



Improving Agricultural Research at Universities in Sub-Saharan Africa: A Study Guide

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ISNAR

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Foreword

This publication is a key output of the ISNAR-led project “Strengthening the role of universities in national agricultural research systems in sub-Saharan Africa.” The project was initiated in 1994 in collaboration with the University of Hohenheim (Germany) and agricultural leaders from six countries of sub-Saharan Africa (SSA): Benin, Burkina Faso, Côte d’Ivoire, Nigeria, Uganda, and Zimbabwe. With the financial support of several German organizations (the Bundesministerium für Wirtschaftliche Zusammenarbeit [BMZ], the Deutsche Stiftung für Internationale Entwicklung [DSE], and the Deutsche Gesellschaft für Technische Zusammenarbeit [GTZ]), and the Dutch-based EU organization Technical Centre for Agricultural and Rural Cooperation [CTA], the project helped universities in these countries to improve their performance in agricultural research and to strengthen their linkages with other components of their national agricultural research systems (NARS). This study guide is based on the experience gained during this process and is particularly addressed to university administrators and agricultural research leaders.

Since its foundation, ISNAR has taken a broad systems approach in defining its task of strengthening the performance of NARS. NARS include various organizations in the public and private domains that are active in technology development and transfer, such as universities and colleges, nongovernmental organizations, farmers’ organizations, and the private sector. ISNAR’s concern with the role of universities goes back to its collaboration in 1984 with the Association of Faculties of Agriculture in Africa.

ISNAR continues to be involved in strengthening the capacity of organizations to interact with each other to increase their contribution to research for agricultural development. ISNAR’s new Road Map 2002–2006 identified improving linkages between research organizations and stakeholders as one of the Institute’s five major thematic areas. In April 2001, ISNAR and our sister institute in the CGIAR, the West Africa Rice Development Association (WARDA), jointly organized an international workshop involving 15 academic institutions in sub-Saharan Africa to develop a framework for more productive partnerships between universities and international agricultural research centers. This resulted in the development of a collaborative platform for agricultural research in sub-Saharan Africa including other key actors of the NARS (re: ISNAR and WARDA 2001).

We urge international donors to recognize anew the importance of national institutions for sustainable national development, and particularly for agriculture, the most important engine for poverty alleviation. Institutions of higher education in sub-Saharan Africa have been neglected for a long time and, without concerted effort, the current crisis in the universities and their ability to serve their peoples will continue. Our investigations during the project confirm that universities have a high potential for research that can contribute to agricultural and rural development in Africa. We hope that this study guide will help to realize that potential.

Stein W. Bie
Director General, ISNAR

Acknowledgments

This study guide is an outcome of ISNAR's project on Strengthening the role of universities in NARS in SSA (the "University in NARS study"). This was an action-oriented, multi-year project involving six countries in SSA: Benin, Burkina Faso, Côte d'Ivoire, Nigeria, Uganda, and Zimbabwe. A wide range of professionals from local, national, regional, and international institutions contributed in one way or another to the guide's development.

The authors are particularly grateful to the following:

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 - the chair persons of the national steering committees,
 - the national consultants from the six participating countries,
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 - the international consultants,
 - the members of the ISNAR steering committees, and
 - other members of the ISNAR project team.
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Many people helped to turn the draft into a book. Jan van Dongen, Head of ISNAR's Publication Services, coordinated the production. Editing was by Green Ink Publishing Services Ltd, UK. Richard Claase designed the cover. We express our heartfelt thanks to all.

Finally, we extend our appreciation to the six reviewers who took the time to read the manuscript and make valuable comments and suggestions.

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Abbreviations

AAU	Association of African Universities
ABU	Ahmadu Bello University, Nigeria
ADEA	Association for Development of Education in Africa
AISA	Association Ivoirienne des Sciences Agronomiques, Côte d'Ivoire
AKIS	agricultural knowledge and information system(s)
ANVAR	Agence Nationale de Valorisation des Résultats de Recherche, Burkina Faso
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit, Germany
CENIFA	Centro Nacional de Investigación Forestal Aplicada, Honduras
CGIAR	Consultative Group on International Agricultural Research
CIRES	Centre Ivoirien de Recherches Economiques et Sociales, Côte d'Ivoire
CNRST	Centre National de la Recherche Scientifique et Technique, Burkina Faso
CORAF	Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles
CTA	Technical Centre for Agricultural and Rural Cooperation
CVL	Central Veterinary Laboratory, Zimbabwe
DSE	Deutsche Stiftung für Internationale Entwicklung, Germany
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
FOA	Faculty of Agriculture (of Ahmadu Bello University, Nigeria, and the University of Zimbabwe)
FRSIT	Forum National de la Recherche Scientifique et des Innovations Technologiques, Burkina Faso
FSA	Faculté des Sciences Agronomiques (de l'Université Nationale du Bénin), Benin
FVS	Faculty of Veterinary Sciences, Zimbabwe
GFAR	Global Forum on Agricultural Research

GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit, Germany
IAD	Ingénieur Agronome Diplômé
IAR	Institute for Agricultural Research, Nigeria
IARCs	international agricultural research centers
INRAB	Institut National des Recherches Agricoles du Bénin, Benin
ISNAR	International Service for National Agricultural Research
MORP	Mandate, objectives, and policies; Organization, structure, and linkages; Resources (human, financial, and physical) and information; Program planning and management
MOU	memorandum of understanding
MU	Makerere University, Uganda
MUARIK	Makerere University Agricultural Research Institute, Kabanyolo, Uganda
NAERLS	National Agricultural Extension and Research Liaison Service, Nigeria
NAPRI	National Animal Production Research Institute, Nigeria
NARO-Ug	National Agricultural Research Organization, Uganda
NARO	national agricultural research organization
NARS	national agricultural research system(s)
NGO	nongovernmental organization
PM&E	planning, monitoring, and evaluation
R&D	research and development
SACCAR	Southern African Centre for Cooperation in Agricultural and Natural Resources Research and Training
SPAAR	Special Program for African Agricultural Research (of the World Bank)
SSA	sub-Saharan Africa
UI	University of Ibadan, Nigeria
UNB	Université Nationale du Bénin, Benin
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
WARDA	West Africa Rice Development Association

Executive Summary

Many universities in sub-Saharan Africa (SSA) are primarily regarded as teaching institutions, but they also have a mandate and resources for research. A key question many university administrators therefore face today is how their institution can better contribute to national agricultural and economic research and development (R&D) by making more effective use of its potential in this area. This Research Management Guideline is aimed especially at university administrators and national agricultural research system (NARS) leaders in SSA who have identified the need to strengthen the performance of research at their university.

Although the focus of the publication is on the research component of the universities, the authors do not imply that universities should be converted into research organizations. Universities and national agricultural research organizations (NAROs) have complementary mandates and distinctly different resources to contribute to national development-oriented research. Both can therefore benefit from better linkages. In taking into account its respective mandate and resources and matching these against the spectrum of research activities to be tackled (basic, strategic, applied, and adaptive research), each kind of organization will usually find that it has a comparative advantage for particular activities. Solving farmers' problems and providing new opportunities for farmers require the contribution of both universities and NAROs; the development of mechanisms to enhance collaboration serves to ensure the quality of the outputs for the benefit of all concerned.

This document does not present a blueprint or model for a new research-based university. Instead, it presents a procedure that will enable universities to take responsibility for using their potential to better contribute to national agricultural R&D. The document includes a conceptual framework, procedures, approaches, strategies, and actions, together with many examples, detailed information, and hands-on advice. Further details and examples are provided on the CD-ROM included in this document.

The publication is a key output of the ISNAR project "Strengthening the role of universities in NARS in sub-Saharan Africa." This project was initiated in 1994 in collaboration with the University of Hohenheim and agricultural research leaders in six SSA countries, namely Benin, Burkina Faso, Côte d'Ivoire, Nigeria, Uganda, and Zimbabwe. The project succeeded in assisting universities in these countries in improving their agricultural research performance and in strengthening their linkages with other components of the NARS, based on a detailed study of each specific situation. This document is based on the experiences gained in these countries, a literature review to capture experiences in other countries, and two international workshops with representatives from the countries participating in the study, regional and international organizations, and donors. The document will be of particular value to agricultural leaders and policymakers who want to use a learning-process approach to identify and carry out institutional changes.

Conceptual Framework

The conceptual framework provides an appropriate context for analyzing the contributions of universities to national agricultural research. It acknowledges that universities are part of a larger educational and research system. This system perspective allows one to analyze university research performance in relation to the performance of the NARS as a whole. This analysis usually shows that the performance of a university is closely related to the effectiveness of its linkages with other institutions in the system.

The performance of university-based research is assessed using factor analysis. The performance criteria used are effectiveness, efficiency, and sustainability. Factors influencing the research performance of universities are grouped into four categories that characterize an organization: (1) mandate, objectives, and policies; (2) organization, structure, and linkages; (3) resources and information; and (4) program planning and management. By classifying the factors that influence university performance, we can focus on critical areas and determine appropriate recommendations and actions. Actions in these categories involve different actors and proposed changes require different time periods and human and financial resources.

The Five-Phase Plan

The “road map” for a review-and-change process consists of a plan with the following five phases: (1) planning and preparation; (2) collecting information and summarizing results; (3) preparing a report and recommendations; (4) developing and implementing action plans; and (5) evaluating implemented actions. Each phase consists of several steps and clearly defined outputs.

Phase 1: Planning and preparation. Once a decision has been made to improve a university's contribution to national agricultural development, the first step of the first phase is to appoint a committee to review the research currently conducted at national universities. It is recommended that the review committee begin by studying a wide range of possible strategies and actions to strengthen the research performance of the universities and the universities' linkages to other NARS components. It is also recommended that the committee collect relevant background data and information from available publications and statistics. Using information about possible strategies and actions (chapter 5) and the background information, the committee can determine whether a more detailed study is needed or whether a report with recommendations can be prepared directly. In the latter case, the committee follows the informed-judgment approach (and skips the second phase). If a study is deemed necessary, the review committee needs to identify a study team and organize a workshop with the major stakeholders of university agricultural research.

Phase 2: Collecting information and summarizing results. In this phase, the review committee first decides on the most appropriate type of review, based on discussions with major stakeholders at the workshop: the opinion-oriented or the data-oriented approach. Once the approach is agreed upon, the appointed study team proceeds to collect primary information (using questionnaires, survey instruments, and interviews with selected individuals) from staff and managers of universities and other NARS institutions, as well as those of other stakeholder institutions.

Phase 3: Preparing a report and recommendations. In the third phase, the study team prepares a detailed report using the results from the selected study approach (i.e., opinion-oriented or data-oriented). If the informed-judgment approach is used, the re-

view committee prepares the report, including the background information. The report includes recommendations for improving university research and strengthening linkages, as well as suggestions for actions to implement them.

