agencies that generate and facilitate such innovation or ensure their sustainable adoption by farmers.

Recognizing the importance of technological innovation, both national governments and donor organizations have invested substantial sums in agricultural research in Africa over the past 30-40 years. During the 1990s, roughly a billion dollars[1] were spent on agricultural research in sub-Saharan Africa annually compared to roughly 800 million dollars during the 1970s. After a major expansion of agricultural research capacity during the 1960s and 1970s, this expansion merely came to a halt during the 1980s and 1990s. In part, this was due to financial and economic crises that have affected most African countries so severely during the past 20 years, but also because past investments in agricultural research did not yield as nice a dividend as expected. Improvements in agricultural productivity in Africa have persistently lagged behind those taking place in the rest of the world and the Green Revolution seems to have largely by-passed Africa. With such a poor 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.[2]

Because of the changing circumstances mentioned above, the emphasis has shifted from an expansion of agricultural research capacity during the 1960s and 1970s to a better use of the existing capacity during the 1980s and 1990s. During the latter period, most African countries consolidated (most of) their agricultural research capacity into a single organization and emphasized strong central coordination and leadership. National agricultural research strategies and plans were developed to streamline and focus the national agricultural research agenda. In addition, efforts were undertaken to introduce sound management practices in these organizations such as planning, monitoring and evaluation, financial management, and management information systems. Hence, reform and restructuring of agricultural research has been an on-going process for a quite a while in Africa. So, what is so new about it that it warrants a new study?

What is new about it is that the focus of the reform agenda has shifted in recent years from *centralization* to *decentralization*. The new reform agenda forces agricultural research to be more outward looking, client-oriented, and impact-driven. It is not enough to produce good science. Research organizations are being urged to make sure that their knowledge and technology is being applied and preferably so by poor subsistence farmers in hitherto neglected areas. Client-orientation has always been most strongly in commercial agriculture. In subsistence agriculture, comprising the large majority of farmers, the demand for agricultural research and innovation is a lot more scattered and less articulated.

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

[2] McCalla …… Despite this negative image at the macro level, rate-of-return studies on African agricultural research are on average quite positive (Alston et al 2000, Evenson 2001) and do not suggest that the return on agricultural research investment in Africa is significantly lower than agricultural research investments elsewhere. The problem with McCalla's statement is that it does not considers the without case. Without investment in agricultural research, Africa's agriculture may have deteriorated even more.

This study intends to describe and analyze 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, World Bank, and international agencies like FAO, IFAD, and ISNAR) in pursuing the new reform agenda.

The more specific objectives of the study are:

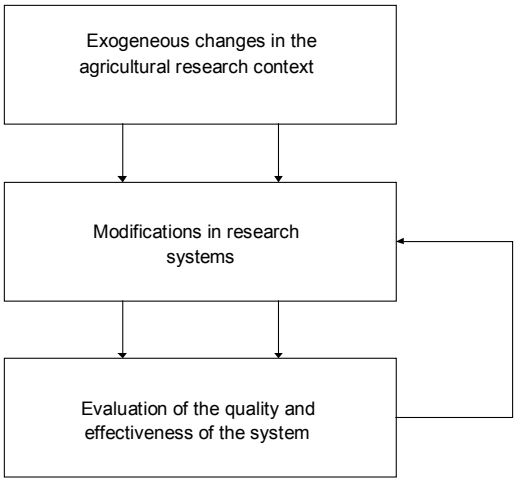
(1) Build understanding of the origins and rationale of the new approaches to the organization of agricultural research
(2) Establish the scope and depth of implementation of these approaches
(3) Identify the major conceptual strengths and weaknesses of the approaches
(4) Establish the feasibility of 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 structure of this paper is as follows. The next section, chapter 2, provides our analytical framework and an overview of the five major reform themes identified by this study as well as a discussion of the ideas and concepts behind these reform themes. Chapter 3 gives a description and analysis of how the reform ideas and concepts are being absorbed and implemented in seven African countries as well as an assessment of the feasibility of these ideas and concepts to the majority of smallholder farmers. This will lead then into chapter 4, which discusses the transition issues when moving from a "centralized" to a "decentralized" agricultural research system. Chapter 5 discusses the implications of the reform agenda for the various actors involved, national governments, research managers, donor agencies, etc. Chapter 6 draws the principal conclusions.

2. The NARS Reform Agenda in Africa

Janssen and Braunschweig (2002), in their study on trends in the organization and financing of agricultural research in developed countries, introduce a simple 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 the research system at the hand of quality criteria



Note: The arrows indicate the direction of causality between the different steps.

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

The structure of this chapter is as follows. In section 2.1, we will briefly explore the exogenous changes that have taken place in the context of African agricultural research. Our tentative conclusion is that the identified exogenous changes have had some influence on the (proposed) modifications in African NARS, but that concern with the weak performance of most African NARS (the feedback loop) has been the principal driving force.

The principal reforms that are currently being implemented or contemplated in African NARS will be explored in section 2.2. In section 2.3, we make a side step and look into the underlying schools of thought that have shaped the current reform agenda. In section 2.4, we briefly discuss the eight NARS quality criteria as suggested by Janssen and Braunschweig (2002). Conclusions are drawn in section 2.5.

2.1 Exogenous changes in the agricultural research context

An important argument of our analytical model is that agricultural research systems are context specific and historically determined. They reflect many years of evolution, trying to adapt as best as possible to changing circumstances and demands. Hence, understanding the changes in the external context of the NARS may help us to understand better the NARS reforms. However, the argument also runs the other way, the better agricultural research systems understand exogenous changes and developments the better they can respond and adapt themselves.

One of the often-heard complaints is that African NARSs are bombarded by reform suggestions that are borrowed from elsewhere, but which neglect the context-specificity of such reforms. This does not mean that there are not useful ideas and concepts that could be borrowed from elsewhere (it is not necessary to reinvent the wheel), but a considerable amount of caution and critical evaluation is required before adoption is pursued. Janssen and Braunschweig (2002), for example, illustrate very well that the changes in financing and guidance of agricultural research in developed countries (and now being promoted in the developing countries) were the consequence and not the genesis of agricultural modernization.

Three broad categories of exogenous trends affecting the development of agricultural research systems can be identified, namely: (1) Changing demand for agricultural research; (2) Changing research technologies, methodologies and approaches; and (3) Changing economic policies.

2.1.1 Changing demand for agricultural research

Agricultural research organizations have to adapt themselves continuously to the changing demand for new agricultural technology and knowledge, which in turn reflects changes in the agricultural sector as well as the broader economy. The focus of public agricultural research in the developed countries, for example, has clearly shifted in recent years from productivity research to more general, societal concerns like 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 quite a while to adjust their public research agendas accordingly.[3]

[3] Public support for productivity-enhancing agricultural research came increasingly under attack as the surpluses it created are costing taxpayers billions of dollars in terms of agricultural subsidies. Moreover, these subsidies are having major negative externalities to 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 subsidies (currently estimated at US$ 350 billion per annum against a $50 billion of aid to developing countries), because of its damaging impact on farmers in developing countries. Recently also the World Bank has spoken out against the massive use of agricultural subsidies by most developed countries.

When looking at the demand side for agricultural research in African countries, enhanced production and productivity still stands out and will continue to be the primary goal for both public and private agricultural research for quite some time to come. In most African countries, food security is still very precarious (and increasingly so), agricultural income extremely low, and the economic transformation process only in its very early stages.

After independence, the demand for agricultural research in most African countries expanded quite dramatically from servicing a limited group of colonial farmers and plantations (often occupying the best land) to servicing all farmers, including a very large group of predominantly subsistence farmers operating under very diverse (and often harsh) agro-ecological conditions. At least that was the intention. This shift in the demand for agricultural research reflected the new political realities and was inserted from the top. However, given the dismal improvement in agricultural productivity in Africa during the past 30 years, one has to conclude that most governments (and their development partners) have grossly underestimated the magnitude of this agenda. The sheer number and diversity of subsistence farmers relative to service providers and their disorganisation virtually guarantee poor service.

The current emphasis on stronger stakeholder participation in formulating the demand for agricultural knowledge and technology (see also section 2.2.3) is an attempt to match the supply of agricultural research better with the demand. It should, as proponents of stakeholder participation believe, shift the supply more to the needs of poor subsistence farmers. This would be concurrent with broader poverty alleviation policies (see section 2.1.3). However, egalitarian / participatory processes do not necessarily result in egalitarian outcomes (Hood 1999). In the end, stakeholder participation may favor the better-organized, market-oriented farmers rather than the weaker-organized, subsistence-oriented farmers. Empowering the smallholders and making their huge numbers a power in transforming African economies needs to be supported by policies and investments that will make them active participants in national economies.

2.1.2 Changing research technologies, methodologies and approaches

During the past 10-20 years, there has been extensive experimentation in Africa with participatory and farming-system research approaches. Currently, there is a major push towards scaling these approaches up and bringing them to center stage in African agricultural research. In Tanzania, for example, the World Bank specified that at least 50% of the research trials should be in farmer fields.

Multi-disciplinary research approaches are increasingly being promoted, often bringing researchers together from different institutions/disciplines and with different backgrounds. More holistic production-to-consumption chain approaches to innovation are also gaining importance. They usually require multiple partners and institutions to come together, resulting in new modes of (research) collaboration.

Emerging new technologies, such as information and communication technologies (ICT) and biotechnology, are having a major impact on agricultural research globally. For most African countries, however, these technologies are also very expensive, which is holding back their rapid adoption.

2.1.3 Changing socio-economic policies

After nearly two decades of harsh structural adjustment policies, which tried to get African economies "back on track," new economic policies have been formulated in many African countries in recent years that have taken a more pro-active stance by setting out clear development goals such as poverty reduction and agriculture-led development.

The World Bank, together with several donors, has played a leading role in developing poverty reduction strategies for most African countries. These strategies reflect the vision of both the national governments and the World Bank of how they intend to target poverty reduction. They tend to have an impact on the demand side of agricultural research by giving greater weight to the needs of poor farmers and by exploring very explicitly how to target agricultural research to the poorest of the poor.

After many years of relative neglect, agriculture is back on the economic policy agenda in many African countries. Increasingly, the conviction has taken hold 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 take a holistic approach, arguing that in order to modernize the agricultural sector many aspects have to be improved simultaneously.

The New Partnership for Africa's Development (NEPAD), bringing together African governments and the donor community, also pays substantial attention to the development of Africa's agriculture as reflected in its Comprehensive Africa Agriculture Development Program document. It proposes three broad mutually reinforcing development pillars comprising: (a) extending the area under sustainable land management and reliable water control systems, (b) improving rural infrastructure and market access, and (c) increasing food supply and reducing hunger (NEPAD 2002).

A more questioning attitude towards the role of government in society has been a widespread phenomenon in market economies all over the world during the past decade or so. Moreover, confronted by severe budget deficits and debts, most African governments have been forced out of necessity to be extremely selective about the tasks they can take on board. So either for political or for practical reasons, the preferred option is to leave agricultural research as much as possible to the market and only go for government intervention when markets fail excessively. This is particularly so in those areas where markets are underdeveloped, unattractive to the private sector, or nonexistent.

2.2 Five Major Reform Themes

The poor performance of the agricultural sector in Africa in recent decades has raised major questions and concerns about the performance of African NARSs. Despite many years of NARS reforms, the need to improve their performance has become stronger than ever. In addition, as we explored in the previous section, exogenous changes in the agricultural research context may also require NARSs to reform.

This study argues that, although it has probably not gone far enough, the NARS reform agenda in Africa has changed significantly in recent years. After two decades of enhancing

central control over national agricultural research activities, 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 1 summarizes the principal contrasting characteristics of the two agendas. In reality, there are all kinds of gray nuances between these black and white contrasts, but we want to argue here that there has been a significant shift in focus.

Table 1: *Shift in focus in the NARS reform agenda*

Old reform agenda	**New reform agenda**
Centralization	Decentralization
Tendency towards blue print approach, one format fits all	Pluriformity in institutional arrangements considered an advantage rather than a handicap
Inward looking, little attention for context	Outward looking, emphasis on context
When focus 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

Characteristic for the centralization period was a strong push towards consolidation of agricultural research capacity into a single national agricultural research institute or under a strong apex body, the introduction of national agricultural research strategies and plans, and centralized priority setting.[4] To finance such a centralized agricultural research plan, all resources should be put together into a single "consolidated" funding mechanism. The dominant system concept was that of a narrowly defined NARS (see section 2.3.1) often consisting of an all-embracing institute (NARI). The emphasis, with the encouragement of development partners and international service organizations, 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 only. The focus of agricultural research was more on research than on development, and if it focused on development is was 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. Research was only responsible for the first part of this linear process.

In contrast, the new reform agenda supports much greater institutional pluriformity and tries to make research organizations outward looking and more in touch with a much broader clientele. Conducting good research is not sufficient. One has also to make sure that the research undertaken is relevant and is being applied. Rather than focusing exclusively on research, the emphasis is on innovations actually being adopted and applied by farmers or other research clients. Partnerships in this process are far more diverse than traditionally

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

perceived. Moreover, in a continent with one of the most diversified farming systems in the world and with huge numbers of smallholder farmers (50-80% of the population) the challenge to reach farmers is easily underestimated and devising mechanisms of reaching a significant percentage of them has yet to make it to the development agenda.