Phase 4: Developing and implementing action plans. The first step of this phase is to present and discuss the review report and the recommendations at a (second) workshop. This requires the full participation of, and input from, all stakeholders. The goal of the workshop is to develop a draft action plan, which is later published after approval by key agricultural leaders, such as university deans, research institute directors, national policymakers, representatives of extension services, and farmer representatives. In addition, responsibilities for implementing the various strategies and actions are clarified. The short-term plan is subsequently implemented within about 12 months by the managers of the institutions involved and with assistance from the review committee.

Phase 5: Evaluating implemented actions. Phase 5 brings the review to a close with an evaluation of the outputs and impact of the implemented short-term actions, as well as an identification of the problems encountered. A final review report, in which future actions are proposed with a view to continuous improvement, is prepared and distributed.

Approaches

Three different review approaches are presented that university administrators can use to formulate recommendations and develop appropriate action plans: (1) the informed-judgment approach; (2) the opinion-oriented study approach; and (3) the data-oriented study approach. The informed-judgment approach requires no specific study or extensive collection of information because it assumes that the major constraints and measures needed to improve the contribution of universities are already known. The opinion-oriented study approach is based on the idea that various groups of people in the university and throughout the NARS can play a key role in identifying constraints and making suggestions for improvements. The data-oriented study approach uses questionnaires and interviews to build a solid foundation for making specific recommendations and to help identify problem areas that were unknown, unclear, or not fully recognized by staff, management, or policymakers. As all three approaches build on each other, the informed-judgment or opinion-oriented approach can be tried first, before engaging in the more cost-intensive data-oriented approach.

Strategies and Actions

Based on ISNAR's University in NARS study, 15 strategies are presented that universities may use to improve their contributions to national agricultural research without engaging in a review process. They relate to the four categories that characterize a university's research program: (1) mandate, objectives, and policies; (2) organization, structure, and linkages; (3) resources and information; and (4) program planning and management. For each of the strategies presented, information to describe the basis and rationale for the specific circumstances as well as a problem statement are provided, and some possible actions are identified for implementing the strategy. Where possible, examples from the case-study countries are provided in separate boxes.

Concluding Remarks

The concluding recommendations focus on important actions for national review committees. These actions can positively influence the review-and-change process:

- select a competent and respected senior-level review team;
- maintain strong relationships with top policymakers, particularly those at the ministerial level;
- encourage agricultural research leaders to communicate to their staff the importance of the review-and-change process;
- minimize the time institutions and staff need to devote to providing information;
- develop a sense of ownership of the process by staff;
- bring stakeholders into the process at strategic points to provide input and feedback;
- focus on clearly defined and reasonably adoptable actions;
- define, and comply with, a time-frame for the process.

Preconditions for success in the change process are (1) a strong commitment from all parties to contribute to the institutional changes required and, particularly, to allocate the necessary resources to implement them; and (2) a broad consensus among staff and other stakeholders on the need to strengthen the contribution of universities to national development-oriented research. It is important to consider that this process will take time and will need a sustained effort. In many cases, the fruits of strategies and actions initiated by the process will be visible only in several years' time.

Introduction

During the past four decades, the number of universities in sub-Saharan Africa (SSA) has grown significantly. In 1960 there were only six universities or university colleges in the region (Goma 1989). Since then, almost all SSA countries have set up universities, and today these countries have more than 200 universities and institutes of higher education, covering a wide range of disciplines. Among these, 87 are involved in agriculture and its related fields (ISNAR and WARDA 2001). This significant increase in universities and institutes of higher education was accompanied by substantial growth in the number of staff and students. In sharp contrast to this, however, are the significant cuts in public funding for higher education that have been made throughout Africa during the 1980s and into the 1990s (Beintema, Pardey, and Roseboom 1998).

It is often argued that universities in SSA, given their mandate, their considerable human resources and scientific infrastructure, and the fact that they train the next generation of scientists, could be more effectively integrated into national agricultural research systems (NARS) and could contribute more to urgently needed agricultural research and development (R&D) (e.g., World Bank 1999; FAO 1993; Plucknett 1995). In addition, universities in the region, while concentrating on education, have been criticized for maintaining an ivory-tower mentality and not participating actively in national agricultural R&D.

To address these issues, ISNAR initiated a study on “Strengthening the role of universities in national agricultural research systems of sub-Saharan Africa” (the “University in NARS study”) in 1994. The purpose of the study was to assist selected universities in SSA in enhancing their performance in agricultural research and in improving their collaboration with other key actors in the NARS, particularly the national agricultural research organizations (NAROs). The study was designed in such a way as to derive guidelines and develop procedures that will allow other countries to improve the contribution of their universities to national agricultural research. The focus was on development-oriented agricultural research, which is defined as any “type” of research (basic, strategic, applied, and adaptive) or “kind” of research (disciplinary or multi-disciplinary) that addresses (in whole or part) national priority issues in agriculture.

Today, many policymakers and agricultural leaders are seeking professional guidance and advice on how to strengthen the contributions of their universities to national agricultural research.¹ To respond to this expressed need, ISNAR produced this publication as a key output of its University in NARS study. The publication does not present a blueprint for a new research-based university, but rather encourages a learning process. Designed primarily for university administrators and NARS leaders, the publica-

1. When initiating the second phase of the study in 1996, ISNAR received requests from 15 Ministers of Research and Higher Education or Ministers of Agriculture in SSA to participate actively in its University in NARS study. More recently, at an international workshop concerned with developing a collaborative platform for agricultural research in SSA in 2001, representatives from 15 academic institutions highlighted the importance of national collaboration among key NARS component institutions to improve the contribution of research to agricultural development.

tion presents some generic procedures, approaches, strategies, and actions. It is based on (1) a literature review (annex 2); (2) the six country studies that ISNAR conducted in the course of its University in NARS study; and (3) the results of two international workshops.² The international workshops included important contributions from those involved in the country studies as well as from representatives of regional organizations, international organizations, and donors.

Rather than promoting a new university model, we present a procedure that will enable universities to take responsibility for using their potential to contribute more effectively to national agricultural R&D. Any country that wishes to enhance the contribution of its universities to national development-oriented agricultural research can apply these procedures to prepare and implement action plans. The section on strategies and actions presents ideas, information, and practical advice (not models) that any country may use, without engaging in a review process.

Although the focus of the publication is on the research component of the universities, the authors do not wish to imply that universities should be converted into pure research organizations. Universities and NAROs have complementary mandates and unique resources to contribute to national development-oriented research. Both can therefore benefit from better linkages. When each kind of organization takes into account its respective mandate and resources, and matches these against the spectrum of research activities to be tackled (basic, strategic, applied, and adaptive research), it will usually find that it has a comparative advantage for particular activities. Solving farmer problems and providing new opportunities for farmers require the contribution of both universities and NAROs; developing mechanisms for collaboration enhances this process and ensures the quality of the outputs for the benefit of all concerned.

About this Document

The publication is organized into five chapters. Examples and details are provided on a CD-ROM included in the inside back cover of the document.

Chapter 1 presents background information on universities in SSA and ISNAR's University in NARS study.

Chapter 2 provides a conceptual framework that places the procedures, approaches, strategies, and actions in an appropriate context. The framework acknowledges that universities are part of a larger education and research system. This system perspective allows one to analyze the university's performance in relation to the country's overall agricultural knowledge and information system (AKIS). This analysis usually shows that university performance is strongly related to the university's linkages with other institutions in the system. Chapter 2 further provides an analytical framework for a country-wide review process by describing the: (1) goal, objectives, and expected outputs; (2) criteria for performance analysis; (3) categories for analysis; (4) research performance analysis; and (5) linkage performance analysis.

Chapter 3 presents a five-phase plan for studying and improving the contribution that university research can make to national agricultural research. The phases are (1) plan-

2. Country studies (Burkina Faso 1997a, Republic of Nigeria 1995a, Republic of Uganda 1997a, Republic of Zimbabwe 1998, République de Côte-d'Ivoire 1998a, and République du Bénin 1995a), proceedings of the two international workshops (Michelsen et al 1995, Michelsen and Shapiro 1998) and related publications are listed in the project publications and are available from ISNAR upon request.

ning and preparation; (2) collecting information and summarizing results; (3) preparing a report and recommendations; (4) recommending action plans; and (5) evaluating implemented actions. Objectives, steps, and outputs are defined for each of the five phases.

Chapter 4 presents three different approaches for developing recommendations and action plans: (1) informed judgment; (2) opinion-oriented study; and (3) data-oriented study. In brief, the informed-judgment approach requires no in-depth study and leads to strategies and actions that universities may use immediately; the opinion-oriented study approach is based on an exercise involving opinion surveys; and the data-oriented study approach includes questionnaires and interviews for collecting quantitative and qualitative data and information. Since the presented approaches build on each other, we strongly recommend that policymakers and agricultural leaders test the informed-judgment approach before embarking on a costly review of their university's situation.

Chapter 5 presents a wide range of strategies and corresponding actions that universities can implement to improve their contribution to national agricultural research. These strategies and actions are based primarily on the outputs of ISNAR's University in NARS study. They do not constitute a model for university research and need to be applied judiciously. The ideas presented should be modified and adjusted to suit each situation individually. Just as agricultural research itself must remain flexible, these strategies and actions should also be flexible; they are not meant to be applied as rigid rules.

The concluding remarks section focuses on some of the key issues that determine or influence the success of a review-and-change process to improve the contribution of universities to national agricultural research.

Chapter 1: Background

This chapter provides a brief description of the development of universities in SSA. It also describes the three phases of the University in NARS study.

Universities in Sub-Saharan Africa¹

The development of universities in SSA has passed through three major phases over the past 40 years (Eicher 1990, 1999). In the 1960s, after independence, the governments of the young African nations initiated a significant effort to develop and improve their universities. Many developed countries, development organizations, and donors supported the creation of universities in SSA (World Bank 1994a, 1994b). The initial concern of political leaders was the training of Africans to run the civil services of their newly independent countries. Governments respected universities, provided generous financial support for them, and granted them a huge degree of autonomy. However, higher education usually remained the privilege of the newly established upper classes (Last, Lewin, and Scharbius 1991).