Based on a literature review, the study team identified five principal reform themes as dominating the current NARS reform agenda in Africa. These reform themes are:

(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 the developed countries.[5] However, what stands out in the case of the African reform agenda is the emphasis on decentralization and stakeholder participation – topics that are of relative minor importance in the case of developed countries. In the following section, each of the five themes will be discussed in detail.

2.2.1 Redefining the role of government in agricultural research

The hegemony of neo-liberal economic policy since the collapse of the former USSR and allies in the late 1980s, has led worldwide to a considerable more critical attitude towards the performance and hence role of government in society. The role of government is increasingly been questioned – also in agricultural research. The (some would argue unproven or disputed) claim is that a (considerable) part of the research traditionally undertaken by the government could as well (if not better) be undertaken by the commercial private sector (e.g., agricultural input industries, commodity boards) or civil society (e.g., NGOs, CBOs, farmer organizations). It all hinges on whether there is a clear commercial advantage as well as the relative strength of market or civil society organizations. Moreover, while the government has a responsibility for funding public agricultural research, it does not necessarily mean that the government should implement the research itself. It could contract such activities to third parties.

Figure 2 provides a decision tree that tries to help identifying whether government intervention is warranted or not. It is argued that only in last instance that direct government intervention is needed. Alston and Pardey (1996) argue that governments all over the world have had a tendency in the past to assume responsibility for agricultural research (as well as many other activities) without exploring whether other approaches could be as effective. [6]

Markets, other than very localized ones, are largely absent in subsistence agriculture and so government intervention in the provision of new agricultural technology through markets is not viable option. Hence, under those circumstances the decision tree in figure 1 does not offer another option than government intervention of the more direct type. However, the story

[5] They identify the following major changes in the means of producing knowledge and technology: (a) Guidance of research systems; (b) Emerging financing models; and (c) Emerging implementation models.
[6] They are encouraged in this, of course, by the fact the World Bank and most of the other development partners provide the bulk of their assistance only through governments.

is quite different for commercial commodities – more indirect methods of solving the problem of technology provision are possible and increasingly also practiced.

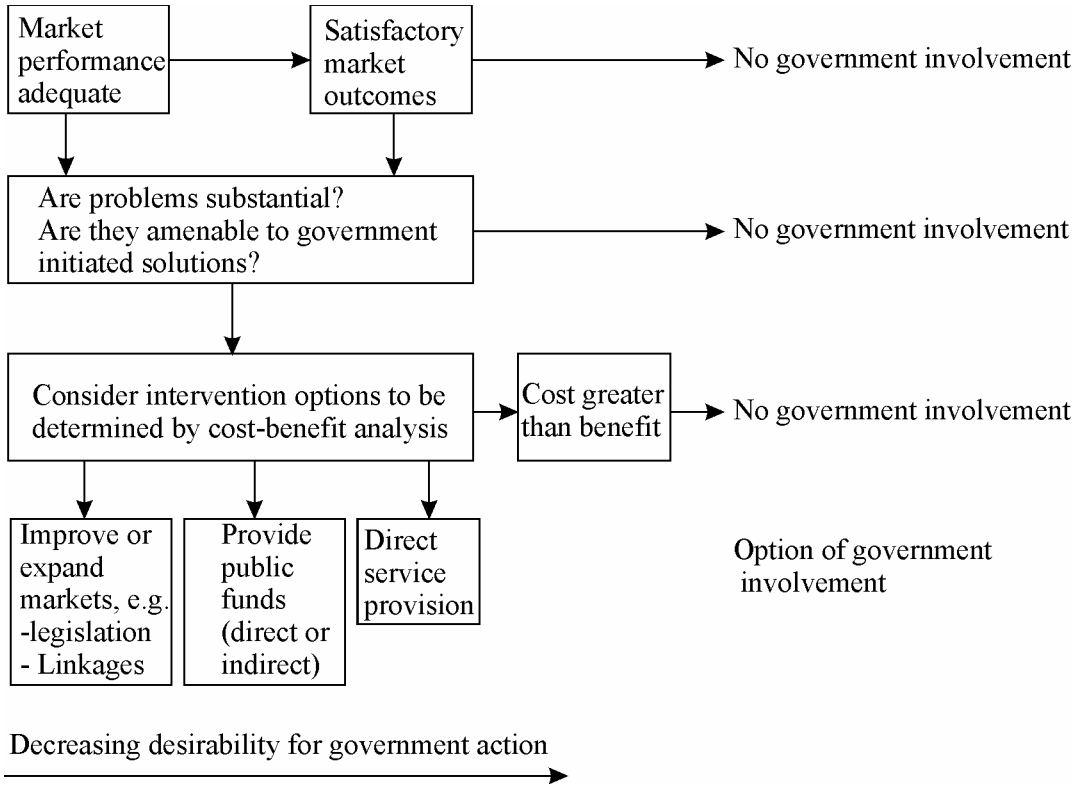


Figure 2: *A decision tree to determine the need for government intervention in cases of market failure*.

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 characteristics. In the latter instance, privatization of agricultural research or shared responsibility for funding, where this is not being practiced already, is being called for. In that way, resources can be freed up for the truly public-good part of the agricultural research agenda (Byerlee and Alex 1998). Moreover, it is believed that stakeholders will scrutinize research priorities more carefully when own resources are involved.

The redefinition of the role of government has also led to an important institutional innovation, namely a clear separation between *funding*, *priority setting*, and *implementation* functions. While in traditional government bureaucracies such functions are usually integrated, by separating them each of the three functions can be executed independently without being compromised by the other. This can help to avoid that government agencies become completely supply-driven and out of touch of the needs of their clients. It will result in 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 *de facto* resulted in a separation of research funding from priority setting and implementation. The latter responsibilities were in most instances handed over to the new organizations, while funding remained the responsibility of the central government. As will be discussed in the section on stakeholder participation, proposed reforms intend to take (at least a part of) the responsibility for priority setting away from the agricultural research organizations and hand it over to farmer groups or district councils. Similarly,

competitive research funds are an example of a merger of the funding and priority setting functions in one agency, leaving the research organizations with the responsibility for implementation only. There are all kinds of variations possible on this theme and there is no *a priori* preference for one approach or another.

2.2.2 Decentralization of agricultural research

One element of making agricultural research more outward-looking, client-oriented and impact-driven, is by bringing agricultural researchers closer to their largest and most prominent ultimate client – the farmers. Hence, one of the major themes of the new reform agenda is that of decentralization of agricultural research. There are four different types of decentralization:

(1) Geographic decentralization of agricultural research capacity from headquarters to sub-national centers;
(2) Decentralization of decision making within agricultural research organizations based on the principle of *subsidiarity* – decisions should be taken at the lowest level possible in the organization;
(3) Deconcentration of (a part of) the responsibility for agricultural research funding to specific client groups, which is in line with stronger stakeholder participation (section 2.2.3) and mobilizing private funding (section 2.2.4); and
(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 dynamics and logic, which are not necessarily favorable to the organization of agricultural research. For example, the political boundaries of provinces and districts may not necessarily be the most logical boundaries for local research centers.

Decentralization of agricultural research at the national level results in a tiered research system with local research focusing on the adaptive end of the research spectrum and national research more on the applied, strategic and basic part. A clear division of responsibilities between local and national research entities is needed as well as an exchange of information and knowledge. Often such a tiered research system already existed, but the point is that decentralization further deepens the differentiation in research focus. Since ensuring that research is applied by end users is now a major focus, it must be emphasized that such stratification of research must not demean the status of those who are engaged in research at the applied end.

While at the national level agricultural research is usually organized according to disciplinary or commodity lines, at the sub-national 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 being produced, etc.

Across all four types of decentralization, it is important to find the right balance between centralization and decentralization. A strong center is a prerequisite for successful decentralization. Without it, organizations will fall apart into isolated, fragmented entities.

2.2.3 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) The stakeholders are consulted in the selection of research priorities (and often also in the research process itself);
(2) The stakeholders of agricultural research actually control the allocation of the agricultural research budget; and
(3) The stakeholders participate in the funding of agricultural research and hence have a strong incentive to control the allocation of the research budget carefully.

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

The second type of stakeholder participation is still relatively rare, but increasingly being promoted by (some in) 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, stakeholders may still not select research priorities very carefully because it is not their own money but that of the general taxpayer that they allocate. In addition, it is important to note that the stakeholders usually do not 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.[7] One of the general lessons from political organization is that the smaller and more uniform the group, the easier it is 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. However, there are also important other 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 make sure that a maximum number of players in each interest group has its fair share in defining the agricultural research agenda. Consumers, for example, may be more interested in food safety issues, the government in research in support of policy measures, and society in general in environmental issues.

Stakeholder participation does not only take place in the problem identification and priority-setting phase of agricultural research, but increasingly also during the implementation and evaluation phases of agricultural research. Participatory research approaches are becoming more-and-more standard practice. However, given the very large numbers of subsistence

[7] Still, also in these commodity-specific research schemes major and often unresolved conflicts over the research agenda may exist between, for example, smallholders and large plantation owners.

farmers in Africa (farming under rather diverse agro-ecological conditions) and the small numbers of researchers, participatory research approaches are ineffective in reaching the large majority of farmers.

2.2.4 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 own income through commercialization of research results were some of the ideas that were contemplated. However, the SFI idea that has attracted most attention has been that of competitive research funds for agricultural research.[8] 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. Not only at the national level, but also at the regional level competitive research funds are becoming increasingly fashionable.

Possible advantages of a competitive research fund are: (1) closer alignment of research activities with (regional, national, or sub-national) 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 underutilized capacity.

There are also possible disadvantages such as: (1) most competitive research funds in Africa do not have a secure, local funding basis (heavy donor dependence); (2) given their small size, transaction costs can be high, particularly in the early stages; (3) it is a financing instrument that is suitable for a (specific) part of the research agenda, but not for the whole agenda; (4) the instrument requires relatively mature research organizations that can handle research contracts; and (5) the instrument does not work in small research systems due to lack of competition.

Another, somewhat less noted innovation in the management and organization of public agricultural research is the increased use of contracts between funding and implementing agencies. Contracts do not only play an important role when public agricultural research agencies interact with private companies, but increasingly also in the interaction between public sector agencies. Competitive research funds, for example, use contract arrangements all the time. Financial resources are provided for given objectives, which can 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 increasingly also formally) to targets and expected outputs.

In addition to funding mechanisms that are new *per se*, one can also notice a shift in existing financing instruments. For example, research-specific surcharges (either voluntary or legally enforced) are making their comeback because of the increased emphasis on private financing of agricultural research. Private financing mechanisms (cess, levy, voluntary contribution)

[8] Abt Associates conducted for USAID a series of country case studies into competitive funding schemes (Abt Associates 2001 a-e). Gills and Carney (1999 a and b) conducted a study into competitive agricultural technology funds in developing countries for DFID.

work best when there is a close correspondence between research costs and benefits. In these instances, the financers will 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.

2.2.5 Strengthening of system linkages

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

(a) focus (commodity, factor, discipline, farming system);
(b) geographical coverage (i.e., local, national, regional, international);
(c) orientation (i.e., adaptive, applied, strategic, basic); or in
(d) addressing specific aspects of the production-to-consumption chain.

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

A complicating factor in the African context is that most African NARS are extremely small in terms of scientific staff. Of the 48 countries in the region, 25 had less than 100 FTE researchers in 1991. Only five systems employed more than 400 FTE researchers (Roseboom, et al. 1998). The percentage of farmers actually reached by the research and extension services tends to be disappointingly low. It is clear that with such limited capacity relative to the number of scatter smallholders, most African NARS are not in a position to cover the whole waterfront of agricultural innovation issues and will have to depend importantly 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, which have the potential of dramatically altering the division of labor between the various research partners. So, not only at the local level new ways of organizing agricultural research may require new linkages to be established, 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.

2.3 Schools of Thought Shaping the Current Reform Agenda

Two schools of thought were identified that have strongly influenced the current reform agenda: *new public management* and *system 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 *system analysis* ideas and concepts. There are no less than three system concepts that shape up current discussions about agricultural research and innovation: (1) national agricultural research system (NARS); (2) agricultural knowledge and information system

(AKIS); and (3) national system of innovation (NSI). The three system concepts will be discussed in section 2.3.1. The new public management thinking will be discussed in section 2.3.2.

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

The NARS, AKIS and NSI concepts are all three rooted in system theory and analysis. Adopting a system perspective helps to analyze complex phenomena by means of simplification (Hartwich and Meijerink 1999). Any system under study is usually part of a larger system and consists of interlinked sub-systems. There is specialization in the system and hence interdependence. Hence, the system itself is bigger than the sum of its sub-systems.

System analysis emphasizes four different dimensions of a system: (1) system structure and its elements; (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.

An issue of continuous confusion is that of the difference between hard and soft systems. Table 2 summarizes the principal differences between the two. Because system analysis started off in the "hard" sciences, most people are more familiar with the hard than with the soft system concept. However, it is the soft system concept that is the more relevant one when studying social phenomena like research, knowledge or innovation systems. A soft system is a social construct that only exists in the heads of people. For many reasons, however, people often try to treat a soft system as a more tangible, hard system. For example, discussions about which agencies or activities should be considered part of a certain system and which not are endless, because there are no hard boundaries to begin with nor necessarily common objectives.

Table 2: *Hard versus soft systems*

	Hard systems	Soft systems
System objectives	Pre-defined	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).

We are used to talk about soft systems in day-to-day language as if they really exist. For example, we talk about the education system, the legal system, the financial system, etc. Nevertheless, one should be aware that it is an analytical concept that we use to describe a loose conglomerate of different agencies that perform a similar task and not a real entity.