In the 1980s, a significant increase in the quantity of education was accompanied by a decrease in its quality, leading to “mass universities” (Last, Lewin, and Scharbius 1991). Austerity measures and structural adjustment programs hit universities particularly hard, as university funds came almost entirely from the government (Lynam and Blackie 1994). During this period, universities and governments coexisted in an uneasy and frequently conflictual relationship. The major causes of conflict were the inability of governments to meet the financial needs of universities, the increased involvement of governments in university affairs, and the tendency of sections of the university community to question their governments on matters ranging from corruption to shortcomings in democratic decision making (Mwiria 1992). Meanwhile, donor preference shifted from higher education to other sectors. Agencies like the World Bank argued that developing countries spent too much on higher education which, it claimed, had lower economic and social returns than elementary and secondary education (Psacharopoulos and Woodhall 1985; World Bank 1994a). Consequently, support from the World Bank and other international donors for agricultural education, including higher education, decreased drastically in the 1980s and 1990s (Willett 1998).

In the 1990s, after some 30 years of experience, it became apparent that university education in SSA no longer met the demands of society. On the one hand, it was found that a large number of graduates remained jobless, either because the public sector was already overstaffed or because the private sector was not able to provide jobs. On the other hand, and despite the fact that an increasing number of universities in SSA were offering degree training, there was a shortage of scientists in disciplines like agricul-

1. This section is based on the section “University development in SSA” published in Michelsen and Hartwich (forthcoming): Performance in agricultural research organizations: a comparative statistical analysis of universities and public research organizations in sub-Saharan Africa.

ture and economics, due to the limited opportunities for postgraduate training (Pardey, Roseboom, and Beintema 1997; Fine, Lyakurwa, and Drabek 1994). The insufficient supply of qualified national scientists has meant a continuing reliance on short-term expatriate appointments in many developing country programs (Jones and Blackie 1991). Many African students continued to be trained in universities in the North.² However, this option was becoming less and less feasible as the costs of an MSc or PhD course in the North continued to rise. Moreover, the changing focus of universities in the North made the education they provided less relevant to current African research needs (Lynam and Blackie 1994; World Bank 1999).

African governments facing stringent economic conditions were barely able to finance their universities at even the most basic levels. The relentless financial crises led to a decline in the universities' intellectual resources, research funding, and teaching facilities. The most serious casualty was staff morale. Faced with "starvation wages," many professors searched for income outside the university, running small businesses or "consulting" for private companies and foreign agencies (Useem 1998). Meanwhile, official organizations and nongovernmental organizations (NGOs) frequently looked upon universities as distant cousins, enjoying a privileged position and returning little to the societies that supported them (Uphoff 1996). As Useem (1998) puts it, "Across Africa, crumbling public universities are barometers of the continent's intellectual malaise."

During the 1990s, several international organizations evaluated their support for higher education in developing countries. A World Bank report concluded that old approaches emphasizing bricks and mortar, hardware, and overseas training for staff are now largely inadequate to address the new imperatives of improving food security, developing more secure rural livelihoods, improving productivity and sustainability, and introducing reforms in the agricultural sector (Willett 1998). In his review of agricultural institutions in SSA, Eicher (1999) provided four insights:

- There is no single university or research or extension model that will be effective throughout Africa.
- Most African nations are at an earlier stage of scientific and institutional development than India was on the eve of the Green Revolution in the mid-1960s. Consequently, there is a need to pay careful attention to the time and resources required to accomplish the task of strengthening the human capital base and the institutional foundation.
- Imported institutions from other cultures and other continents will undoubtedly have a high failure rate in Africa if they are replicated before the satisfactory completion of a pilot phase.
- There are numerous design flaws in donor-financed, supply-driven models of institution building.

There seems to be a general agreement that new approaches and renewed international and national support are needed to revitalize universities in SSA. The conclusions of various reviews of donor experiences with African university capacity building are quite consistent and provide guidance for future university capacity building (Alex 2000). ISNAR's University in NARS project, presented in the following section, tries to contribute to the current debate and offer solid information on what can be done to improve the contribution of universities to national R&D.

2. In the early 1990s, over 88,600 African students were trained abroad (Beintema, Pardey, and Roseboom 1998).

ISNAR's University in NARS Study³

ISNAR's mandate is to strengthen national agricultural research and development in developing countries. Since 1982 ISNAR's activities have focused on strategic relationships between institutions seen to be part of the NARS, including farmers' organizations, extension services, and the private sector. ISNAR's concern with the role of universities goes back to collaboration with the Association of Faculties of Agriculture in Africa in 1984 and ISNAR's active participation at the United Nations Food and Agriculture Organization (FAO) expert consultation on the role of universities in NARS in 1991 (FAO 1993). In 1994, ISNAR, in collaboration with the University of Hohenheim and with the support of several organizations (the Bundesministerium für Wirtschaftliche Zusammenarbeit, Germany [BMZ], the Technical Centre for Agricultural and Rural Cooperation [CTA], the Deutsche Stiftung für Internationale Entwicklung [DSE], and the Deutsche Gesellschaft für Technische Zusammenarbeit [GTZ]), initiated its University in NARS study. The specific objectives of the project were to

- develop a methodology to analyze the context in which universities and other NARS component institutions are evolving and to identify constraints that limit their contributions to national agricultural research;
- identify opportunities and imaginative mechanisms to improve the contributions of universities to development-oriented research in agriculture in Benin, Burkina Faso, Côte d'Ivoire, Nigeria, Uganda, and Zimbabwe;
- initiate action plans to improve cooperation between universities and other components of NARS in the selected countries;
- derive guidelines that enhance the contributions made by universities to NARS;
- develop procedures to allow other countries to study and improve university research contributions to NARS.

There were three major phases of the project.

Phase I involved a literature review (annex 2) and the consequent development of the conceptual and analytical framework. The literature review included ISNAR's past experiences, studies by other organizations, and other relevant documents. Many ISNAR's studies and experiences concerning linkages between research organizations and various other actors in the NARS, summarized in Zuidema et al. (1995), have influenced the development of the conceptual framework.⁴ In addition, several reviews by other international organizations have surveyed key issues pertaining to universities in developing countries over the last decades: FAO (FAO 1993, 1996, 1997), the World Bank (Craig 1990; World Bank 1988, 1999; Willett 1998; Bawden 1998; Alex and Byerlee 1999; Byerlee and Alex 1998; Saint 1992; Venkatesan and Kampen 1998); the United States Agency for International Development (USAID) (USAID 1986; Hansen 1989), the United Nations Educational, Scientific and Cultural Organization (UNESCO)

3. More details on the study, particularly the activities and outcomes at the national level, can be obtained from the project's web page www.isnar.cgiar.org/education.htm and activities (see also the list of project documents).

4. Early ISNAR publications addressing the role of universities include Contant (1988, 1991), Taylor (1989), Taylor and Contant (1992), and Elliott (1995). Key publications addressing the system perspective are Elliott (1992) and Engel (1990). Key conceptual issues relating to linkages between different NARS component institutions are presented in the works of Bennell (1989) and Valverde (1990). ISNAR work on linkages between research organizations, farmers, and farmer organizations is published in Eponou (1993) and Eponou et al. (1999) while the focus of the work of Kaimowitz (1990), Kaimowitz, Schneider, and Engel (1989), Merrill-Sands and Kaimowitz (1990), and Zuidema (1989) is on linkages between agricultural research organizations and technology transfer agents.

(UNESCO 1995; Farrant 1996), the Association for Development Education in Africa (ADEA) (AAU and World Bank 1997; Assie-Lumumba 1993; Mriwia 1992), and the Rockefeller Foundation (Coombe 1991; Court and Coleman 1993). Reviews summarizing these experiences (Michelsen and Hartwich 1997; Hartwich 1997a, 1997b, and 1997c) as well as studies of the agricultural research systems in Britain, France, and Germany (Carsalade 1994; Heidhues 1994; and Willett 1994) formed the basis for determining the potential factors and key issues that influence the research performance of universities and university linkage performance. Based on these reviews and studies, ISNAR developed the conceptual and analytical frameworks for this study.

During Phase I, case studies were conducted in Nigeria (Ahmadu Bello University) and Benin (Université Nationale du Bénin) to test the conceptual and analytical frameworks. In May 1995, national workshops were held in these two countries to review the results of the studies prepared by national consultants to develop recommendations and to formulate concrete action plans for improving the role of their universities in national agricultural research systems. When the action plans were approved by the steering committees formed in the respective countries, under the auspices of ISNAR's University in NARS study, the plans were published and ISNAR provided funds to the committees to support the implementation of selected short-term actions.

In September 1995, an international synthesis workshop was held at ISNAR in order to: (1) review and draw lessons from the two case studies; and (2) assess and revise the conceptual and analytical frameworks used for the country studies (Michelsen et al. 1995). In addition, a critical assessment and comparison of ISNAR's data-oriented approach with the approach developed by FAO for case studies in Near East countries revealed that the ISNAR approach resulted in reviews and change processes that were much more substantial than those initiated by the FAO approach (Blanckenburg 1995). It was further determined that the comprehensiveness and mix of quantitative and qualitative data collected through ISNAR's approach provided a very good picture of what was going on at the universities, at the NAROs, and between the two (Shapiro 1995). The FAO approach led to reviews that did not go beyond general recommendations. Based on the output of the workshop and comparative reviews, the project team slightly revised the conceptual and analytical framework for Phase II of the study.

Phase II began in 1996 with the selection of Burkina Faso, Côte d'Ivoire, Uganda, and Zimbabwe as additional case studies, since they covered a broad range of universities in terms of historical background, size, and research performance. These countries used the revised framework to conduct their national studies and to develop and implement recommendations and action plans under the guidance of the national steering committees.

The approach used in the case studies continued to require the collection of a large amount of information and was, therefore, very time-consuming. It was recognized that the key purpose of developing the comprehensive data-oriented approach was to allow comparison of cross-country experiences and to accumulate knowledge about possibilities for improving the university contribution to national agricultural research. Therefore, it was necessary to develop an approach that other countries could use to conduct their own studies without external assistance. In many countries, it was found that the major constraints to optimum performance of the university could be identified, without in-depth studies, through the knowledge and opinions of various groups of people in the university and/or throughout the NARS. Consequently, the informed-judgment approach and the opinion-oriented approach were also developed.

All approaches were reviewed during an international workshop in 1997 (Michelsen and Shapiro 1998) organized to review the outputs of the project, and several sugges-

tions were received to improve the approaches. The international workshop concluded further that ISNAR should go ahead and prepare generic documents that (1) serve as a basis for informed decision making by policy makers; (2) lay out a conceptual framework regarding the role of universities in NARS; and (3) provide a self-diagnostic tool for other countries based on the procedures and approaches developed.

Phase III of the project started in 1998. The key activity was to finalize and publish generic documents for use by other countries that wish to strengthen the contribution of their universities to national agricultural research. In addition to this document, a research report on factors influencing research performance of universities in SSA was developed (Michelsen and Hartwich, forthcoming). The results of the project were further published in several papers and posters and were presented at several international conferences (see Project Documents section).