The NARS concept has been around for some 25 years now and has become a household name in agricultural research. Nevertheless, inherent to the fact that it is a soft system, no watertight definition of a national agricultural research system exists other than it is a loose conglomerate of agencies or actors involved in conducting national agricultural research. Trying to pin the NARS concept down more precisely just leads to a whole series of rather arbitrary borderlines.[9] In addition, it does not really matter whether linkages between those various agencies or actors actually exist or not, the fact that they are often nonexistent or weak is in itself already an insight that a NARS perspective may provide.

The AKIS concept is slightly less well known than the NARS concept, but has gained a lot in popularity in recent years. AKIS combines agricultural research, extension and education in one system (also known as the knowledge triangle – see figure 3) and focuses on how the three activities generate 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 land-grant universities in the late 19th century, the linkage problem is still acute in most countries.

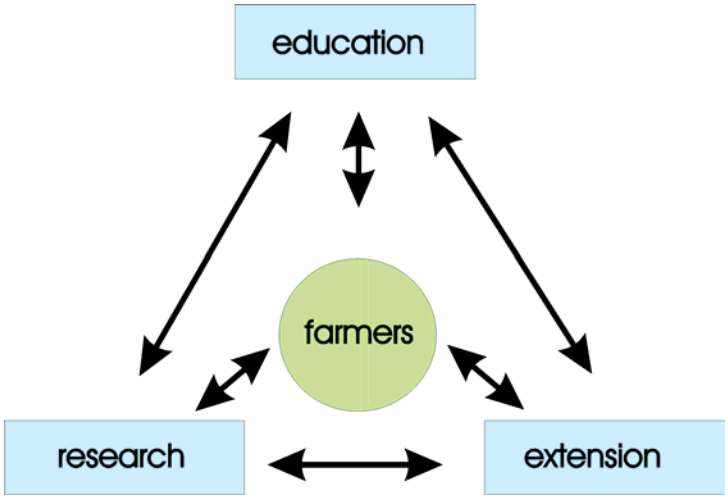


Figure 3: *The AKIS model*

Nagel (1979) was the first to describe the properties of an agricultural knowledge system (AKS) in detail.[10] Röling further developed and popularized the concept during the 1980s (Röling 1986, Röling 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 a Strategic Vision and Guiding Principles on the topic in 2000. This document (FAO and World Bank, 2000) 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 extensionists to harness knowledge and information from various sources for better farming and improved livelihoods."

[9] Also within ASARECA there is an ongoing discussion of who should be considered part of the NARS and who not.

[10] It is only recently that information has been explicitly added to the AKS concept and that the name was changed into AKIS.

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

The study of NSI started with rather simple and descriptive analyses of innovation systems that tried to explain differences in innovation activity and performance across countries. More recently, however, 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."

Being such a young field of study, definitions have not settled down yet and the analytical emphasis changes from author to author. 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 look upon it more broadly as a certain aspect of the economic process located in almost every part of the economy (Johnson 1997). Lundvall (1992), for example, emphasizes 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.* It determines largely what is going to be learned and where innovations are going to take place.

Four broad categories of learning and knowledge accumulation that shape up innovation processes can be identified: (1) learning as 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 jointly, although their relative importance varies across firms, industries, and economies as well as over time.

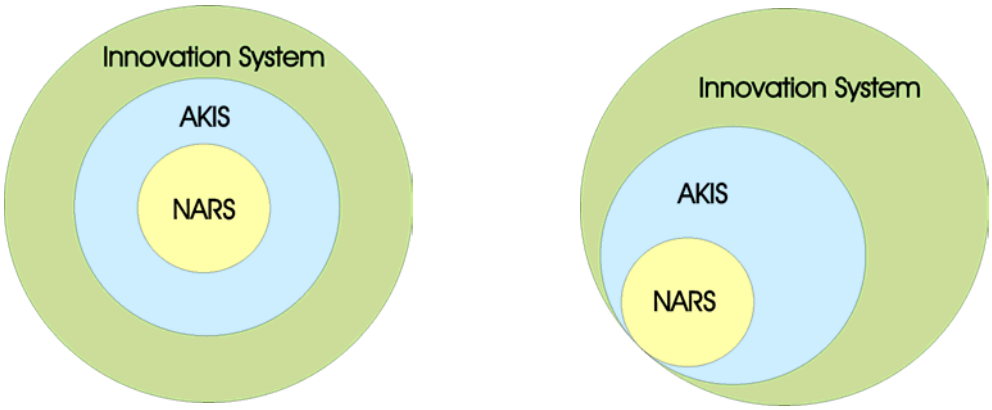
The NSI approach stresses and focuses on the differences between the various systems rather than abstracting from them. It usually takes a strong historical perspective because differences in today's institutions and organizations have their origins in the economic and

socio-political history of a country. In that sense, a unique, optimal NSI does not exist; instead, there are multiple NSIs with varying strengths and weaknesses.

One of the pioneers in applying the NSI concept to agricultural research in developing countries is Andy Hall. In a recent paper (Hall and Yoganand 2002), the following features are highlighted 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 of the activities and processes associated with the generation, production, distribution, adaptation and use of new technical and institutional, organizational or managerial knowledge.
(2) By conceptualizing research as part of the wider process of innovation, it helps identifying the scope of the actors involved and the wider set of relationships in which research is therefore embedded.
(3) Because it recognizes the importance of both technology producers and technology users and that their roles are both context specific and dynamic, it breaks out of the polarized debates of technology push versus demand pull theories.
(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 shapes outcomes of the system as a whole. This aspect is enormously important for introducing a poverty focus. The framework provides a lens to examine and reveal which agendas are being promoted, highlighting the arena in which the voice of the poor can be promoted.
(5) It recognizes this as social system. In other words, it does not just focus on the degree of connectivity between the different elements, but the learning and adaptive process that make this a dynamic evolutionary system.

While each of the three system concepts has its own strengths and weaknesses, they can be seen as interlinked and well as follows: 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 could depict the connection as in figure 4a.



(a) (b)

Figure 4: *Linking NARS, AKIS, and NSI*

The problem with figure 4a is that it still depicts research as the sole source of innovation. Without research, there is no innovation. We are still held hostage by our linear thinking. Another way of depicting the link is shown in figure 4b. The NARS is no longer seen as the epicenter of innovation but considered one of various sources. Knowledge and information may spill into the NSI from other sources than the NARS, and, perhaps even more crucially, knowledge and information may emerge outside the realm of formal research because of on-farm learning by doing, using, or interacting.

2.3.2 New public management ideas and concepts

Since the 1980s, a reform movement in public management has spread around the world, known as the *new public management* school. This reform movement, which aims at fostering a performance-oriented culture in a less centralized public sector, shares a common set of six core characteristics:

(1) *productivity*: try to find ways to squeeze more services from the same-or smaller-revenue base;
(2) *marketization*: contract out the implementation of policies to the private sector or to semi-autonomous, nonprofit agencies and replace traditional bureaucratic command-control mechanisms with market strategies;
(3) *service orientation*: to make government programs more responsive, turn the service delivery system upside down. Instead of designing programs from the point of view of service providers and managing them through existing bureaucratic structures, reformers try to put citizens (as service recipients) first;
(4) *decentralization*: transfer more service-delivery responsibilities to local governments and to front-line managers;
(5) *policy*: separate government's role as purchaser of services from its role in providing them; and
(6) *accountability for results*: focus more on outputs and outcomes instead of processes and structures. Replace top-down, rule-based accountability systems with bottom-up, results-driven systems (Kettl 2001).

Although new public management (NPM) has often been associated with anti-government sentiments, NPM is *not* about whether tasks should be undertaken by government or not. It is about getting the public sector working better.

Australia, New Zealand and the UK are well known for their early experimentation and adoption of NPM ideas and concepts during the 1980s.[11] In recent years, these ideas and concepts have become increasingly popular and spread quickly around the globe, including many developing countries. Hence, experiences with NPM approaches are accumulating rapidly.

To date, the experiences with NPM approaches in both developed and developing countries are somewhat a mixed bag. There are great successes, but also major failures. Overall, the outcome seems to be (for the moment) that NPM approaches can improve government performance somewhat, but not to the extent that some of its advocates want us to believe. Many of the proposed changes derail due to unexpected complications, have negative side

[11] Other relatively early adopters have been: Canada, Chili, the Netherlands, South Africa, Sweden, and the USA.

effects that reduce the positive gains, or come with extremely high adjustment costs. One of the reasons why NPM may be less successful in developing countries is that governments themselves are often not trustworthy partners in contract arrangements due to late or non-payment or inconsistent policies. Hence, service providers do not feel obliged to deliver either.

Batley (1999), who has studied a series of new public management interventions in developing countries, provides some insightful observations that are also of relevance to the current study:

(a) Indirect – regulatory, contracting, financing and enabling – roles of government are usually weakly developed.
(b) Experience in contracting should be developed progressively, focusing first on cases where services are less critical and can be specified and measured. Particularly for research, the specification and measurement of research service delivery is complicated and difficult.
(c) Managerial autonomy needs to be within a clear policy framework and matched by ex post managerial accountability to users or elected representatives. If the accountability mechanism does not work properly, decision-making power ends up with the service managers.
(d) Where radical reforms to service delivery mechanisms are externally imposed under crisis conditions they are rarely effectively implemented.

2.4 Quality Criteria to Evaluate Agricultural Research Systems

The pressure on African NARS to reform is based largely on the poor performance of the agricultural sector during the past 30 years: production has expanded but productivity, as measured by the average productivity of agricultural labor, has contracted in most countries. Agricultural yields have also been level or falling for many crops in many countries (World Bank 2002). Despite this disappointing result at the macro level, Alston et al (2000) and Evenson (2001) report, based on a substantial number of rate-of-return studies, a median rate of return on investments in agricultural research in Africa in the order of 34-37%, which is only slightly lower than in most other regions of the world. Hence, the World Bank argues that the technological lag in African agriculture is primarily a symptom of underinvestment and lack of adoption, not of low rates of return to research (World Bank 2002). Without agricultural research, the agricultural sector would have performed even worse.

Nevertheless, 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. Janssen and Braunschweig (2002) propose a set of eight quality criteria that characterize relevant and efficient NARSs. They adopted these criteria from Byerlee and Alex (1998) and Pineiro (1999). The eight criteria are:

(1) Separation between 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; and
(8) Presence of adequate legal frameworks

Some of the current NARS reform themes in Africa very specifically target a particular quality trait of a NARS, such as stakeholder participation. That does not mean, however, that such a reform does not have an effect on the other quality traits, either positively or negatively. In chapter 3, we will explore how the different reforms score across these eight quality criteria.

2.5 Conclusions

In an attempt to summarize and provide insight into the current NARS reform agenda in Africa, we identified five major reform themes, three factors shaping the external context of agricultural research, and two underlying schools of thought. They do not necessarily give a complete picture, but we believe that they capture the essence of the reforms currently being undertaken.

When it comes to the two underlying schools of thought that shape the current reform agenda, they both have their roots in a variety of economic and social theories. We could have further elaborated, for example, on the influence of institutional economics, contract theory, and evolutionary theories on the two schools of thought and hence the reform agenda. We have opted not to do so, given the limited scope of the current study. Similarly, a deeper analysis of the external factors shaping the NARS reforms in Africa could be possible.

The next chapter presents the findings of our seven case studies regarding the five reform themes and looks at how they score across the eight quality criteria.

3. Country Case Studies

To obtain a better understanding of the NARS reform agenda and how it works out in practice, case studies have been conducted in seven African countries. In addition to four ASARECA members (Ethiopia, Kenya, Uganda, and Tanzania), three West African countries were studied (Côte d'Ivoire, Ghana, and Senegal). These seven countries were selected because they are currently reforming their NARS with assistance of the World Bank. They can be considered the more dynamic NARS in the region and are therefore not necessarily representative for the rest of the NARS in sub-Saharan Africa.[12] Nevertheless, the case studies may provide important insights and experiences for other African countries that are contemplating reforming and strengthening of their NARS. The study also benefited from a series of recent studies (covering six of the seven case study countries) conducted by Abt Associates for the Sustainable Financing Initiative sponsored by USAID and SPAAR (Abt Associates, 2001a-e).

Annex 1 provides some selected characteristics of the seven case study countries. The World Bank classifies all seven countries as highly indebted, low-income countries. Nevertheless, Ethiopia and Tanzania stand out as 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 score lower than Tanzania. The share of agriculture in 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 quite some margin in the East African countries and Senegal. In 2000, agricultural output per capita in these countries ranged between 60-80% 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 back where it was 30 years ago. During the past 30 years, agricultural labor productivity only improved in Côte d'Ivoire. In Senegal, Tanzania, and Uganda, agricultural labor productivity was in 2000 about 20% lower than 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, however, the countries that have been politically stable (Kenya, Senegal, and Tanzania) have not outperformed the politically unstable countries in any significant way.

This chapter is structured as follows: section 3.1 summarizes our findings from the different country studies across the five reform themes, section 3.2 assesses the different reforms in relation to the eight NARS quality criteria, while section 3.3 draws conclusions.

3.1 NARS Reforms

Table 3 summarizes for each country the types of reforms that have been or are in the process of being implemented. The numbered headings correspond with the five reform themes. In annex 2, we have summarized the main NARS reform highlights for each of the case study countries. For more detail, we also refer to the specific country reports. In the following sections, we will briefly discuss the main findings across the five the reform themes.

[12] 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 3: *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 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	Eco-regional	Federal	Eco-regional	Eco-regional	Eco-regional	Eco-regional	Eco-regional
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 Co-financing	Planned	Minimal	Minimal	Commercial commodities	Planned	Commercial commodities	Horticulture
3.4 Research implementation		Encouraged	Encouraged	Encouraged		Highly encouraged	Encouraged
4. Emerging financing mechanisms							
4.1 Competitive research fund	Planned	Planned	Second attempt planned	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 collaboration	Planned	Limited	With university	Limited	Supported by competitive fund	Limited	Limited
5.2 Role university	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

3.1.1 Redefining the role of government

The following three aspects in the governance of agricultural research were identified across the seven case study countries: i) Granting agricultural research organizations a degree of administrative autonomy by freeing them from restrictive civil service regulations; ii) Separation between research funding, priority setting and implementation; and iii) Stricter application of the public good argument, leading to an increase in cost sharing and public-private partnerships or to siphoning off certain parts of the research agenda to the private sector altogether.

Granting of a degree of autonomy from civil service regulation by placing research under governing boards, which draw membership from a wide selection of stakeholders and institutions, is now general practice and was observed in all the seven countries – even in Tanzania where research is nominally a civil service department. The latter was the only case of autonomy regression, i.e. reversal of semi-autonomous agricultural research organizations back to the civil service. As a civil service department, its board has circumscribed authority. Nevertheless, this more restrictive administrative setup 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 as they intend in the medium to long run to consolidate all funding for the agricultural research system in one competitive research fund. One has to seriously doubt whether this is a viable proposition. [Comment: this duplicates with section 3.1.4]

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 (specifying the expected output) in the management of agricultural research.

In all seven countries, except Ethiopia, explicit attempts are underway to *privatize* certain parts of the public agricultural research agenda. The most common way 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 malting barley, oils seeds, pigs, pyrethrum, sugar and horticultural crops. In some instances, attempts are underway to also 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 whatsoever, but has a long tradition dating back to colonial times (e.g., cacao in Ghana and coffee and tea in Kenya). The overall picture emerging is that African NARS are gradually becoming more pluralistic with more private sector involvement. Nevertheless, there is still a lot to be achieved in strengthening and developing the agricultural private sector in Africa, and particularly so in the smaller and poorer countries.

Proponents of stronger private sector involvement in agricultural research financing argue that it could help freeing up government resources for research relevant to poor subsistence farmers. Others, however, are concerned that the call for agricultural research to diversify its

funding base may lead researchers to work largely, or even exclusively with those who can contribute to research financing. For example, in the models developed for the two Francophone countries in the study, there is a large measure of privatization of the research service in that farmers' associations, agribusiness community (exporters, processors, input suppliers, commodity traders) and other beneficiaries are being called upon to contribute and own the research program. The intention is to pay incentives to researchers according to their proven contribution to farming profitability. Without spelling it out, the proposed system is heralding withdrawal from research (or at least benign neglect) for the peasant farmer engaged in subsistence food production and livestock keeping. Even if the government were able to provide funding for the poor, there will be relatively little incentive for researchers to work in that area. What might emerge is a two-track research system with a reduced number comprising not the most brilliant researchers, drawing low salaries, conscripted to the poverty war while the best researchers work on those commodities for which there is privatize funding.

A contrasting example, however, comes from the Tanzanian southern agro-ecological zone, the country's most important cashew-nut growing area. Reacting to a research-led reversal of a long downward trend in cashew-nut yields, producer organizations, with active support from both the local government and the Ministry of Agriculture, decided to increase the surcharge on cashew production and use these funds to also finance research on commodities other than cashew, but important to the local community (Abt Associates, 2001e). To provide incentives to researchers and their support staff, producers proposed and the government agreed, that "adequate" additional income packages to their normal government salaries would be paid out of the surcharge. It would appear to be a viable formula for wealth creation all round. What is important to realize in this given example is the congruence between who pays for the research and who benefits from it. It will be far more difficult to convince producers of a commercial commodity to subsidize agricultural research that will benefit others than their own community.

3.1.2 Decentralization of agricultural research

Decentralization of research by *physical dispersal* of research facilities, an expensive exercise to start *de novo*, has been accepted in principle in all the seven African countries. It is seen as an important step towards more adaptive research and farmer participation. In six countries, the intention is to have eco-regional centres as the lowest decentralization limit for research, even where a decision has been taken to devolve general agricultural administration (particular extension) to districts (four of the six countries) or lower (one country). In the remaining country, Ethiopia, the stimulus for decentralization was political in that it was driven by a desire to establish a federal system of government and encouraging each state or province to have, where possible, its own research centers. A decentralized research infrastructure is more-or-less in place and operational in all seven countries, except for Ethiopia and Uganda. In Ethiopia, six brand new research stations are to be built, while in Uganda 12 existing facilities have been designated to become Agricultural Research and Development Centers and are being refurbished. In both instances, research staff will have to be transferred to these regional centers or new staff hired. In Côte d'Ivoire, Ghana and Senegal, also some relocation of research staff to regional centers is considered necessary. However, relocation of staff to regional centers is often problematic due to the lower living standard to be endured in such locations as well as safety issues. Moreover, poor communication facilities severely hamper access to information and exchange of ideas and experiences with colleagues in other locations.

Another, perhaps far more limiting factor in the decentralization of agricultural research capacity are the small numbers of researchers employed relative to the farmer population. With agricultural labor to researcher ratios ranging from 15,000 to 50,000 (annex 1), it is clear that there is a limit to how close one can bring research to the farmers. Just for comparison: the agricultural labor to researcher ratio in developed countries was about 400 in the early 1980s (Pardey, Roseboom, and Anderson 1991) and has most likely further declined in recent years.[13] The interaction between farmers and researchers in the developed countries is of a completely different order than that in African countries. Farmers in developed countries are relatively few (2-5% of the working population), well organized, can very well articulate their technology demand, make use of the latest communication and information technologies, and can be reached easily through the market or their own professional organizations. In contrast to African countries, most developed countries are moving towards consolidation of agricultural research capacity in fewer locations because being physically close to the farmers has become less relevant.

The principle of decentralization of responsibility for research design, implementation and evaluation to sub-national levels in the research organization appears to have been accepted in at least six countries although the mechanics of devolving financial responsibility are still evolving in all studied countries. In Tanzania, the zonal centers have wide devolved powers for regular programmes as well as for the zonal competitive funds. Zonal Executive Committees, with substantial stakeholder representation, have been established in each of the seven agro-ecological zones of the country and granted financial and operational responsibility for agricultural research in their zone. Their obligation is to ensure that details of their expenditures are regularly communicated to the headquarters and also that all transactions are conducted according to standard government regulations. In Kenya, all research centres, national and regional, have authority to spend certain types of funds, such as locally generated revenues. In Ethiopia provincial research centers answer to respective states/provinces and not to the national headquarters.

Recent reviews of government decentralization in Africa and elsewhere are not particular positive about it. There are no clear indications that decentralization has made government more efficient and effective as was expected (Farrington 2002 a,b). Nor has decentralization made government services more pro-poor. Part of the reason for this relates to the difficulties encountered in accurately assessing the views and needs of unorganized populations. At the local level, power relationships play out in the same way as at the national level – a small elite controlling the decision-making (Crook and Sverrison 2001). In addition, actors at the center can very effectively frustrate decentralization by holding on to authority and resources. Even when these have been nominally transferred to local governments, actors at the center could try to recapture them (Wunsch 2001). Whereas power play is always a possibility, it was not reported as an important issue in this study. In Tanzania, there was considerable debate about overall administrative decentralization to the districts instead of stopping at the zones. The efficiency of the zonal system as practiced by agricultural research had convinced many that it was a more viable than the untested district administrative system. But in the end dominant development partners, perhaps with the all too frequent “one model fits all” won the day.

[13] These figures do not include the researchers employed by private agricultural input and processing industries. Inclusion would sharpen the contrast in research capacity even further.

3.1.3 Stakeholder participation

One of the major criticisms on African agricultural research is that it is not meeting the demand for new agricultural knowledge and technology of millions of poor subsistence farmers. In all seven countries, stakeholder participation is strongly promoted as a way to mobilize and articulate agricultural research demand. While an improvement on the old supply-driven research models, stakeholder participation in agricultural research formulation tends to work well for those farmers who are integrated into the market, well organized and capable of articulating their needs. These are, however, a small minority in Africa although often economically important. The large majority of the African farmers is not integrated into the market, dispersed, and poorly organized. Although 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. Experience in countries such as Kenya, where promotion of farmer organizations has been on-going for several decades, indicates that after they are formed maintaining them as functional entities is difficult. This is even so for farmer organizations that focus on commercial commodities. Their long-term viability appears to be closely tied to economic and political stability. Smallholder farmer organizations for food crops (or non-commercial, livestock keeping pastoralists) have generally not proved a success. Farmer cooperatives in Africa often have had a similar fate (Hussi, Murphy, Lindberg, and Brenneman 1993). Therefore getting a coherent voice through stakeholder participation to guide research is likely to remain elusive in subsistence agriculture.

Even where conditions for farmer participation exist, balancing the interests of farmers according to commodities, economic or social standing or gender must be watched carefully. Of the seven countries, Côte d'Ivoire and Senegal have adopted the most far-reaching plans to involve farmers and farmer groups in agricultural research guidance. Although these plans have not undergone a successful run yet, it is quite revealing that the poorest stratum of farmers, those engaged in subsistence food production and livestock keeping, have no prominent roles in the proposed models.

That there is exclusion of the poor subsistence farmer in the more ambitious proposed research guidance systems might be a tacit admission that, even at this time, where poverty alleviation is a strong focus, working "with the better endowed farmers" could be a viable strategy and not an epithet. Although not explicitly spelled out, the West African models appear to suggest a two-track research guidance system. The first, for commercially oriented commodities, would be guided and (co-)financed by organized trade oriented groups while the second, for the poor and still unorganized producers, would continue to rely on a "civil service" structure that has not been quite worked out or explained. Byerlee and Alex (2002) differentiate the latter group into one with a possible future in commercial agriculture and one for which such future is unlikely due to unfavourable production conditions. For this latter group, diversification out of agriculture is the only opportunity to escape permanent poverty. Alternative policies are needed to make such transition possible.

There is a tendency in all seven countries to equate "stakeholder participation" with "farmer participation" and, more specifically, with participation by the better-organized, commercial farmers. Other (potential) stakeholders like agricultural traders, input suppliers, transporters, processors, consumers, CBOs and NGOs are often neglected as well as the large majority of subsistence farmers. Catching a substantially wider and more balanced net of stakeholders is a prerequisite for stakeholder participation to deliver what is expected from it: better articulated demand for agricultural knowledge and technology.

In recent years, more decentralized stakeholder participation models have emerged as part of the decentralization agenda. Local (rather than national) farmer organizations are to interact directly with researchers at the local research stations. This may happen in a consultative way in the form of farmer research groups or as part of farming systems' research. A step further is, first, to devise ways to induce farmers to form strong sustainable groups and then to give such easier to service local farmer groups control over the research budget and hence full control 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, thus building upon existing government structures and mechanisms. This may be a preferred option when farmer organizations are weak or nonexistent. However, a concern is that also local district councils are usually poorly equipped to perform the research formulation and priority-setting task delegated to them. How to harness them to do so may be a topic for further research.

While quite a bit of experience has accumulated during recent years on farmer participation methods in special projects, the major difficulty lies in how to upscale such approaches into a nation-wide system of farmer participation in agricultural research. Mobilizing farmer groups or local authorities and turn them into active stakeholders of agricultural research requires a lot of social capital and social engineering. The assumption that this will happen automatically when you transfer responsibility to them has to be doubted seriously.

3.1.4 Emerging funding mechanisms

In all seven countries, government contributions are disbursed mainly as 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 inputs that can be purchased (number of positions, salary levels, operating expenses, etc.). How those inputs are to be used and what they will produce is usually not specified explicitly. The emphasis is on input financing rather than output financing. Other providers of resources (donors, private sector, etc.), however, place more emphasis on what is to be produced by the research they finance and specify this in contracts.

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

While endowments funds have not taken off in any of the seven countries,[14] *competitive research funds* have been established in all seven countries and stand out quite prominently as a new and innovative way of disbursing research funding. Since the early 1990s, experiments with competitive research funds have taken place in various African countries.[15] Recent evaluations of these experiments indicate that most of the early competitive research funds have known a rather slow and rocky start or no start at all.[16] During the 1990s, most funds had a modest turnover (generally less than 3% of the total agricultural research budget),

[14] Kenya is still contemplating setting up one.

[15] 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.

[16] See Chema (1999a-c), Dufaut (1999), Gill and Carney (1999) and Abt Associates (2001a-e)

but rather high management costs (25-50%).[17] They are often viewed as exogenous and depend almost fully on donor funding. National governments have generally failed to regularly honour their modest financial commitments to these funds. Until competitive research funds become consciously internalized by the host governments and become instruments of clear public policy, they will probably continue to struggle.

The more recent competitive research funds proposed for Senegal and Côte d'Ivoire are much more ambitious and appear to be targeted at commercial producers and away from subsistence smallholder producers. They are much larger and embrace a wider spectrum of stakeholders. They also, given the need for policy changes and concrete financial commitment by government, have encountered numerous impediments and are yet to be fully operational several years after they were initiated. They appear to be largely externally induced and funded and not the result of a conscious national evolution.