Another important activity was the evaluation of actions implemented in the six participating countries in 1998–99, about one year after the development of the action plans (Michelsen and Petry 2001). The results of the evaluation survey confirmed the validity and relevance of the action plans that were formulated as part of the project. The results further confirmed the potential of institutions to implement change successfully. The dialogue between the different actors within the NARS, started during the formulation of these action plans, had continued and evolved during the implementation phase. Moreover, awareness of the role of universities in the NARS was raised, leading to many other suggestions being generated on how to improve the NARS. On the basis of the University in NARS study, there is a strong indication that the contribution of universities to national agricultural research was improved, particularly through the establishment of stronger linkages with the other NARS components.

A final evaluation was begun during 2001, and the results are expected in 2003. The evaluation is designed to show whether the recommendations of the study led to effective, efficient, and sustainable changes and whether additional recommendations with positive impact on the research system were implemented.

Chapter 2: Conceptual Framework

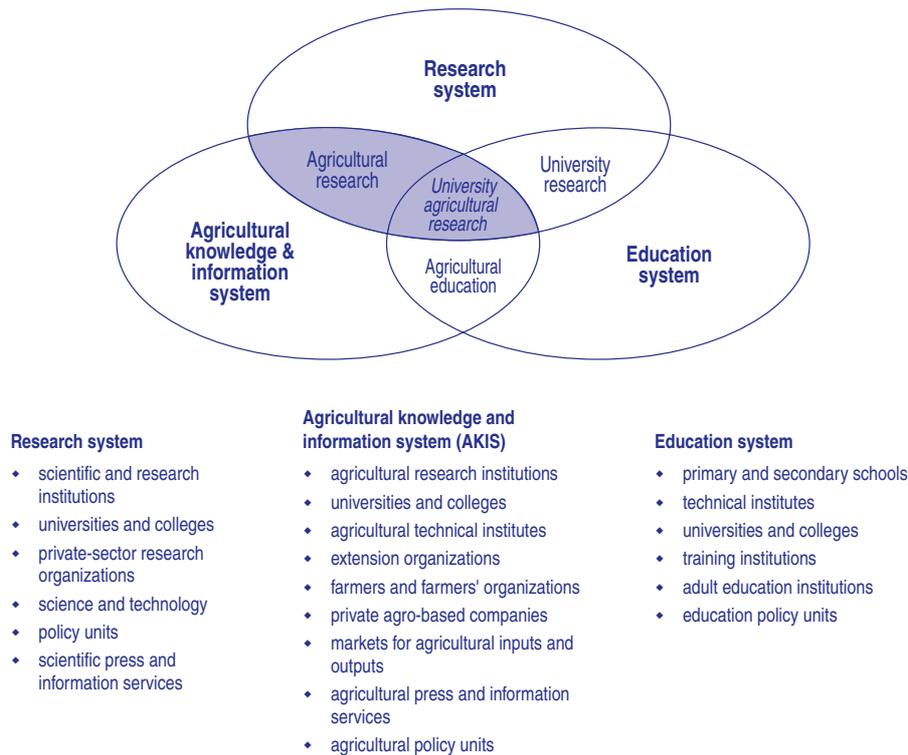
The conceptual framework of the ISNAR study acknowledges that (1) universities cannot be studied in isolation, but rather should be studied in a systems context; and (2) universities, given their mandate for education and research, are not only part of the national education system, but are also part of the national research system. Consequently, a systems approach is adopted in seeking to enhance the contribution that universities make to agricultural research at the *national* level (University Agricultural Research in a Systems Context, below). The analytical framework serves as the basis for reviewing the research performance of universities and the linkages of universities to other components of the NARS (Analytical Framework, following section).

University Agricultural Research in a Systems Context

The term “Systems” commonly refers to a complex set of related components within an autonomous framework. Churchman (1979) defines a system as a set of parts that are coordinated to accomplish a set of goals. Any system is usually part of a larger system composed of more molecular systems. The complex interrelationships among the components of a system preclude any analysis of sectors or subsystems of the system in isolation. The success of any one institution in a systems context is related to the success of the other institutions and the performance of a successful system amounts to more than the sum of its parts (Bonnen 1998). This institutional interdependence means that different institutions need to collaborate (and compete) in various ways to carry out the tasks needed within the system. For agricultural research, these tasks include defining problems, designing experiments, adapting existing technology, verifying new technology, packaging technology, producing information, providing services, training staff, demonstrating technology, and providing feedback (Zuidema et al. 1995). While building a system takes time and requires a clear commitment from the institutions involved, doing so can help component institutions to become more efficient and effective.

Given their science and education mandates, universities are part of the national education system, but at the same time they are part of the national research system. The NARS concept has been commonly used over the last decade when analyzing agricultural research. Röling (1989) further broadened the NARS concept (see also Röling and Engel 1992), leading to the development of the broader concept of an agricultural knowledge and information system (AKIS) of which the NARS forms a part. Consequently, agriculture-related faculties, and departments of agriculture in particular, can also be seen as components of the national AKIS. Figure 2.1 shows the close relationship between university research, agricultural research, and agricultural education. Thus, *university agricultural research* belongs to all three systems: education, research, and AKIS. This interrelationship makes it imperative to take a systems approach to studying and improving agricultural research at universities.

Within a systems context, it is appropriate to use a systems approach in analyzing the contribution that universities are making to national agricultural research and in mak-



Source: ISNAR (1996)

Note: Shaded area represents the NARS.

Figure 2.1: Systems context for university participation in national agricultural research

ing recommendations to improve their contribution in this area. The analysis of systems includes four different parts (Fuchs-Wegener 1972 cited in Hartwich and Meijerink 1999): analysis of the system structure and its elements; analysis of the system environment; analysis of the relationships among the system components; and analysis of the system performance.

The aim of analyzing the components of the NARS is to identify ways of improving the performance of the overall system. However, enhanced performance for one or more components does not automatically result in an improvement in the performance of the entire system; linkages and relationships need to be improved as well. Linkages between universities, NAROs, and other component institutions of the NARS are of prime importance.

The analytical framework (next section) and the approaches developed and presented (chapter 4) address all components of a system. They include a detailed description of the higher education system, the NARS, and their respective environments. They also include an analysis of (1) the research performance of NARS components with special emphasis on the research performance of universities; and (2) the linkages between the different NARS components, with special emphasis on the linkages between universities and other NARS components, particularly the NAROs.

Another important aspect of the systems approach relates to institutions that are part of more than one system. For example, measuring the performance of a university involves evaluating not only its direct research output in terms of publications and technologies (research system), but also its indirect research output through better trained and qualified graduates (education system). In our approach, educational performance is only touched upon for the purpose of evaluating the research related to it (for instance, through supervision of thesis research). An evaluation of the educational component itself, such as curriculum development, was not undertaken. However, in order to assess the research performance of universities, it is necessary to understand the characteristics and dynamics of each of the systems in which they are involved.

Before presenting the analytical approach, we describe in more detail the components and characteristics of the three systems of which a university is part: the education system, the research system, and the AKIS. This overview demonstrates that these systems differ significantly in terms of their mandate, organization, resources, and management.

Education system

A country's education system includes all of its educational and training institutions at all levels. Educational institutions are typically mandated to provide the basic knowledge and human resources to meet a country's education, training, research, and development needs.

In SSA, most universities are affiliated to ministries of education, which have broad mandates that include primary, secondary, and higher education. This document focuses on institutions of higher education, particularly the agricultural universities or the agriculturally oriented faculties and departments of comprehensive universities. The science and education mandate of these institutions often provides the rationale for the research (mostly basic and strategic) done by the university. However, universities and their research components are usually seen as part of the (higher) education system and their role as part of the NARS or the AKIS is not explicitly recognized. Exceptions are agricultural universities because they are often based in ministries of agriculture and may have an arrangement whereby their research components feed directly into the NARS.

The mandate of universities is to contribute in two ways to augmenting the stock of knowledge: through teaching and through R&D. However, in developing countries, universities have been primarily regarded as teaching institutions. There are a number of reasons why universities should be involved in R&D and indeed may have a comparative advantage in this area (Venezian 1995 cited in Echeverría, Trigo, and Byerlee 1995; Eyzaguirre 1996; World Bank 1999):

- Local institutions should be involved in locally important R&D. Some local problems cannot be studied elsewhere as it is not possible to replicate local natural and social conditions abroad.
- Universities usually comprise highly qualified human resources and a diversified infrastructure, both of which can be used for R&D. The existence of a teaching infrastructure may enable universities to carry out R&D even if budgets are limited.
- Universities profit from the effects of synergy between teaching and R&D. R&D has a positive effect on the quality of teaching as necessary scientific skills are developed. Teaching has a positive effect on R&D as students provide a critical mass for scientific discourse, carry out adaptive research (for instance, as a basis for writing

theses), and provide skilled, relatively low-cost labor for technical assistance and fieldwork.

- A large university profits from the effects of scale and scope (for instance through the existence of a research culture, research infrastructure, and a critical mass of highly educated scientists), which can greatly enhance R&D efforts.
- Universities train students who will later be responsible for the development and implementation of R&D programs and projects.
- Universities usually have more academic freedom than other R&D institutions. This may have a positive effect in encouraging creative, unplanned (but potentially very productive) R&D, outside the mainstream. The associated scientific climate at universities is beneficial to R&D as well.
- Universities usually have good access to information and, thanks to advanced means of communication and the personal contacts of staff trained abroad, they interact well with the international research community.

As a rule, universities are organized along disciplinary lines and departments have considerable autonomy in defining scientific topics. The administrative structure of African universities bears the mark of their European origins. Typically, their administrative organization is highly centralized, hierarchical, and rigid (Assie-Lumumba 1993). Most universities manage research in one (or more) of the following ways (FAO 1993):

- **No specific research administration.** Individual staff develop initiatives for research, with budgetary support from outside the faculty.
- **Department-based management.** Research activities are based in departments with no faculty-/college- or university-coordinated administration. Departments initiate, fund, and coordinate research programs, which are carried out by one or more members of the department.
- **Faculty/college research committee.** The committee is responsible for organizing and funding research at the faculty/college level. It distributes the funds from the budget assigned for research to the individual research projects in the various departments.
- **Faculty/college director or vice-rector for research.** A director or a vice-rector is appointed to organize and administer research activities. This indicates a strong commitment to research.
- **Central research committee within the university.** A faculty/college research board may assist the committee. In most cases, there is then no specific research administration at the faculty level.
- **Directorate of scientific research** under the vice-chancellor (or rector). The directorate formulates research policy guidelines based on proposals from the various faculties. It also coordinates, seeks funds for, and promotes the publication of, the results of research as well as providing linkages with relevant bodies outside the university.
- **Special research institute, center, unit, or other distinct entity within the university.** The director of such an entity, which is usually autonomous or partly so, reports directly to the vice-chancellor (or rector). Institutes have a separate budget and a core staff. Examples of such units are the Centro Nacional de Investigación Forestal Aplicada (CENIFA) in Honduras and the Centre Ivoirien de Recherches Economiques et Sociales (CIRES) in Côte d'Ivoire.