In the longer run, the proposed schemes 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 commodity. This could lead to a loss of interest on part of the private sector to contribute to the fund. Donors may have similar sentiments. Therefore, a research system that assumes a diversity of funding sources and priorities may not be ideal on paper, but could be more realistic.

Another concern is related to the apparent attempt to make the fund the only source of financial support (Abt Associates, 2001c). The fear is that it is not designed to support recurrent costs, infrastructure, and long-term training. Elliott (2000), summarizing the main conclusions of an international workshop on competitive research funds, argues that such funds are a valuable complement to institutional funding, but not a substitute.

Initially, the competitive research funds considered the selection of research projects a scientific task, but increasingly stakeholders have been given a greater say in the funds. This is particularly so in Côte d'Ivoire, Ghana and Senegal where the competitive research fund is expected (at least in theory) to consolidate most if not all research funding. In the other four 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* (i.e., levy or cess) on commercial (export) commodities to finance agricultural research has a long tradition in most African countries, dating back to colonial times. A revival of their use seems to be in the making. The funds can be collected through various channels including marketing boards, processing industries, or by customs at the border. In most former French colonies, however, no surcharges were collected. Instead, the money for research was paid for directly by monopolistic marketing boards or processing industries. The breakdown of these monopolies under structural adjustment programs during the 1990s has eliminated an important source of funding for research on export crops, which, as far as we know, has not been replaced by a new mechanism to date.

[17] Actual transaction costs have been even higher, considering the time researchers have spent on developing proposals that have been rejected. Introducing a staged selection procedure (first submitting a project idea, before developing a full proposal) can reduce the latter, while a higher turnover may bring management costs down significantly.

One of the problems most NARS encounter when they try to introduce or expand the use of surcharges to finance agricultural research is that Ministries of Finance, supported by the fiscal experts of IMF and the World Bank, often oppose the introduction of such tax instruments vehemently. Another option, a system of *voluntary contributions*, only works reasonable well in sub-sectors with few producers. The problem of free riders can be quite serious and defeat the whole mechanism. In that sense, Côte d'Ivoire is taking a great risk by assuming that the private sector will be able to voluntarily provide a major part of the funding for agricultural research.

Using a carrot (in the form of a matching grant scheme), rather than a stick (taxation), is another tool that may support a voluntary contribution scheme. A *matching grant* scheme, financed with World Bank loan money, has turned out an effective instrument in mobilizing funding from local districts and NGOs for the Zonal Agricultural Research Funds in Tanzania. However, except for Tanzania, we did not encounter the use of matching grant schemes in any of the other countries. Nevertheless, implicit matching grant schemes with a simple construct do exist in most countries -- the government pays for salaries and infrastructure, while a third party (commodity boards, farmer organizations, NGOs, or donors) pays for all operating costs. In the financing literature, matching grant schemes are quite popular as an instrument that could facilitate public-private collaboration in agricultural research.

Funding by third parties, like donors, private companies, producer organizations, or NGOs, is increasingly been 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 to top up the salaries of the researchers and technicians involved. In one country, for example, the scientists (and the technicians assisting them) winning contracts 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.

3.1.5 Strengthening of system linkages

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

Research-extension linkages are considered problematic and are under scrutiny and remodeling in all seven countries that have been studied. In part, this has been due to the poor performance or even collapse of the extension services in these countries. The training and visit (T&V) system, which has been very popular and aggressively endorsed by the World Bank, has turned out to be a disappointment in almost all countries where is has been adopted. The percentage of farmers reached by the T&V approach on a regular basis never exceeded the 10% in most countries, leaving the large majority of subsistence farmers untouched. Gautam (2000), for example, studied the Kenyan T&V system and concluded that:

> *"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……in 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."

Attempts to revitalize extension are currently underway, but adopting radical new approaches. Côte d'Ivoire and Senegal, for example, are privatizing their extension services, whose financing will depend largely on contributions coming from producer organizations, which are dominated by commercial farmers. It is very doubtful whether poor subsistence farmers will benefit from this reorganization. There is a great risk that they will be further marginalized. In Uganda, privatization is predicated on success in "doing away with subsistence farming" which is a credo in its Plan for Modernization of Agriculture (PMA) – thus again focusing on tradable commodity surpluses and all the necessary post-harvest arrangements (infrastructure and local as well as external market improvement, processing or value adding, etc. being addressed at the same time). For subsistence farmers, alternative extension providers (NGOs, CBOs, farmer organizations) are being factored in. A cautionary note would be that those organizations are stable as long as the external support holding them together lasts. It is also difficult to imagine that they will find an effective formula for reaching the large numbers of subsistence farmers.

The difficulty of servicing scattered farmers is well illustrated by Kenya's experience. In that country, 15 years of World Bank mediated T&V left public extension in a situation indistinguishable from what was obtained in the preceding 15 years. With thousands of extension agents distributed to location level in most areas, farmer contact remained very low (Gautam 2000). The T&V project was not renewed after expiry in 1997. Alternatively, KARI has greatly expanded its outreach program in recent years through the Agricultural Technology and Information Response Initiative (ATIRI), a competitive program considered quite innovative. Within the first fifteen months of launch, contracts have been established with 170 NGOs, CBOs, and other intermediaries reaching about 22,000 farmers (Muturi 2002). Considering the fact that there are over 3 million smallholder farmers, KARI's outreach is currently not more than a drop in the ocean and it has to be seen whether this approach can be scaled up to reach millions given the limited resources available. As we have mentioned before, effective networking with the majority of unorganised, scattered farmers is going to be extremely challenging and whose feasibility in terms of personnel, financial resources and likely payoff have never been worked out properly.

National forums for agricultural research have been established in most countries in order to improve *linkages* among 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 in the other countries such forums have remained informal. In addition, there are also various component-specific linkage mechanisms hat 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 *multi-disciplinary* teams in major programs.

Joint research ventures with the private sector are sought after in all the countries with a tradition of commercial agriculture. For example, a common "joint venture" is that public research institutions conduct field trials or provide laboratory services for private companies. Kenya's experience is that such joint ventures are often transitory and that when companies

grow they tend to develop their own in-house research or laboratory capability. In such instances, the companies often hire the scientists they can entice from the public institutions they originally collaborated with. For private companies whether or not to go into joint ventures with public research organizations depends importantly on trade secrecy and quality control considerations.

Cross-border *research networks* play an important role in agricultural research in most African countries. They play an important role in facilitating information exchange and in providing access to donor funding as well as to international expertise. However, cross-institutional and cross-border research projects are not very common yet. This may change in the future. Two of the three sub-regional research organizations in Africa were specifically set up to coordinate research networks. ASARECA, for example, currently oversees 18 of such networks. In addition, countries may participate in research networks that are pan-African or global.

In five of the seven countries, *universities* (in particular faculties of agriculture) are playing a minor role in the agricultural research system. Only in Tanzania, an agricultural university has been given a specific zonal research mandate along with some financial support to carry it out. In Ghana, universities participate actively in commodity research (coordination) committees. In all other countries, universities tend to set their own priorities and operate at the periphery of the agricultural research systems. Some of the competitive research funds are trying to address this situation by specifically inviting university staff and students to submit proposals. While a step in the right direction, the amount of funding made available is very small.

Multi-institutional programs are still rare in African countries and where they occur they are usually exogenous and instigated by availability of funds for the purpose. In developed countries, however, multi-institutional programs are gaining importance rapidly (Janssen and Braunschweig 2002). There is optimism that 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 discussed as important reforms are being contemplated. Further integration of the three levels may lead to more research specialization, greater interdependence, and hence stronger linkages. The expected outcome of this integration is that more can be achieved with the same resources. However, it requires a substantial amount of mutual trust and finding appropriate ways to share research costs.

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, however, is that it depends completely on donor funding. No national commitment has materialized to date.

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

Although not an easy question to answer, we tend to believe that the current NARS reforms are a positive step forward. Overall, they contribute positively to the eight NARS quality

criteria as described in section 2.4. However, whether improvements actually materialize, depend critically on how well the proposed reforms are being implemented and adopted. We have identified several areas where we tend to have doubts about the feasibility or impact of the proposed reforms and which we have 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, however, to occur in subsistence farming systems predominating in Africa. All indications are that for the vast majority of smallholders private-sector involvement in research will grow inversely with the decline of subsistence agriculture. Only Uganda has a clear long-term policy and commitment aimed at the commercialization of agriculture and realigning all relevant government instruments to achieve this. Even then, to shift a part of the responsibility for (financing of) agricultural research to the private sector requires careful institutional engineering on the part of government. Research areas to be privatized have to be selected carefully and opportunities to privatize may be limited.

Decentralization: Physical decentralization of research facilities is accepted in principle in all the seven African countries. However, finding the right balance between centralization and decentralization in agricultural research is a permanent issue. While centralization of research capacity may increase its efficiency, decentralization may increase its relevance. There is a difficult trade-off here, for which there is no easy answer. In addition, research capacity itself is a major constraint on the level of geographic decentralization, but also the willingness of staff to live in remote areas. It is unrealistic to assume that research can be decentralized in a similar way as extension. Moreover, decentralization of decision-making in organizations not only requires major changes in responsibilities and procedures, but also in culture, a consideration that is often neglected.

Stakeholder participation: Stakeholder participation is pursued in all seven countries and is the most complex of the five reform themes. Not only has one to deal with a variety of stakeholders, but also a variety of mechanisms that can facilitate stakeholder participation. The almost exclusive emphasis on farmer participation in most countries makes one wonder how other legitimate stakeholders (traders, input suppliers, 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, however, are usually poorly represented.

The sheer numbers of subsistence farmers relative to researchers, lack of organization, the diversity and complexity of their farming systems, and their unarticulated technology needs guarantee them a place at the periphery of the agricultural innovation system. It is not only finances that are required but also new thinking on whether the research and extension linkages as currently conceived (and which, at best, will reach 10-20% of the farmers) has any likelihood of ever solving the problem. Not only are farmers' needs largely unknown (and they transcend productivity technologies and information), they are likely to require a mix of skills currently unavailable in the narrowly defined R&D armamentarium. It is axiomatic that an essential ingredient in solving the problem lies in the level of organization of farmers. However, based on past experience, the glue needed to keep them together remains to be determined. New innovative policies and linkage mechanisms, both national and international, are needed to help smallholders move from subsistence to commercial farming.

Giving the emerging farmer organizations control over (a part of) the research budget, which is being attempted in several countries, is not without problems either. It radically changes power relationships. Farmers will no longer be passive recipients of technology but clients in a research market. However, this research "market" is usually a very peculiar one, with a limited range of research suppliers and a product that is not standard whatsoever. The analogy with an anonymous market for standard products is therefore rather weak. Close consultation between research suppliers and buyers is needed to identify innovation needs and formulate future research projects. Information costs are high and so what usually emerges is a "preferred" supplier situation. Alternatives are only checked occasionally, but this may be enough to keep preferred research suppliers sharp.

Emerging Funding Mechanisms: In six of the seven countries, there is a strong push towards diversification of the funding base of public agricultural research away from the traditional government block grant. Most of the new sources of funding, however, are tied to specific private sector interests, be it a private company or a commodity organization. There is a major risk that these new sources of funding will steer the public research agenda even further on the road of private interests and marginalize the interests of poor subsistence farmers. Despite the cashew-nut example in 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 to consolidate all agricultural research funding in the medium to long run. The feasibility as well as the desirability of this consolidation has to be seriously doubted.

System Linkages: The strengthening of system linkages between research-extension-farmers is difficult in a situation where both research and extension organizations are in a state of flux and reorienting their mode of operation. For example, the upcoming privatization of the extension service in several countries has probably major repercussions for the relationship between research and extension. How that new relationship will shape up in the future is difficult to predict.

3.3 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 getting 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 through this gridlock, there will be little effective demand for agricultural research coming from this large group of subsistence farmers. We can continue to fine-tune the wheels of the existing research and innovation systems, but still find out in 10-20 years time that we have not reduced poverty and hunger whatsoever. During the past 30 years, the existing agricultural research and innovation systems in Africa have not delivered what we expected, so how can we expect that with some modifications here and there they will do so in the future? What is needed is a far more radical rethinking of the problem and of how we could solve it. We have to start thinking outside the box and not taking anything for granted.

Does it mean that the current NARS reforms are a waste of time? No, there are certainly elements in them that could be used as building blocks for completely new agricultural research and innovation systems. Applied to a more inclusive R&D system, many of the reforms could contribute much more to poverty alleviation. The more holistic innovation system perspective could provide us with a better understanding of how a whole spectrum of interventions and involving many actors is needed in order to facilitate the shift from subsistence to commercial farming. For this, new linkage systems for reaching and providing for the needs of the majority of farmers will be required. The linked R&D providers should be equipped not only with the traditional productivity-enhancing research expertise, but also with research expertise that can deal with the pre- and post-production constraints of the wider agricultural sector.

We are not alone in our conviction that African agriculture has to be reformed drastically and urgently. Numerous initiatives have been launched during the past year by African governments, donors, and international agencies to address the problem.[18] They all scratch the surface, just as this study does, but no clear and convincing answer to the problem has emerged yet. We have to try harder and better.

[18] See NEPAD (2001), USAID (2002), World Bank (2002), FARA (…), FAO (….).

4. The Transition Process

The previous chapters have outlined the origins and majo r components of the NARS reform effort that is now spreading throughout Africa and examined the experiences with the application of the reforms in seven countries. The reforms reflect general trends in development thinking that are very much in ascendancy, notably greater roles for the private sector, decentralization, stakeholder participation, new funding arrangements, and stronger linkages among development partners, up and downstream. There is broad consensus among stakeholders in support of the reforms as a long run goal. At the same time, the experiences to date raise serious questions about the operational feasibility of various aspects of the new reform agenda in the social, political and economic context of the countries of the region that need to be addressed. Further, the reform agenda makes major demands upon the donor agencies themselves. Designing and managing programs and projects that incorporate the key features of the new reform agenda requires skills that are in short supply in donor agencies as well as the research systems in the region. Donor agencies are currently the dominant proponents and supporters of the reforms - not a particularly desirable situation from every prospective and one that donors themselves would like to change.

Most the reforms are not strictly new since elements of the reform agenda have featured in projects and programs in several countries in the region for more than a decade. This fact must give one considerable pause about whether the reforms, individually and collectively, represent an approach that will dramatically improve the performance of agricultural research services in addressing the needs of the majority of their clients, namely subsistence-oriented smallholders. Our assessment is that while the reform agenda may be less than perfect and is certainly not the last word; overall, it represents a reasonable collection of approaches that draw on experiences in Africa and elsewhere.

“Transition” in the context of this study is defined as the process by which the new reform agenda is being implemented and absorbed. More specifically, the question is how one moves from a centralized, supply-driven research system involving a few public sector agencies, supported almost exclusively by grants, projects and budget allocations from the central government and donors; to a decentralized, demand-driven system with broad stakeholder participation in the control, support and implementation of the research agenda. This transition also implies movement from the somewhat narrow NARS view of the research system to the more inclusive and participatory systems implied by the AKIS and NSI models.

This chapter tries to make a first attempt to examine the conditions required for successful implementation and absorption of the new reform agenda (section 4.1). Whatever reforms are being contemplated, building consensus for reform is a critical precondition for reform to succeed. This is particularly true for the new reforms, which involve many more stakeholders and in a far more active way than in previous reforms. This issue will be taken up in section 4.2 The final section examines the sequencing of reforms or more to the point in the cases of countries where the reform process has been initiated, what adjustments in sequencing might be considered.

4. 1 Evaluating Readiness for Reform

The transition process leading towards a more competent and relevant research system is difficult and at times painful. It involves a wide range of actors, going very much beyond the core agricultural research organizations *per se*. Moreover, the target of the transition is not fixed; it is changing all the time. Most African research systems have been in various states of transition for more than two decades and uncertainties will continue (Eicher and Rukuni 2002). Successful systems, however, have the capability to adapt continuously, both to the specific demands being made upon them as well as to the general conditions in each country that can change dramatically at short notice.[19]

Success of implementing the new reform agenda depends critically on a whole set of facilitating conditions. If they are not met, reforms may derail completely and expected improvements will not be achieved. Creating the right conditions for reforms to take place can be as important as the reforms themselves. In table 4, we have summarized some of the most critical facilitating conditions for each of the reform themes.

Table 4: *Transition evaluation criteria*

Reform theme	*Facilitating conditions*
Redefining the role of government	Relative strength of the private business sector as well as of 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 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	There is consensus on the right balance between geographical coverage (equity) and innovation opportunity (efficiency, i.e. concentrate research in high-potential areas) For areas for which agricultural modernization is unlikely to take place alternative poverty alleviation policies are to be developed There is consensus on what to decentralize and what not Devolvement of responsibility should go hand in hand with control over resources Local organizations are strong enough to assume new responsibilities or are supported to acquire the necessary capability to do so
Stakeholder participation	There is a political culture that 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 that also the poorer stakeholders can 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 systems in place that can handle reporting to multiple funding sources
System linkages	Agreement to adopt an innovation perspective, which will lead to a more inclusive set of stakeholders participating in agricultural research priority setting and funding as well as to a more comprehensive agricultural research agenda by taking on board pre- and post-production issues Adoption of instruments to facilitate system linkages (e.g., funding facility for joint research projects, co-financing of research, farming system research)

[19] Unfortunately, the more dramatic changes are often negative in character (e.g. civil war). A key question related to the new reform agenda is the extent to which reforms improve the ability of national public and private organizations to adjust to inevitable shocks. A detailed treatment of this issue is beyond the scope of the current study, but might be considered as a focus of future study in this area.

The seven case-study countries represent the better and more dynamic research systems in the region. They all have developed some basic organizational and managerial skills during the NARS reforms of the 1980s and 1990s. The new reform agenda builds upon these former efforts. 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, although the orientations and the specific techniques may need to be revised in many instances.[20]

Even where the NARI may possess significant organizational and managerial capacity, other components of the research system may have limited capacity or interest (e.g., NGOs and the private commercial sector); or, as in the case of the universities, they may possess capacity and interest, but lack both resources and an enabling environment. Thus, in virtually all cases, additional organizational and managerial strengthening is required, both in terms of basic capacities as well as to meet the specific requirements of the reform agenda. In our view, the failure to adequately address such organizational and managerial weaknesses has seriously limited the effectiveness of reforms efforts to date.

Success in reforming research systems and the sustainability of the reforms depends to a significant degree upon a continuity of facilitating conditions in a country and a region as a whole. Beyond having a favorable policy framework, as indicated in table 4, a decentralized, demand-driven system requires the existence of a reasonably strong and resilient civil society. In countries or parts of countries where these conditions do not exist at the present time, it may be untimely to initiate or extend the reform process.

The focus of the discussion and analysis in this chapter and in this paper as a whole is upon the larger and stronger African NARS, as represented by the seven case studies. For the many smaller and usually weaker African NARS, however, the new reform agenda may be a step too far, at this point in time, and too demanding on their organizational and managerial capabilities. Hence, pushing the new NARS reform agenda in these smaller, weaker systems may only succeed in sinking them. A modified agenda, adapted to the circumstances and problems of the smaller African NARS, is clearly needed.[21] Such a modified reform agenda, for example, may place more emphasis on regional (i.e., supranational) rather than national research services.

An assessment of readiness for reform should extend to the donor agencies themselves. These agencies are providing a significant portion of the impetus for the reform agenda. However, the "charge" is being led by a precariously thin line of staff in these agencies with responsibility for developing the policies as well as designing and managing the sets of projects and programs that give expression to these policies. For a range of reasons, the capacity of some donor agencies in the agricultural sector is less today than a decade ago while the demands on the remaining staff are greater and more complex.[22] The reform effort

[20] For example, fund raising will focus increasingly on competitive grants and support from sources other than donors and governments.

[21] The specific problems of small countries in developing their agricultural innovation capacity have been studied by ISNAR during the early 1990s. See Gilbert, Matlon, and Eyzaguirre (1994) and Eyzaguirre (1996).

[22] Most of the donor agencies that were historically active in supporting agricultural research and extension, reduced budgets and staffing levels for the sector during the 1990s. USAID agricultural staff dropped from over 200 in the 1980s to just over 30 in 2002. A discussion of the current situation in the World Bank is the focus of a

requires extensive (unending) communications among donors, governments and research organizations at the international, regional, sub regional and national levels aimed at building a consensus on reforms and the specific actions (policies, projects, etc) that must follow. Differences of opinion within and between agencies are often significant.

4.2 Building a Consensus for Reform

There are major differences within and between groupings of agricultural research and development agencies with respect to capacities, orientations and attitudes toward the reform agenda and 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 they have rarely experienced, if ever, to date. Further, they must do so largely voluntarily. Although organizations will continue to compete with one another in the context of an increasingly market driven environment, they will also develop and depend upon sets of partnerships that will enable them to compliment each others strengths. In short, the reform agenda assumes a major convergence of interests among organizations (and the self interests of the staff of those organizations) that will stimulate and sustain collaboration. This is quite unfamiliar territory for many of the organizations. A major challenge for the transition process is to facilitate this collaboration and help 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- or market-driven, they are largely imposed from above. The reforms are commonly 'donor-driven' and emerge from discussions between government and 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 key to the success of the reform process. Similarly other stakeholders are often not systematically consulted either. When they are, the reactions are often a mix of indifference and negative perceptions about 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 investments in research (as opposed to development activities, technology transfer and policy reforms) are really a high priority. There is often a history characterized by sets of somewhat adversarial relationships 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, regional and international agricultural research organizations). Hence, reforms may be resisted and undermined. Building a consensus for reform is an especially critical first step where perceptions of the research service among key stakeholders are negative on balance and where the major impetus for the reform agenda is coming from donor agencies.

Most critically, key decision makers in national governments within the region are often ambivalent themselves about agricultural research. They may give lip service to the need to support agricultural research capacities at the national and regional levels, but those statements rarely translate into budgets that enable research agencies to operate effectively as is evidenced by a stagnant or declining trend in national government support for research

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working paper prepared as part of this study (Gilbert 2002). DFID was a notable exception to this trend and became an increasingly important player in the agricultural sector during the 1990s as a result. However, recent reports suggest that DFID may be in the process of reducing support for agricultural development as a part of general budgetary limitations.

over the past decade (ref). National leaders understandably have higher priorities and are under serious pressure from donors to make hard choices by scaling back public sector responsibilities and reducing staff. When given a choice, national leaders have often selected other sectors in preference to agricultural research to be recipients of donor funds made available for general budgetary support.[23]

A critical initial stage in building a consensus for reform in a country or sub region is for donors to find effective (and credible) ways to share leadership in the effort. The World Bank is actively attempting to build a coalition for reform in the region through presentations at recent conferences in the region hosted by NEPAD and other agencies.[24] These efforts offer significant opportunities for ASARECA and other research agencies to influence the character and course of the reform effort. One needs to be aware of the differences of opinion within and between donor and development agencies on the subject of the reform agenda (Gilbert 2002).

4.3 Sequencing of Reforms

The preceding sections have underlined the importance of starting from an assessment of the current status (and history) of the research system in a country or region and building a consensus for reform among stakeholders based on a shared understanding of that status in relation to future roles and the contributions that individual reforms can make in this process. If a current assessment has not been made and/or a broad consensus on reforms does not exist, those are obvious starting points in the reform process.

The status assessment and consensus building efforts in a country may reach the conclusion that conditions are not suitable to initiate a serious reform of the research system at this time. Alternatively, a determination may be made that the reforms that have been initiated are premature and should be suspended pending certain policy actions or the presence of other facilitating conditions.

In cases where there is a consensus to initiate or continue reforms, there remains the critical question of how these changes should be sequenced in relation to one another and complimentary actions (e.g. policy decisions).

[23] This situation combined with the strong perception within the World Bank in particular that agricultural research in the region is seriously under-funded, has led to the proposal for a special facility that would set funds aside to support agricultural research. To an important degree, the reform agenda grows out of the need to provide a strong rationale for the creation of such a special facility (World Bank, 2002; Touré, 2002).

[24] A paper by M. Touré (2002) and a power point presentation by D. Nielson (2002) are both products of this effort.

5. Implications for Different Partners

The new reform agenda has important implications for the various partners in the agricultural innovation process. In this chapter, we will consider the implications for five distinctive actors in this process, namely: (1) Agricultural research policymaking entities; (2) Agricultural research implementing agencies; (3) Agricultural research stakeholders; (4) Donors; and (5) Sub-regional, regional, and international agricultural research agencies.

5.1 Agricultural research policymaking entities

The new reform agenda challenges African governments to think more strategically about their role in agricultural research and innovation. It asks 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. Such a ministerial policymaking entity has to define the broad outline of the agricultural research system and 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 has the responsibility to make sure that the linkages within the agricultural innovation system function properly. Within the government, this entity is also responsible for negotiating the overall agricultural research budget. For certain parts of the research agenda (in particular commercial export crops), it may set targets for private-sector contributions. It may also decide that no public funding is necessary whatsoever for certain parts of the agricultural research agenda. 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 vision or strategy for the agricultural sector is an important step in order to create cohesion between the various more specific policies such as on research, extension, and agricultural services. A good example, of such a vision or strategy is the Ugandan Plan for the Modernization of Agriculture.

While the Ministry defines the overall agricultural research strategy and budget allocation, it may delegate the actual research project selection to (1) the implementing agencies; or (2) a separate entity representing agricultural research stakeholders. The first option is what in most countries is still standing practice: the implementing agency has, within the broad guidelines of the overall research strategy, control over research project selection. The implementing agency may consult stakeholders in this process, but it makes its own decisions. The new reform agenda pushes for the second option, namely that stakeholders decide on research project selection.

This selection responsibility can be delegated to democratically elected bodies like the parliamentary committee for agriculture or, in the case of a highly decentralized agricultural research system, to local district councils. Another option is to delegate the selection responsibility to special committees that bring together representatives of the various stakeholders. These committees are less democratic, but may have the advantage of bringing more expertise to the decision making process. Depending on how centralized the decision-making is, also these committees can operate at both the national and sub-national level. The

composition of such committees requires careful consideration in order to make them as representative as possible.

What should be clear, however, is that democratically elected bodies or appointed priority-setting committees do not formulate agricultural research projects themselves. They have to rely on the research proposals brought to the table by the agricultural research organizations. By defining problem areas upfront, they may influence the type of research proposals submitted, but in the end of the day, these bodies and committees depend on the creativity and imagination of the researchers. It is therefore unrealistic to assume that by shifting the responsibility for priority setting from the implementing agencies to the stakeholders, a radically different research agenda will unfold.