Universities may also have postgraduate colleges. Since postgraduate courses typically involve research, these colleges may contribute significantly to the research capacity of universities. This is particularly true if they have a clear mandate for the promotion, organization, management, funding, and monitoring of postgraduate programs.

University staff are usually more highly qualified than NARO staff and have a greater degree of specialization. Their focus on advanced degree training requires their involvement in research, but heavy teaching and advisory responsibilities often limit their own research activities. Typically, universities have only weak ties, or no ties whatsoever, with technology users and other components of the NARS and AKIS.

In summary, universities must be involved with research and development if they are to fulfill their education mandate adequately. First, teachers must remain up-to-date in their field and their research requires a thorough familiarity with the relevant current literature. Second, the training of graduate students for research, teaching, and other science-oriented objectives requires a research program and research activities within the university.

Research system

A country's research system includes its universities, public-sector and private-sector scientific and research institutes, science and technology policy units, the scientific press, and scientific information services. Research activities are usually only weakly coordinated, although some countries have science and technology ministries or other apex bodies responsible for coordinating research policies and resources. For current purposes, we focus on the national agricultural research system. ISNAR (1992) has defined a NARS as a system that is made up of all of a country's public and privately funded entities responsible for organizing, coordinating, or carrying out research that contributes directly to the development of its agriculture and the maintenance of its natural resource base. Agriculture is understood to include the production of fish and trees, as well as crops and livestock.

As a rule, the most prominent component institution of a NARS is the NARO. Other components of a NARS may include universities, private companies, NGOs, policy units in the government, and, in some cases, farmers' organizations. There are many kinds of NARS, with diverse organizational structures, and some have reached a certain integration of, or linkages among, their key component institutions. Typical public agricultural research systems include: (1) institutions based at universities; (2) institutions based in a ministry of agriculture; (3) autonomous or semiautonomous institutes; and (4) agricultural research councils (Ruttan 1982). Many different combinations of these components exist and public systems usually coexist with private ones.

The chief objective of a NARS is to make viable and sustainable technologies available to farmers. This means that farmers must find the technologies useful and acceptable in meeting their objectives, such as increased production, diversification of income, equitable distribution of income, and protection of the environment. Another objective of a NARS is to provide policymakers with information and knowledge that will help them to allocate resources effectively (ISNAR 1992).

Compared with university staff, NARO staff are typically less highly qualified, they have lower salaries, their laboratory facilities are less up-to-date, and they work under poorer conditions. Often, they are also under pressure to produce quick results to solve specific problems. However, they usually have stronger linkages with the actual users

of the research results than do university researchers. In general, NARO researchers focus on applied and adaptive research.

Agricultural knowledge and information system

An AKIS is “a set of agricultural organizations and /or persons, and the links and interactions between them, engaged in processes such as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in a given country’s agriculture or a domain thereof” (Röling 1989). The AKIS perspective is a way of conceptualizing the task relationships and information flows between various actors involved in agricultural technology systems.¹

The components of an AKIS include farmers, farmers’ organizations, extension organizations, NGOs, educational institutions, research institutions, private companies, markets, and policymakers. Many of the institutions that are part of the AKIS are components of the NARS while the NARS is a subsystem of an AKIS (see figure 2.1).

ISNAR’s mandate is to look at a NARS from the standpoint of the effectiveness, efficiency, and sustainability of institutions dealing with national agricultural research. An AKIS perspective would presume that the actors of the NARS are working interdependently rather than independently. Institutional interdependence is a key element in determining the performance of any one institution in a NARS.

In practice, the component institutions of an AKIS often function rather independently, with few explicit linkages to each other in the form of networks, consortia, or other groupings. The independently functioning component institutions are often the result of political and bureaucratic realities, legal or financial constraints, high transaction costs, poor management, and/or lack of understanding of how intrasystem collaboration can be mutually beneficial. Members of a highly effective AKIS would share a common vision and sense of purpose, giving rise to (1) clearly defined mandates and a rationale for collaboration; (2) policies and strategies that legitimize and facilitate coordination; (3) specific mechanisms for linkages; and (4) human and financial resources to enable linkages (Zuidema et al. 1995; Zuidema 1997).

Analytical Framework

Based on the system perspective, the following questions need to be addressed in order to review and improve the contribution of a university to national agricultural research:

- What are the potential resources of the university for addressing national agricultural R&D issues?
- How effective, efficient, and sustainable are the university’s current research activities in addressing these issues?
- What are the main factors that influence the university’s research performance and its linkages with other institutions in the NARS?

1. The AKIS system perspective has been adopted by a number of international organizations and donors, including the World Bank, which formed an AKIS working group in the mid 1990s (Byerlee and Alex 1998).

- How could the contribution of the university to the overall goals of the NARS be enhanced?

It should be clear from the nature of these questions that the focus is on development-oriented research. This is defined as any “type” of research (basic, strategic, applied, and adaptive) or “kind” of research (disciplinary or multidisciplinary) which addresses (in whole or part) national priority issues in agriculture. In other words, how can universities become more relevant and more directly useful to the societies of which they are a part, and in particular to the agricultural sector of those societies?

The analytical framework developed for a country-wide review helps in answering these questions and takes into account the (1) goal, objectives, and expected outputs of the review; (2) criteria for performance analysis; (3) analysis of predictors of performance; (4) analysis of research performance; and (5) analysis of linkage performance.

Goal, objectives, and expected outputs

The **goal** of a review is to increase the effectiveness, efficiency, and sustainability of a university’s research performance and of its linkages to other NARS components.

The **objectives** of the review are to

- analyze the context in which universities operate and identify constraints that limit their contribution to national agricultural research;
- identify opportunities and imaginative mechanisms to improve the contribution of universities to development-oriented research in agriculture;
- develop recommendations on how to enhance the university’s contributions to national agricultural research;
- recommend to appropriate managers initial action plans that improve university research and cooperation between universities and other NARS components;
- evaluate implemented actions to improve university research and cooperation.

Expected **outputs** of the review are a study report, recommendations and action plans, implemented actions, and a final report.

Criteria for performance analysis

Good performance can be described as the efficient use of resources in line with predefined objectives. Evaluating performance helps to identify the need for corrective actions. The literature on criteria for describing performance is vast and varied (e.g., Lusthaus, Anderson, and Murphy 1995; Peterson 1998; Alex 1998; Daniel and Fisch 1990; Horton et al. 1993; Sanders 1994). The recommended performance evaluation criteria for analyzing a university’s development-oriented research and its linkages to other NARS components are **effectiveness**, **efficiency**, and **sustainability** (ISNAR 1992). An important objective of the review exercise is to provide information about the extent to which universities meet these three criteria in their research and linkage performance.

Effectiveness is the ability to meet defined objectives. For our purposes, effectiveness refers to the quality of an organization’s research output, the relevance of this output to users, and its ultimate contribution to agricultural development. Effectiveness is as-

essed by analyzing the defined goals of the national research system and determining whether the achievements of the component institutions correspond to the defined national priorities.

Efficiency here refers to how well resources and knowledge are used in generating research output. It is, therefore, a function of the inputs and the outputs of an activity.

Sustainability refers to the ability of the organization to maintain performance over time, to continue to be relevant to its stakeholders, and to acquire needed financial and other resources, indicating the organization's capacity to adapt to changing circumstances.

The approaches developed and presented in chapter 4 provide measures for each of these performance criteria.

Analysis of predictors of performance

The literature offers many models that attempt to explain organizational performance. One example relating to the management of organizations is factor analysis, which involves describing various factors that contribute to effective organizational performance (Özgediz 1990). Of particular concern here is the research performance of organizations. The approach used in this study builds on elements of previous models used by ISNAR to review organizational performance (Nestel 1989; Echeverría 1990a and 1990b). A university's performance in research and in its linkages to other NARS institutions is influenced by factors in four categories that can be used to characterize an organization and that ISNAR has termed the "MORP" categories: **mandate, organization, resources, and program planning and management**:

Mandate, objectives, and policies. Policymakers define the mandate, objectives, and policies of universities and other institutions of a NARS and, where an agricultural research council or other apex body exists, of the NARS itself. These are the guiding principles for these institutions. For example, government policies on export earnings, food security, and financing research are critical determinants of how the NARS, broadly defined, operates, as well as influencing how the individual institutions function, develop, cooperate, and perform.

Organization, structure, and linkages. The structure and organization of a NARS institution influences the extent of its involvement in development-oriented research and linkages with other institutions. For example, universities are typically oriented along disciplinary lines, while NAROs typically have a commodity-based structure and this difference might inhibit linkages between the two types of organizations. The external environment and relation to different stakeholders influence the operations and performance of the institution. Institutions can bring about some internal changes, particularly in relation to their linkages, but policymakers traditionally play the most important role in determining how an institution is organized.

Resources (human, financial, and physical) and information. Human, financial, and physical resources and information management determine how much an institution can do in the area of agricultural development-oriented research. Thus, they also influence a research institution's performance. These factors are managed at the institutional level, but are influenced, if not determined, by policymakers.

Program and activity planning and management. Actual program planning and management processes, including priority setting and the planning, monitoring, evalua-

tion, and coordination of activities and projects, significantly influence a research institution's performance. Institution managers can determine many of these management processes, although priority setting is often a national exercise.

Organizing the factors that influence a university's research and linkage performance within these four categories helps in the review and analysis of background information, data, and findings and in formulating recommendations and actions. Actions within these categories involve different actors and proposed changes require different time periods and financial and human resources. Using the MORP categories as an analytical framework helps focus on the factors that require priority action.

Analysis of research performance

As stated above, the performance of a university in contributing to national agricultural research objectives depends on a number of factors, including the university's mandate, objectives, organizational culture, organization and structure, external factors (clients, donors, policymakers), human resources, financial resources, physical resources, program planning and management, and linkages. It is important to rank the importance of these factors and to assess which ones constrain performance and which provide particular opportunities for improvement. Specific attention should be given to the potential of the university to participate both directly and indirectly in development-oriented research.

Analyzing a university's research performance also involves a comparison between the research component of universities and the other components of the NARS. Note that this comparative analysis of research performance is also used to evaluate constraints and opportunities affecting linkage performance (see Analysis of linkage performance, below).

Using the MORP categories, table 2.1 presents factors that influence university research performance in addressing priorities for national agricultural development-oriented research. These factors identify areas that are potentially limiting. They are distilled from a literature review (annex 2), and in particular the experiences relating to capacity development in higher education of FAO (1993 and 1996), the World Bank (Willett 1998; Alex and Byerlee 1999), and USAID (Hansen 1989), and the six country-case studies that ISNAR conducted during its University in NARS study.