The decentralization of agricultural research, as promoted under the new reform agenda, to some extent also affects the agricultural research policymaking entities. Under the old reform agenda, all policy decisions were taken in a highly centralized manner. Under the new reform agenda, however, a more decentralized approach has been adopted and, where possible, decision-making will be delegated to local levels of government or local stakeholder groups. This delegation of decision-making responsibility requires a careful delineation of responsibilities between national and sub-national government agencies. In most countries, however, tax collection and budget allocation is still highly centralized. In that sense, local governments or stakeholder committees may decide on how the money is being spent on agricultural research, but not how much.

5.2 Agricultural research implementing agencies

The new reform agenda has important implications for the agricultural research implementing agencies. The institutional pluralism proposed by the new agenda tries to move away from government-supported agricultural research monopolies. Agricultural research funding will no longer be channeled automatically to these monopolies, but opened up for competition by non-traditional agricultural research providers (universities, NGOs, etc.). The intention is not to decompose the existing national agricultural research organizations (the consolidation arguments of the old reform agenda are still valid), but to reduce monopolistic behavior and institutional inertia. A by product of this policy is that nontraditional agricultural research agencies are more in the picture for funding and may start to play a more active role.

Under the new reform agenda, agricultural research implementing agencies will have to share increasingly the responsibility for priority setting and project selection with their stakeholders. While in the past these tasks were considered largely an internal affair, in the future outside stakeholders are expected to play a more prominent role in the decision-making. The introduction of competitive research funds is a good example of how governments (in close collaboration with donors) try to enhance stakeholder participation in priority setting and project selection. Some countries even intend to channel all their funding through such a mechanism in the future.

By shifting the responsibility for priority setting and project selection away from the implementing agencies, new procedures have to be established and fine-tuned. As discussed in the previous section, this can take various forms. In all cases, however, the development of research project proposals becomes an even more important activity than it has been in the past. While the traditional internal selection (usually by scientific committees and peers) tends to focus primarily on the scientific merits of the research proposals, the proposed

external selection by stakeholders gives greater weight to the socio-economic relevance of the research projects. At least, that is what reformers hope. For researchers this means that they have to address more explicitly than in the past the expected economic impact of their proposed research. In most agricultural research organizations in Africa, this type of expertise is underdeveloped.

Greater stakeholder participation in the selection of agricultural research project is one way of making agricultural research more relevant. Another way is by having farmers participate directly in the implementation of agricultural research. The new reform agenda strongly promotes participatory research methods such as farming system research and farmer research groups. In combination with the pressure towards a better geographical coverage of the country, this will affect the composition of the research staff in terms of 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 shift of research capacity from headquarters to the regions; and (2) decentralization of decision making responsibility to lower levels in the organization. It is in particular the latter, the invisible part of the decentralization process that is the more problematic. The experience that one can build upon in this area is rather limited and seldom specific to agricultural research organizations. The challenge is to find the right balance between central and delegated responsibility.

The switch from core to special-project funding most likely creates more financial instability among the agricultural research implementing agencies. Donors are currently responsible for most of the special-project funding. With the introduction of competitive research funds, however, also government funding is becoming more competitive and project specific. Research organizations are confronted with the dilemma that, while their financing is becoming less predictable, they still have many long-term obligations like lifetime employment. In order to attain more flexibility, there is a trend among agricultural research organizations to eliminate lifetime employment (by removing civil service status) and adopt employment contracts with limited duration. However, the price for this flexibility is higher, market conform salaries. More competition in the funding of the agricultural research system, not only creates benefits (better and more relevant research), but also costs in the form of higher risks on the part of the implementing agencies. Since these risks are real, they need to be compensated in one way or another in order to make that agricultural research organization can survive financially.

5.3 Stakeholders

One of the major objectives of the new reform agenda is to enhance stakeholder participation in agricultural research priority setting, selection, and implementation. In most African countries, farmers are seen as the primary stakeholders of agricultural research followed by agro-industries, rural NGOs, and extension services. Consumers and other civil society interest groups are largely ignored. This very much contrasts with developments in developed countries, where consumers and the civil society in general are increasingly taking control over the public agricultural research agenda. An important stakeholder of agricultural research that is absent in most discussions is the government itself. In order to formulate sound agricultural policies and regulatory measures, governments usually depend heavily on agricultural research.

Three concerns stand out in the debate about stakeholder participation in agricultural research in Africa:

(1) Local farmer organizations are weak or nonexistent in most countries and hence not in a position to play an active role in agricultural research priority setting;
(2) When farmer organizations exist, the more-advanced farmers usually dominate them. Poor and less-advanced farmers have a lesser voice in these organizations and hence there is a problem of proper representation; and
(3) Farmer organizations often do not show great interest in agricultural research and have difficulty in understanding what agricultural research can do for them. The role of stakeholder is imposed on them.

The proposed reforms shift major responsibility to the stakeholders of agricultural research and assume strong stakeholder commitment. If, for whatever reason, this commitment does not come through, managers of the research implementing agencies will most likely step into this vacuum and set the research priorities for the stakeholders by default. In order to enhance stakeholder commitment, co-financing is seen as an important instrument to facilitate such commitment. Even for food crops, for which private financing of research is unlikely to come forward, small own contributions may help to signal to government that the primary stakeholders consider the proposed investment in agricultural research worthwhile.

5.4 Donors

Donors do not have a direct stake in the agricultural innovation process, but they play a very important role in the background of the proposed reforms in two ways. First, the donor community constitutes an important, if not principal source of ideas and proposals of how to improve the agricultural innovation systems in Africa. The World Bank, DFID, and USAID, for example, have clear agendas (at least that is how it looks from the outside) of what they think is needed to improve agricultural innovation in Africa. The new reform agenda reflects a great deal of consensus among the different donors. Individual donors may place different accents (DFID is strong on stakeholder participation, USAID on 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. Their reform ideas and proposals come with money. It is a difficult combination for the receiving countries to refuse. The World Bank in particular can quite effectively leverage institutional reform through its lending program. Bilateral donors usually have less cloud, but 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 is another field where bilateral donors have stimulated experimentation. In the end, however, national ownership of the reform agenda is crucial in order to succeed. Without it, reforms may never take place or derail completely.

One of the concerns that this study picked up is that the new reform agenda is seen by many national stakeholders as a donor-driven agenda, imposed on them from the outside. The proposed reforms may be sound, but national stakeholders feel that they have not had the opportunity to make them their own and adjust them where necessary. A more open dialogue

between the donor community and the recipient countries is certainly needed. It is important to involve national stakeholders very early on in the reforms discussions.

Donors provide a substantial part of the funding for agricultural research in Africa. Particularly the World Bank is a major source of funding (usually long-term, low-interest loans), but also bilateral donors support African NARS through various funding facilities. Such facilities usually target specific research topics (e.g., environment, biotechnology), research approaches (e.g., farming system research), client groups (e.g., women, poor farmers), or facilitate North-South collaboration. All kinds of strings are attached by which donors try to influence the national agricultural research agendas. More recently, some donors have started to move away from micro-managing their development activities. They have opted to provide budget support to governments that have a record of good governance rather than support to specific projects. The European Union, the World Bank, but also a bilateral donor like the Netherlands has adopted this policy. Within both the EU and the World Bank there is a concern that agricultural research may loose out under this new funding regime because national governments tend to give low priority to agricultural research.

5.5 Sub-regional, regional and international agencies

The national reform agendas are largely silent about the implications of supra-national collaboration in agricultural research. It is a strange omission, but it reflects the fact that most NARS are rather inward looking. Contracting research across national borders is very much an exception and contributing national resources to address supra-national research problems does not figure as a policy option. Regional or sub-regional specialization in agricultural research on specific commodities or topics is not on the national agendas either.

In recent years, ASARECA has emerged as a strong sub-regional entity that manages a set of sub-regional 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 into strong supra-national 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 research results of nationally defined research projects.

A recent, but important institutional innovation is the establishment of sub-regional competitive research funds. The European Union has promised some € 29 million to ASARECA, € 20 million to CORAF, and € 21 million to SACCAR to establish such funds. Other donors may join this initiative. In addition, the World Bank is contemplating the creation of a regional agricultural research fund for Africa. For the most part these supra-national funding facilities for agricultural research will replace bilateral ones.

ASARECA, CORAF, and SACCAR have been asked to manage the sub-regional competitive funds initiated by the EU, while FARA will probably play an important role in the management of the World Bank regional fund. The objective of these supra-national funding facilities is to fund cross-border research issues, rather than specific national ones. Research proposals should be developed jointly by national agricultural research organizations from different countries. The advantage of the existing regional research networks is that researchers already know each other. In addition, most networks employ a full-time coordinator who can take the lead in project development. For new initiatives, however,

establishing cross-border contacts to develop a joint research project can be very time intensive and costly. Cross-border travel and communication in Africa is often expensive. The experience within the European Union with competitive research funds also indicates that submission of research proposals becomes easier over time as the different partners involved learn how to collaborate and interact with the competitive research fund. A problem is that the relative strength of agricultural research organizations differs substantially across countries. In a competitive scheme, the weaker research organizations may loose 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 sub-regional organizations to manage the allocation of ADB's contribution to the international agricultural research centers. It adds a new function to the sub-regional organizations, namely that of research purchaser. This new mode of funding could tie the activities of the international agricultural research centers more closely to the needs of national agricultural research. There are, however, no indications that other donors are contemplating a similar approach.

ASARECA, CORAF, SACCAR, and FARA also could provide important platforms for NARS managers to share experiences in reforming agricultural research and innovation systems. What works and what not? How can one learn from each other? If organized properly, the benefits of this collective learning can easily exceed its costs by quite a margin.[25]

[25] 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.

6. Conclusions

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

The poor performance of the agricultural sector in Africa for more than three decades has cast serious doubts on the performance of the existing agricultural research and innovation systems. Hence, the need for NARS reform (but also extension and other partners involved in the agricultural innovation process) is felt quite urgently in most African countries. In addition, the new NARS reform agenda has been influenced by various other forces, such as: (a) changes in the external context of agricultural research (i.e., changes in demand, research methods, and broader socio-economic policies); (b) emerging theories and ideas about public management and system analysis; and (c) interventions by foreign/international development agencies backed by significant resources. In particular, the influence of the World Bank has been quite significant in all seven countries studied.

Based on a literature review of African NARS, the following five major reform themes stand out as dominating the new 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: geographically and in terms of decision making;
(3) Stakeholder participation: by consultation / by joint implementation / by controlling budget / by co-financing;
(4) Emerging funding instruments: more emphasis on (co-)financing by direct beneficiaries (surcharges, matching grants, etc.); competitive research funds; and
(5) Strengthening of system linkages: between research agencies (national, regional, and international), between research-extension-farmers (the AKIS model), and between all possible partners in an agricultural innovation process, including civil society organizations, traders, and input and processing industries (the NSI model).

Elements of these five reform themes were identified across all seven case study countries. The specifics of the reforms differ across countries but the themes are the same and they all seem to move in the same direction of greater stakeholder participation (in setting research priorities as well as, although modestly, financing) in order to make agricultural research more responsive, client-oriented and demand-driven. There is quite a strong notion that without impact to show for (i.e., innovations contributing positively to the well-being of millions of poor farmers and consumers), public support for agricultural research will even further erode.

An innovation system perspective (rather than the more limited NARS and AKIS system concepts) may help to better understand and analyze the various actors that come together in an innovation process and that are jointly responsible for the ultimate outcome and impact. The responsibility of agricultural research organizations does not stop with the production of

new knowledge or technology. They can only claim success when innovations are being applied and adopted. They have no other choice than to collaborate actively with all the other partners in the innovation process. It is our impression that this more holistic approach to agricultural innovation is gradually being taken on board by national governments and development agencies alike.

For the ASARECA members the question is whether they want to adopt this more inclusive (but also more complex) innovation system perspective, or stick with the narrower NARS or AKIS perspectives. The advantage of the latter models is that the problem can be kept relatively simple by focusing on only one group of actors in the agricultural innovation process. The advantage of the former is that you can cast a far more realistic picture of the complete agricultural innovation process, covering all the various actors and how they depend on each other.

One of the major problems with the strong emphasis on stakeholder participation in the new reform agenda is that the large majority of African farmers are poorly organized. By adopting a demand-driven research strategy, there is a great risk that the public agricultural research agenda will be completely dominated by the better-organized, market-oriented farmers and that subsistence-oriented farmers will be left alone. 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 concrete demand for new technology in subsistence agriculture is underdeveloped, constrained as subsistence farmers are by their own production and learning routines (Omamo and Lynam 2001). It is not until farmers move towards market-oriented agriculture that the 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. As long as this transition has not taken place, 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, also for market-oriented farmers the supply and demand of agricultural research services is far from perfectly organized. This is reflected, for example, by the fact that the yields of many of the traditional African export crops have lagged behind those of competitors in other developing regions. Therefore, there is no reason for complacency or an attitude that the commercial sector will take care for itself. Even when commercial farmers organize and finance their own research, a facilitating environment needs to exist to help them to do so efficiently. Too often, commodity boards and producer organizations have become constraints in themselves due to politicization and mismanagement.

By organizing and mobilizing the demand-side of the agricultural innovation process, one cannot only target the supply of agricultural innovations better, but also get a better insight into the volume of effort that is needed. The best advocacy for expansion of agricultural research and extension capacity is the political pressure by farmers and farmer organizations on their own governments. The strong pleas by development partners to invest more in agricultural research and extension have not had much of an effect on African governments for the past 10-15 years.