Box 2.1 describes the key issues that need to be addressed in an analysis of the research performance of a university.

Table 2.1: Factors Influencing the Research Performance of Universities

Mandate, objectives, policies	Organization, structure, linkages	Resources, information	Program planning and management
University mandate	Intra-university linkages	Staff conditions of employment	Relation to national research priorities
University research policies	University structure for research Postgraduate research University linkages with technology users University linkages with other NARS components	Promotion criteria Staff capacity and incentives Funding for agricultural research Physical resources for agricultural research Publications and dissemination of university research results	Integration of student research Planning, monitoring, and evaluation of research activities

Box 2.1. Key Issues in Analyzing the Research Performance of a University

Mandate, objectives, policies

- ◆ Is there an explicit mission and mandate for development-oriented agricultural research at the university? If so, is the mandate only given lip service, or does it really matter?
- ◆ Is there a policy for budget allocation to research according to the mandate for teaching, research, and extension?
- ◆ Is there a policy to integrate teaching and research activities?

Organization, structure, linkages

- ◆ What is the extent and nature of existing intra-university research linkages?
- ◆ Is there a functional structure at the university that facilitates research? If so, what is that structure (research council, interdisciplinary groups, etc.) and how does it operate for the different units (i.e., at the university, faculty, and department levels)?
- ◆ What government ministry is responsible for supervising the university?
- ◆ Is there any organization or institute at the university that facilitates development of research topics by graduate students? If so, how does it work?
- ◆ What kinds of linkages exist with other institutions? Do these linkages facilitate or inhibit development-oriented research? What is the extent and nature of linkages with farmers and other potential users of research results? Who are the beneficiaries of research? What factors limit utilization of research results by farmers?
- ◆ What is the extent and nature of linkages with other NARS components?

Resources and information

- ◆ What are the staff conditions of employment?
- ◆ Is there a policy on staff members undertaking consultancies? Are there any problems that arise due to consulting by staff?
- ◆ What are the criteria for promotion?
- ◆ What is the degree of autonomy of departments regarding promotions?
- ◆ What is the human resource capacity of the research staff (in terms of highest degree, specialization, experience, etc.)? Is that capacity being effectively utilized (for instance, through efficient time allocation)?
- ◆ What is the productivity of the research staff, as measured by various outputs?

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- ◆ Does the incentive structure serve to stimulate research output? What rewards exist for productive researchers?
- ◆ Are there problems with staff turnover? How much autonomy do university units have regarding recruitment of staff?
- ◆ What has been the level of funding of university research, overall and per researcher, in constant dollars, during the past 10 years?
- ◆ What is the degree of autonomy concerning control of financial resources from internal and external sources? What are the criteria used for allocating university funds to research?
- ◆ Is there a research budget for the university? If so, what is its funding level, and how does it operate?
- ◆ What alternative sources of funding for research are available? What proportion of researchers has funding from these alternative sources?
- ◆ What are the physical resources (labs, equipment, land, etc.) available for agricultural research? What is the condition of these facilities? What is the extent of their utilization for agricultural research?
- ◆ Are there national research publications (journals) in which university agricultural researchers can publish? If so, does publication in these journals have a payoff in terms of salary or promotion? Are there ongoing faculty research seminars and workshops where faculty can present research in progress?

Program planning and management

- ◆ Are there well-defined national needs and priorities? Does the university research agenda take into account national agricultural research goals?
- ◆ Is there a formal system for determining national agricultural research objectives and priorities? Does the university participate as an institution in the setting of national research priorities? How frequently are they revised?
- ◆ What is the focus of completed, ongoing, and proposed research in relation to national research priorities?
- ◆ Is student research planned and integrated into the national research agenda?
- ◆ What are the planning, monitoring, and evaluation procedures in effect at the university, and how do they work?
- ◆ What is the degree of autonomy for development and management of the research program?

Note: The approaches presented in chapter 4 provide measures and indicators for each of these issues.

Analysis of linkage performance

As we have seen, an important determinant of a university's performance in research is the extent and nature of a university's external linkages to the other components of the NARS, particularly the NARO. A linkage between component institutions can be defined as any structural or managerial device or procedure that enhances the complementarity of university-based research and the research done in other components (Eponou 1993). An analysis of how the existing linkages function provides additional information about the contribution of universities to the national agricultural research agenda and the factors influencing that contribution. Although substantial benefits are expected from these linkages, the costs can also be significant (Castillo 1997). Improving these linkages requires the input of both the university and the linking institutions. Linkages are best managed through a mechanism or procedure that strengthens the complementarity of university-based research and other components of NARS-based research. Although the focus of the study is on research, we also include linkages that strengthen the teaching component of universities through linkages with other NARS component institutions. Such linkage mechanisms can be grouped in various ways, e.g., by form, task, degree of formality, managerial level, or function. Here, we use a **functional typology** of the linkage mechanisms between the university and other institutions, units, or individuals (based on Eponou 1993). This

typology distinguishes five different kinds of functions: (1) planning and review; (2) collaborative professional activities; (3) exchange of resources; (4) dissemination of knowledge and information; and (5) training. Table 2.2 shows different mechanisms of functional linkages.

Table 2.2: Mechanisms of Functional Linkages

Functions	Mechanisms
Planning and review	<ul style="list-style-type: none"> Joint priority setting and planning Joint curriculum development Joint review and evaluation activities
Collaborative professional activities	<ul style="list-style-type: none"> Joint research activities Joint supervision of students' theses
Exchange of resources	<ul style="list-style-type: none"> Joint use of facilities (e.g., laboratories, library) Financial resources and materials Information Lectures by and for NARO staff at university Exchange of personnel and/or staff rotation (e.g., sabbatical of university staff at NARO)
Dissemination of knowledge and information	<ul style="list-style-type: none"> Joint publications and reports Joint journal/bulletin/newsletter Joint demonstration trials Joint field days Joint seminars and workshops

While there may be a net benefit for society at large in a well-functioning linkage, the underlying benefits and costs for those involved (universities and NAROs and their staff) may be unequally distributed, in particular when only one side seems to gain or is seen to gain from the linkage. For a linkage to be an attractive and sustainable proposition for all parties, all who are involved need sufficient incentive to participate, and they must be aware of the net gain from the linkage. Any strategy to improve linkages must aim to increase the perceived net gains for the individuals involved, who in turn must make a real effort to contribute to the linkage. Such a strategy involves reducing the risk of individual losses, raising potential benefits, and reducing the general transaction costs of linking. Losses through linkages may be reduced by establishing policies and structures that ensure that the right people and right information are brought together at each level of decision making.

To measure the performance of linkages between the university and the NARO, information is needed about information flows (in either direction) and how information, resources, staff, and physical assets are shared among institutions. There are usually several linkages in place, but only those that are judged to be critically important should be included in the review.

Table 2.3 uses the MORP categories to show some factors that influence the linkage performance of the university with component institutions of the NARS. These factors identify potentially constraining areas. As in table 2.1, these factors are based on a literature review (annex 2), particularly the experiences in capacity development of higher education of FAO (1993 and 1996), the World Bank (Willett 1998; Alex and Byerlee 1999), USAID (Hansen 1989) and ISNAR's experience gained during its University in NARS study.

Table 2.3: Factors Influencing the Linkages between Universities and Other NARS Component Institutions

Mandate, objectives policies	Organization, structure, linkages	Resources, information	Program planning and management
National agricultural research policy	NARS structure Collaboration on professional activities Relations with external institutions	Promotion of staff exchange National fund for agricultural research Joint use of physical resources Exchange of information on available resources and research activities Dissemination of scientific knowledge and information	NARS planning system NARS monitoring and evaluation system

Box 2.2 describes the key issues that need to be addressed in an assessment of the linkages between universities and other NARS components.

Box 2.2. Key Issues in Assessing the Linkages between Universities and Other NARS Components

General

- ◆ What is the assessment by the various managers of the effectiveness of existing university-NARO collaboration in research activities?
- ◆ What are the perceived benefits and costs of existing collaboration? How are they assessed?
- ◆ What is the nature and amount of funding that has been available for existing university-NARO linkages? Are the linkage mechanisms sustainable?
- ◆ What do the various managers see as the comparative advantages of the university and the NARO? How do they assess the research performance of each organization?
- ◆ What do key linkage persons see as the principal constraints inhibiting development of effective research linkages between the university and the NARO?
- ◆ What suggestions do key linkage persons have for improving the performance of linkage mechanisms?

Mandate, objectives, policies

- ◆ Is there a national agricultural research policy that spells out the mandates and responsibilities of different NARS components? Is there a national linkage policy that seeks to foster collaboration among the different NARS components?
- ◆ Are national agricultural research priorities well established and well publicized?
- ◆ Does funding for agricultural research encourage participatory and multidisciplinary research projects?

Organization, structure, linkages

- ◆ Is there an apex body for coordination of agricultural research? If so, what are its mandate, organization, resources, and program?
- ◆ What is the extent of collaboration on joint activities (e.g., joint research programs, thesis supervision)?
- ◆ What is the potential for collaboration – i.e., how similar or different are university and NARO researchers in terms of discipline, specialization, highest degree, time allocation, type and kind of research, number of research activities?
- ◆ What is the extent and nature of linkages among university researchers as compared to those among NARO researchers?

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Resources and information

- ◆ Are there activities of university staff at the NARO and of NARO staff at the university (e.g., days at field stations for university staff, university teaching by NARO staff)?
- ◆ What is the extent of sharing of financial resources?
- ◆ Are there research funds available to universities and NAROs? What are the criteria to allocate these funds between universities and NAROs?
- ◆ Are facilities jointly used?
- ◆ Is information on resources and research activities exchanged?
- ◆ Is information readily available about ongoing and proposed research activities?
- ◆ To what extent is knowledge and information jointly disseminated?
- ◆ What journals are available nationally as outlets for dissemination of research findings?

Program, planning, and management

- ◆ Is there a formal system for determining national agricultural research objectives and priorities? Does the university participate as an institution in the setting of national research priorities? How frequently are these priorities revised?
- ◆ What is the extent of joint planning between universities and NARO staff?
- ◆ How do promotion criteria at the university and the NARO compare?
- ◆ How do monitoring and evaluation procedures at the university and the NARO compare?
- ◆ Is there joint review of research and publications between universities and NARO staff?

Note: The approaches presented in chapter 4 provide measures and indicators for each of these issues.

Summary

This chapter presents the conceptual framework that allows universities to be viewed in a broader context and identifies their role as a component institution of both the NARS and AKIS. The analytical framework developed within this system perspective provides relevant concepts for analyzing the contributions of universities to national agricultural research. It is the basis for reviewing the research performance of universities and the linkages of universities to other components of the NARS. The following chapter describes a road map for a review-and-change process using three alternative approaches based on these analytical concepts.

Chapter 3: The Five-Phase Plan: Steps and Procedures

The five-phase plan for improving university research presented in this chapter is intended to provide a general road map of a review-and-change process. It consists of a program of five phases: (1) planning and preparation; (2) collecting information and summarizing results; (3) preparing a report and recommendations; (4) developing and implementing action plans; and (5) evaluating implemented actions. Each phase consists of several steps and clearly defined outputs.

Applying these steps and procedures will determine which of the three approaches (or combinations thereof) presented in chapter 4—the informed-judgment approach, the opinion-oriented study approach, or the data-oriented study approach—is the best option for university administrators to use when formulating specific recommendations and developing appropriate action plans.

The five-phase plan is based on the assumption that a need has been established to enhance the contribution of a country's universities to national agricultural development. Therefore, we first discuss the question "Why engage in a review-and-change process?" before the five phases are described in detail.

Why Engage in a Review-and-change Process?

How can one determine that a review-and-change process is desirable? Why should a university engage in a review-and-change process to improve its contribution to national agricultural research? A review-and-change process, particularly one that involves a study approach, will cost a lot of money and consume scarce human resources over a significant period of time. The process will impose special demands on senior staff members who may already be overloaded with managerial responsibilities. Can the benefits be expected to outweigh these costs? Is there an urgent need? These questions are not easy to answer. However, the review-and-change process can only be successful if it receives the whole-hearted support of the principal participants; and they will only give such support if they fully recognize the need for change.

In order to facilitate the making of this difficult decision we have prepared a questionnaire to be completed by the management of the university (table 3.1). Not all of the questions can be answered on the basis of purely objective criteria and it might not always be possible to give a clear "yes" or "no" response. If this is the case, the response that best describes the situation should be indicated.

The more questions that receive a negative response, the higher the need for the university to engage in a review-and-change process. Assuming the need for change has been established, the next section describes the recommended five phases for review.

Table 3.1: Questionnaire to Determine the Need to Engage in a Review-and-change Process

Question	Yes	No
Does the university have well-defined research objectives?		
Does the university meet its own research objectives?		
Is there a strong awareness within the university of national priority issues in agriculture?		
Does the university address national priority issues in agriculture?		
Does the university receive political support from local, national, and international sources for its research agenda and activities?		
Does the university have a reasonable research output?		
Is there any quality control of teaching and research outputs?		
Are staff members highly motivated to conduct development-oriented research?		
Are university research results readily available to, and adoptable by, technology users?		
Is there a duplication of research effort with other research institutions?		
Does the university cover a wider range of research topics through collaboration?		
Is the university gaining access to new technologies and markets through collaboration?		
Is the university accessing additional physical resources for research from collaborating institutions?		
Is the university gaining access to complementary areas of expertise, knowledge, skills, and technologies through collaboration?		
Are existing resources for teaching, research, and extension being used efficiently?		
Is the university attracting non-traditional sources of national and international funding?		
Do staff members have the skills, knowledge, and experience needed to conduct development-oriented research and to teach?		
Are staff members flexible and responsive to society's needs?		
Are university research and teaching activities highly relevant to users?		
Does the university attract postgraduate students?		
Does the university attract highly qualified applicants to fill positions?		
Is there a low staff turnover at the university?		

The Five Phases

Once the need to enhance the contribution of a country's universities to national agricultural development has been established, a review-and-change process should be initiated. Based on the experience of the countries involved in the ISNAR case studies, a five-phase process is recommended, as follows: (1) planning and preparation; (2) collecting information and summarizing results; (3) preparing a report and recommendations; (4) developing and implementing action plans; and (5) evaluating implemented actions (see figure 3.1).

Objectives, steps, and expected outputs need to be identified for each of the five phases. Then, for each step, activities—and persons who will be responsible for the activities—need to be identified. A step-by-step guide is provided here for each phase, summarized in the form of bullet points and tables. Some supporting material—terms of reference for key actors and an outline for preparing a report—is provided here. For some steps, more information, hands-on advice, or examples are provided on the CD-ROM, annex 3 (annex 3.1 to annex 3.12).

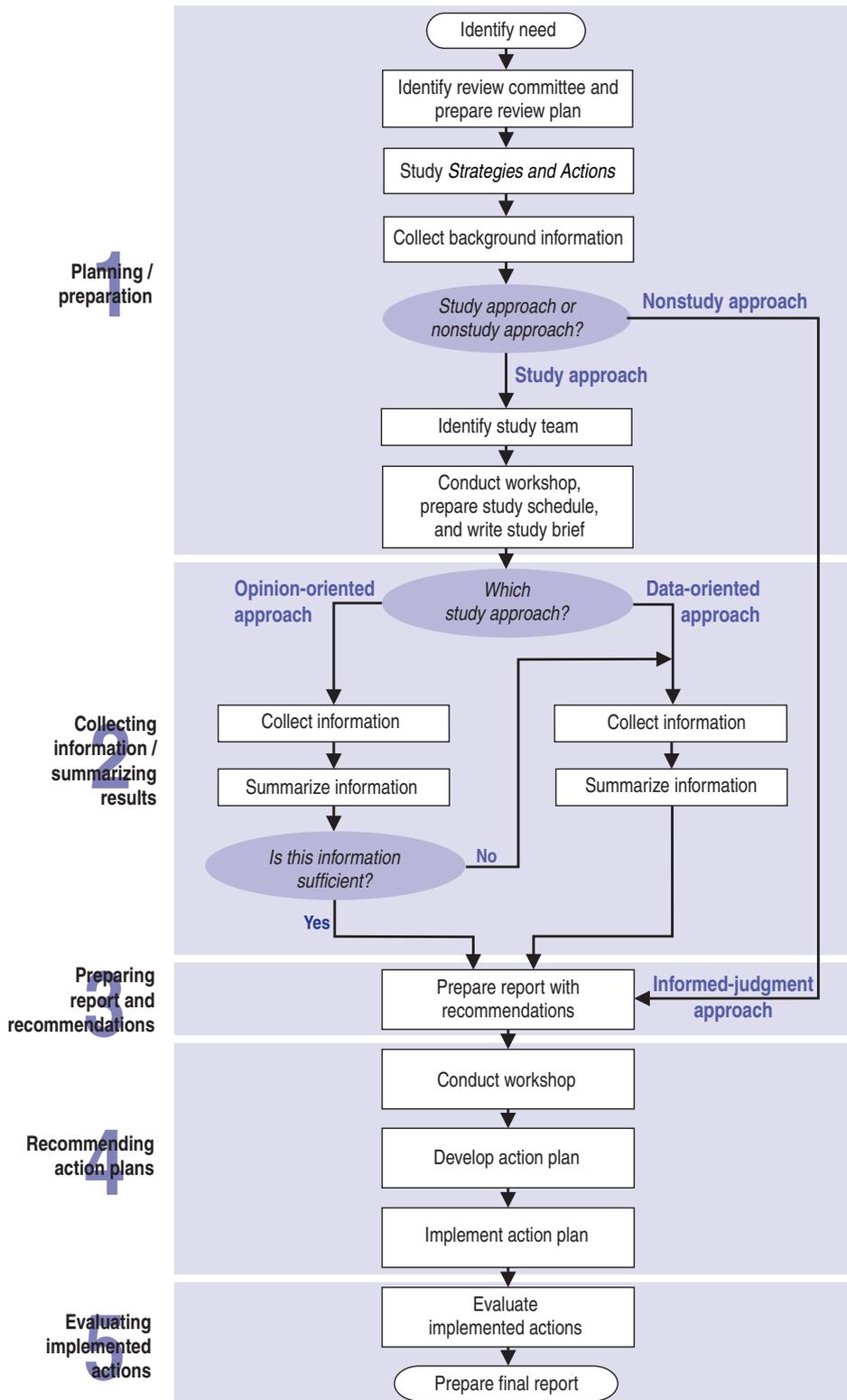


Figure 3.1: The steps of the five-phase plan

Phase 1: Planning and preparation

The objectives and expected outputs of the first phase are described in table 3.2. The steps of phase 1 are outlined in table 3.3.

Table 3.2: The Objectives and Expected Outputs of Phase 1

Objectives of phase 1	Expected outputs of phase 1
To clarify why the contribution of a national university to national agricultural research needs to be improved	A study committee with top managers of institutions involved
To ensure that high-level representatives of relevant institutions are interested in participating in the review	Terms of reference for study committee and study team (see examples in box on facing page)
To agree on objectives, procedures, and expected outcomes of the review	Knowledge of the university's current contribution to national agricultural research
To describe the current contribution of the university to national agricultural research	Sensitization of policymakers and stakeholders to the importance of the study
To choose the review approach required to identify constraints and to improve the current situation.	Identification of the appropriate review approach (see chapter 4) A project brief with complete information about the planned study.

Table 3.3: Steps of Phase 1

Step	Action	Person(s) responsible	Details / info
Step 1	Make decision to review the role of the university in national agricultural research	University executive officer with approval of the university council	
Step 2	Constitute review committee (for terms of reference, see box on facing page)	University executive officer	CD-ROM, annex 3.1
Step 3	Develop a general review plan	Review committee, for approval by the university executive officer and endorsement by appropriate authorities, e.g., ministers of agriculture, livestock, science, and/or education	CD-ROM, annex 3.2
Step 4	Review strategies and actions	Review committee	Chapter 5
Step 5	Collect background information	Review committee	CD-ROM, annex 3.3
Step 6	Choose: non-study (informed-judgment) approach—proceed to Phase 3 or study approaches—continue with Step 7	Review committee	Chapter 4
Step 7	Identify study team (for terms of reference, see box below)	Review committee	CD-ROM, annex 3.4
Step 8	Conduct an interinstitutional workshop involving key institution leaders and stakeholders in defining the study and outlining key issues	Review committee	CD-ROM, annex 3.5
Step 9	Choose between the two study approaches (opinion-oriented or data-oriented)	Review committee	Chapter 4
Step 10	Develop and announce a detailed study schedule defining responsibilities and the time frame for all tasks	Review committee	CD-ROM, annex 3.6
Step 11	Prepare and distribute a study brief explaining the study to all involved units, including potential respondents	Review committee	CD-ROM, annex 3.7

Terms of Reference of a Study Team

- ◆ assist the review committee in the preparation and organization of the first interinstitutional workshop
- ◆ conduct a study, analyzing constraints, problems, and opportunities for strengthening the research activities of the university and the university's contribution to national agricultural research
- ◆ propose recommendations to improve the university's contribution to national agricultural research
- ◆ document the results of the study and recommendations for publication
- ◆ present results at the second interinstitutional workshop
- ◆ report to the review committee

Terms of Reference of the Review Committee

- ◆ to sensitize policymakers, management and staff of relevant institutions, and other stakeholders to the importance of the study and the potential benefits for these institutions
- ◆ to appoint a study team
- ◆ to guide and assist the study team in collecting, organizing, analyzing, and reporting relevant data and information
- ◆ to receive the report and recommendations from the study team
- ◆ to disseminate the detailed report and recommendations
- ◆ to recommend strategies and actions
- ◆ to monitor the implementation of the action plan
- ◆ to evaluate and report the results

Phase 2: Collecting information and summarizing results

The objectives and expected output of the second phase are described in table 3.4. The steps of this phase are outlined in table 3.5.