The new NARS reforms will most likely improve the efficiency and relevance of agricultural research (and particularly so 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 get 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 actors, leading to a complete overhaul of existing production systems. Moreover, such an overhaul depends far more on institutional innovation than on technical innovation. Agricultural research organizations have expertise on the latter, but usually not on the former.

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ANNEXES

Annex 1: *Selected characteristics of countries studied*

Attribute	*Côte d'Ivoire*	*Ethiopia*	*Ghana*	*Kenya*	*Senegal*	*Tanzania*	*Uganda*
Agricultural land in '000 km^2 (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 (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
Politically stability (4)	Military rule (1999-2000)	Military rule (1974-1991)	Military rule (1966-1992)				Military rule (1971-1985)
Share agriculture in GDP (2)	29.2%	52.3%	35.3%	19.9%	18.2%	45.1%	42.5%
Share agricultural employment (1)	49.2%	82.4%	56.9%	75.4%	73.7%	80.4%	80.1%
Number of 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)	175	475	364	471	205	348	250
Agricultural labor-researcher ratio	18350	48200	14850	25350	15030	41810	36520

Sources: (1) FAOSTAT Database (November 2002). (2) World Bank (2002). (3) UNDP (2002). (4) From country studies and the Abt reports (Abt.2001a-e).

Annex 2: *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 out of a merger of IDESSA and IDEFOR. CNRA is a private company in which the government has a minority stake of 40%. Producer organizations and agro-industries 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 financed research (and many other services) directly.	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, except for own income coming from the fact that CNRA owns some plantations. The expected resurrection of private funding for research on export crops has not materialized to date. 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 block progress.
Decentralization of agricultural research	The geographical spread of agricultural research facilities is considered 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 5 regional directorates with broad management autonomy (financial and human resources, etc.).	
Stakeholder participation	Producer organizations and agro-industries have a majority share in CNRA since 1998.	Producer organizations and agro-industries provide a major part of the budget of CNRA and are actively involved in agricultural research priority setting. Strengthen producer organizations in order to make them effective farmer representatives. Reinforce research on farming systems.	No progress to date.
Emerging funding mechanisms	No competitive funding mechanism operational yet. No experience to date with contract arrangements between funder (FNDA) and implementer (CNRA and universities).	Create a National Agricultural Development Fund (FNDA), which will be fed by contributions from farmer organizations, agro-industries and government. It will 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 time all funding will be channeled through FNDA.	The decree to establish the FNDA has not been signed yet by the President and hence implementation of the FNDA is on hold. The private sector is only prepared to contribute to the FNDA when the Government lowers its taxes on agricultural commodities with an equal amount. The private sector prefers a cess to be collected by the government rather than voluntary contributions as proposed. Donors push for the establishment of regional development funds, which match with 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 secure functional linkages between the two. For example, specific research	Strengthen the collaboration between ANADER and CNRA and improve CNRA's responsiveness to client needs. Enhance collaboration of CNRA with universities and	

	programs were linked to requests of beneficiaries through annual technical/funding contracts between ANADER and CNRA. Given CNRA's dominance, internal linkages within the NARS have been relatively poor.	other relevant research agencies and support CNRA's participation in regional research initiatives.	

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

Annex 3: *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 feasible yet. 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 considered incomplete. Since 1997, responsibility for the regional research centers has been handed over to regional governments. Only four of the nine regions have actually taken up this responsibility to date.	Increase the geographic coverage of agricultural research by building six new regional centers. Possible further devolution of agricultural research responsibility to regional governments.	Expansion of the research system will require major expansion of research staff and budget. Involvement of regional governments makes the research system more difficult to manage. For personal reasons researchers may not be keen to live in remote areas with a low level of facilities such as 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 level, primarily through consultation. Adopt a strong farming systems' research approach.	Illiteracy among farmers is high and land distribution is relatively equitable due to the land reform of the 1970s. Ethiopia seems to lack a group of advanced and 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 yet.	Create an Agricultural Research Fund (ARF). This fund, to be managed by EARO, should mobilize nontraditional research partners into 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 US$ 1.5 million for the first five years.	The establishment of the ARF, its secretariat, etc. has taken quite some time. First call for proposals has just been out.
System linkages	A research-extension-farmer linkages department has been setup within EARO. The old	Establish Research and Extension Advisory Councils (REACs) at three levels:	Emphasis is primarily on the creation of formal research-extension structures rather than

	Research-Extension Linkages Committees (RELCs) established under IAR considered ineffective. No clear authority and high turnover of members.	federal, regional, and research center. Each will have their own ways of organization, supervision, authority, function and periodic meeting.	processes. The delegation of responsibility for regional research to regional governments, has created new and more complex NARS linkages.

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

Annex 4: *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 adaptive research centers that are closely aligned with extension. 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 in the future about 30% of their own funding.	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 that the private sector and other stakeholders co-finance at least 15% of adaptive research for commercial crops and livestock. The long-run target is 25-30%. The idea is to setup 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. For several research institutes it is quite unlikely that they will 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 some 10 commodity or topical research institutes at the national level and six regional adaptive research centers managed by MOFA. These regional centers are closely aligned with extension. As part of a more recent, overall decentralization strategy of the government, 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 how the decentralization of MOFA will work out in practice. MOFA's research capacity is very limited.
Stakeholder participation	In the 1990s, an 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	The model adopted is to have farmers and agribusiness influence the agricultural research agenda at the highest level possible. The question is how representative are the farmer representatives on these boards and committees? Are there mechanisms in place for them to link back to their constituencies?

		MOFA.	
Emerging funding mechanisms	Experiment with a competitive research fund under NARP (1991-99) failed. 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 increasingly be shifted to CARG to promote excellence in research.	Planned, not yet implemented.
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 linkages committees (RELCs) have been established for each of the major agro-ecological zones in the country. Internal links within the NARS have improved in recent years. This has been part 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.

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

Annex 5: *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. Coffee and tea research 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 (a greater part 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.	Spinning off the responsibility for research to industry associations has been a slow process. To date, none of the commodities up for privatization have actually made the jump. Sugar seems to be the closest in having arrangements in place to do so. There are apparently no mechanisms available to step up private financing for research on a particular commodity gradually.
Decentralization of agricultural research	KARI consists of headquarters, 15 national research centers (in charge of commodity or factor research), 6 regional centers and 7 sub-centers. The geographical spread of agricultural research capacity is considered adequate. Decision-making in	No major changes in decentralization of research capacity or in decision-making are foreseen.	

	KARI is relatively centralized, while research implementation is decentralized.		
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 non-commercial crops has so far remained weak and particularly so at the regional level.	More active participation of stakeholders in the funding and formulation of agricultural research proposals. Intensification of the use of the farming systems' approach.	Stakeholder participation depends heavily on co-financing arrangements and hence covers mainly commercial export crops. Stakeholder participation for noncommercial commodities is considerable
Emerging funding mechanisms	The Agricultural Research Fund (ARF) is operational since 1991. Implicit matching grant scheme (government pays for salaries and infrastructure, private sector for operating costs) and research contracts with third parties 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 how to increase the contribution by the private sector gradually.
System linkages	Links between research and extension have turned problematic 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 has been quite good. However, links between research and small-scale farmers have generally been weak.	Introduce stronger stakeholder participation in both extension and research (e.g. ATIRI). Given limited resources, the extension service will 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 on hold (?)

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

Annex 6: *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. No private sector activity of any significance. The Government only finances the salaries and so ISRA and ITA have to search for additional funding	The long-term vision is a separation of research funding and priority setting from research implementation. All research activities should be funded through FNRAA, managed independently 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	FNRAA seems to be envisioned as 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 to support agricultural research. It is not clear whatsoever how private contributions to FNRAA will be organized. No mechanism, such as a commodity levy or cess, has been suggested. Another problem is that producer

	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.	research. In the pessimistic scenario, they will contribute 20% of the funds, and in the optimistic scenario 60% 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.	organizations may not be interested in putting their money in one big pot, 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 agro-ecological zones.	Reallocate a considerable part 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 will be able to participate in the financing of research and extension activities out of, inter alia, the existing levies on agricultural production, which will be co-managed with the government in the future.	Exact modalities on how producer organizations will have access to existing levies on agricultural production still unclear. An important question to be answered is to what extent levies will be pooled or not.
Emerging funding mechanisms	Previous experience with a competitive funding scheme under the USAID Natural Resource Based Agricultural Research Project between 1992-98. Total budget US$ 2 million. A new fund, FNRAA, has been 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 time. 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 be de facto the single agricultural research funding and priority setting entity in the country. Two rounds of project selection completed, a third one launched. Criticism in the press on the selected projects, certain areas not covered. Two possibilities: priority areas do not correspond with that of the outside world or quality of proposals in certain priority areas not up to standard.
System linkages	The extension service has been reconstituted as a public company (government has 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	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.	

	and development agencies is being supported through FNRAA. ITA uses consultation forums to bring stakeholders in a particular production column together and discuss production issues.		

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

Annex 7: *Tanzania Summary Table*

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	The research activities under the old Department of Research and Training (DRT) have recently been broken up between the Ministry of Agriculture and Food Security (MOAFS), the Ministry of Livestock and Water, and the Ministry of Cooperatives and Marketing. In addition, 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. In these arrangements DRD is providing staff and facilities, while the industry finances the operating costs. Contracts are increasingly being used to allocate research resources, while zonal agricultural research funds have assumed (part 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 in the pipeline. 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) established in four of the seven agro-ecological 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 a limited headquarters 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 own resources. The ZARF model to be strengthened and expanded to other zones. Some rationalization of	Recent reforms have focused mainly on zonal agricultural research. It is not clear how this may have affected the national agricultural research agenda. Is this just the sum of the zonal agendas? Are there research topics that require national coverage? And, how to avoid duplication?

		research facilities is considered necessary.	
Stakeholder participation	Stakeholder participation takes place through consultation, but to a considerable extent also through co-financing of agricultural research by commodity boards dealing with a cash crops for which a cess or levy is collected.	Invite District Councils to contribute to Zonal Agricultural Research Funds and get them involved in setting local research priorities. Further intensification of the farming systems' approach to research. At least 50% of the research trails/ demonstrations should be in farmer fields.	
Emerging funding mechanisms	A National Agricultural Research Fund (NARF) was established in 1992. It experienced major starting 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, establish 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 agro-ecological zones and have so far succeeded in attracting funding from donors, NGOs, and District Councils. The matching funds provided by the World Bank are quite 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 into a significant devolution of responsibility for agricultural research to local governments and stakeholders. Expand the use of cess schemes to finance research on commercial export commodities.	The World Bank's TARP II doubles every dollar contributed to the ZARFs. Hence, the incentive to donors and local stakeholders (District Councils, NGOs) to participate is quite high. It may help to consolidate all research resources in one pot. It remains to be seen, however, what happens after the contribution by the World Bank is being phased out.
System linkages	Farming systems' research is the main vehicle for bringing research, extension and farmers together. Moreover, researchers and extensionists meet each other 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 separate from the Ministry of Agriculture and Food Security has resulted in a division of agricultural research responsibility across three different ministries. This has resulted in new and probably more complex linkages among agricultural research entities and between research and extension. It may also affect the farming systems' approach negatively.

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

Annex 8: *Uganda Summary Table*

	Current situation	Proposed change	Feasibility issues
Redefining the role of government in agricultural research	NARO is a semi-autonomous, public agency, which depends heavily on donor funding (65%). It has received very limited support through producer organizations and private companies (1%<) to date. Cess schemes exist for coffee, tea, and cotton, but little of it is spent on research. NARO's coffee research institute has received some modest financial support during the late 1990s. NARO has not undertaken tea research to date, arguing that the tea sector should pay for it. The private sector (including sugarcane, tea, tobacco, flower and vegetable estates and companies) undertakes a considerable amount of research on its own.	Shift the financial burden for research on commercial export crops to the private sector. Closer involvement of farmers/communities in priority setting, monitoring as well as in co-financing of agricultural research on non-commercial crops called for. Proposal to give local communities through District Councils direct control over research budget allocations, following closely 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 rather centralistic.	Establishment of 12 Agricultural Research and Development Centers (ARDCs), strategically located in different agro-ecological zones. Initially the activities at the ARDCs will concentrate mainly on outreach and development, but research will become more important over time. This will require a relocation of research staff from current locations around Kampala to the regions.	For personal reasons researchers may resist relocation to regional centers. Relocation will have major implications for the existing research institutes, particularly when staffing 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 non-commercial commodities to be facilitated by giving local government control over priority setting and budget allocation. Significantly expand the farming systems' approach as developed under ARTP I.	Changes currently on hold. Feasibility of the proposed stakeholder mechanisms is being questioned.
Emerging funding mechanisms	Agricultural Technology Fund established in 1998 with 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 US$500,000.	Implementation is currently on its way
System linkages	NARO is setting up eight Agricultural Research	The establishment of eight Agricultural Research	New modes of collaboration between NAADS and NARO

	Development Centers (ARDCs) in specific agro-ecological zones. The extension service is in the middle of a major transformation to become a highly decentralized National Agricultural Advisory Service (NAADS).	Development Centers (ARDCs) should significantly strengthen NARO's link with extension and farmers.	need to be established. Modes of operation may not match.

Source: Ngategize (2002); World Bank (1999b); World Bank (2001).