Table 3.4: The Objectives and Expected Output of Phase 2

Objectives of phase 2	Expected output of phase 2
To identify the groups and persons to be interviewed	A summary of information about existing and potential contributions of the university to national agricultural research
To identify the information required and select approach for collecting data	
To analyze the collected information	
To summarize the collected information	

Table 3.5: Steps of Phase 2

Step	Action	Person(s) responsible	Details / info
Step 1	Collect primary information using the selected approach	Study team	Chapter 4 (respective sections)
Step 2	Prepare summary of information including tables and graphs	Study team	Chapter 4 (respective sections)

Phase 3: Preparing report and recommendations

The objectives and expected outputs of the third phase are described in table 3.6. The steps of this phase are outlined in table 3.7.

Table 3.6: The Objectives and Expected Outputs of Phase 3

Objectives of phase 3	Expected outputs of phase 3
To analyze all information collected	A report analyzing the factors that influence the university's research performance and linkages (see box below for a sample outline)
To prepare a report on issues related to university research and linkage performance (see box below for an outline of such a country report)	A list of recommendations to strengthen the university's research performance and the collaboration of the university with other NARS components
To formulate, based on the results of the report, recommendations about opportunities and creative mechanisms to improve the contribution of the university to national agricultural research	

Table 3.7: Steps of Phase 3

Step	Action	Person(s) responsible	Details / info
Step 1	Prepare a detailed study report combining background and collected information	Review committee (for nonstudy approach) Study team (for study approaches)	CD-ROM, annex 3.8
Step 2	Prepare preliminary recommendations based on the conclusions of the report	Study team	
Step 3	Submit preliminary recommendations to review committee	Study team	
Step 4	Refine and prioritize recommendations	Review committee	
Step 5	Publish and distribute widely a final report of study results and recommendations	Review committee	

Outline of a Country Report

1. National context for the national agricultural research system
 - 1.1 Brief overview of the country and its economy
 - 1.2 Science and technology
 - 1.3 The agricultural sector
2. The higher education system
 - 2.1 Overview of the higher education system
 - 2.2 Agricultural component
3. The NARS and its environment
 - 3.1 Historical overview
 - 3.2 Mandate, objectives, and policies
 - 3.3 Structure, organization, and linkages
 - 3.4 Resources and information
 - 3.5 Program planning and management
4. Research performance of the university and performance of linkages with the NARS components
 - 4.1 Factors that influence the research performance of the university
 - 4.2 Factors that influence the linkage mechanisms between the university and other NARS components
5. Recommendations for strengthening the role of the university within the NARS (about 10 pages)
 - 5.1 Ways of improving the research performance of the university
 - 5.2 Improvements of the linkage mechanisms between different components of NARS
6. Summary and conclusions

Phase 4: Recommending action plans

The objectives and expected outputs of the fourth phase are described in table 3.8. The steps of this phase are outlined in table 3.9.

Table 3.8: The Objectives and Expected Output of Phase 4

Objectives of phase 4	Expected output of phase 4
To recommend to appropriate managers preliminary action plans that have the potential to improve the university's research and linkage performance	An action plan specifying appropriate short-, medium-, and long-term actions, developed and disseminated
To implement action plans	Budget allocations made for those recommended actions that require funding
	Responsibilities assigned for implementing the agreed actions

Table 3.9: Steps of Phase 4

Step	Action	Person(s) responsible	Details / info
Step 1	Prepare preliminary action plan	Review committee	CD-ROM, annex 3.9
Step 2	Organize second interinstitutional workshop to review, refine, prioritize, and finalize recommendations and action plan	Review committee	CD-ROM, annex 3.10
Step 3	Identify persons responsible for actions	Review committee	
Step 4	Specify time and cost implications	Review committee	
Step 5	Produce and submit to the university executive officer a final action plan, including budget estimates and identification of responsible persons	Review committee	
Step 6	Submit action plan to appropriate authorities (e.g., university council and relevant ministers) for their review, comments, and approval	University executive officer	
Step 7	Endorse approved actions	Appropriate authorities	
Step 8	Publish and distribute widely the final action plan	University executive officer	
Step 9	Assign appropriate managers, staff, and committees to implement selected actions and report progress	University and NARO executive officers	
Step 10	Assign members of the review committee to facilitate actions	University executive officer	
Step 11	Monitor and report progress of implementation of action plan	Review committee	

Phase 5: Evaluating actions implemented

The objective and expected outputs of the fifth phase are described in table 3.10. The steps of this phase are outlined in table 3.11.

Table 3.10: The Objective and Expected Outputs of Phase 5

Objective of phase 5	Expected outputs of phase 5
To evaluate actions that were implemented and to identify reasons in the case of any actions that were not implemented, in order to assess the feasibility of implementing changes	Recommended actions implemented; A revised action plan prepared, specifying short-, medium-, and long-term actions
To make necessary changes in the action plans	A final report
To prepare a final evaluation report. To recommend to appropriate managers preliminary action plans that have the potential to improve the university's research and linkage performance	

Table 3.11: Steps of Phase 5

Step	Action	Person(s) responsible	Details / info
Step 1	Evaluate progress made in implementing actions 12 months after beginning of implementation*	Review committee	CD-ROM, annex 3.11
Step 2	Prepare and forward final report to the university executive officer	Review committee	CD-ROM, annex 3.12
Step 3	Publish and widely distribute final report	University executive officer	

* A period of 12 months is suggested to implement (part of) the action plan. It is important to keep up the momentum created by the study and to show that changes are possible even in the short-term.

Summary

Chapter 3 presents a road map for a review-and-change process. The five-phase plan is based on a learning process approach and, consequently, is very action-oriented. The implementation of changes recommended in the course of the review is an integral part of the process. The process helps build consensus by ensuring that all stakeholders participate actively. Finally, the process is flexible insofar as it allows the national review committees to decide on the most appropriate approach for the local situation. The three alternative approaches (informed-judgment approach, opinion-oriented study approach, and data-oriented study approach) and their different assumptions and comparative advantages are described in detail in the next chapter.

Chapter 4: Approaches

This chapter presents three different review approaches that university administrators can use to formulate specific recommendations and develop appropriate action plans: (1) the informed-judgment approach; (2) the opinion-oriented study approach; and (3) the data-oriented study approach. The informed-judgment approach requires no specific studying or extensive collection of information, because it assumes that the major constraints are already known and that recommendations to improve the contributions of universities can be readily generated based on this knowledge. The opinion-oriented study approach is based on the idea that various groups of people in the university and throughout the NARS can play a key role in identifying constraints and making suggestions for improvements. The data-oriented study approach uses questionnaires and interviews to build a solid foundation for making specific recommendations and to help identify problem areas that were unknown, unclear, or not fully recognized by staff, management, and/or policymakers.

It is important to note that the approaches build on each other and, therefore, can be used in a complementary manner. The informed judgment approach may be used to identify strategies and actions that can be implemented immediately; the opinion-oriented approach may be used to identify additional problem areas and constraints; and the data-oriented approach can help to collect more detailed information about the causes of these problems.

Table 4.1 compares the three approaches, in terms of the resources they require and the nature of the outputs they provide. The study-based approaches require more resources than the informed-judgement approach, and a data-oriented study requires more resources than an opinion-oriented study.

Table 4.1: Comparison of the Approaches from the Perspective of Requirements

Requirements	Informed-judgment approach	Opinion-oriented study approach	Data-oriented study approach
Management	Review committee	Review committee	Review committee
Budget	Low	Moderate	High
Staff	Review committee	Study team (1 person plus support)	Study team (2 persons plus support)
Time for study report	3 months	6 months	10 months
Descriptive information	Minimal	Minimal	Considerable
Analytical information	Opinion focused	Opinion focused	Data and opinion focused
Analysis	Minimal	Moderate	Considerable
Report	Simplified	Simplified	Detailed

The relative benefits of the three approaches are difficult to assess. Taking into account the different assumptions on which the approaches are based, any of the three approaches should enable the reviews to identify recommendations and actions that will enhance the research and linkage performance of universities. Figure 4.1 provides a quick guide to making the appropriate choice, based on the key assumptions inherent in each approach.

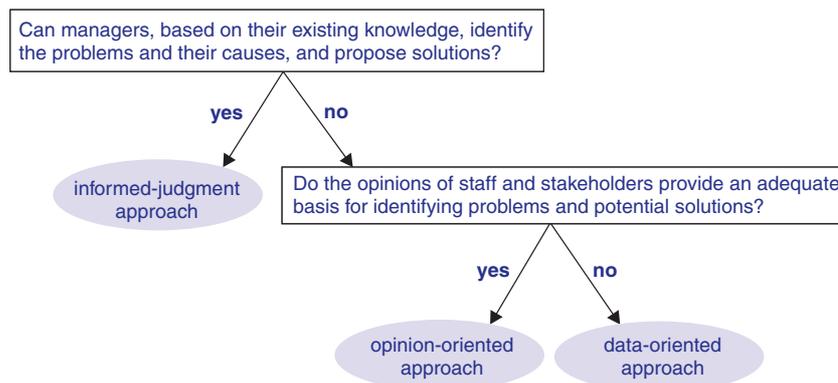


Figure 4.1: Choosing the right approach

Enhancing the contribution that universities make to the NARS depends on appropriate decisions being made by key administrators on mandate and policy, organization, resource allocation, and program management. There are many actors involved and many ways of addressing the issues. The choice of an appropriate approach for a specific situation may determine the success of the review-and-change process—but there is no formula for deciding the “best” approach and each situation must be examined in context. However, as the three approaches build on each other, we highly recommend using the informed-judgment or opinion-oriented approach first and assessing the results, before deciding whether or not to invest the considerable extra resources required for a data-oriented study.

Regardless of the approach chosen, several conditions have to be met before a country can hope to enhance, in a sustainable fashion, the contribution of its universities to national agricultural research. These conditions include the following:

- A **broad consensus** exists among stakeholders on the need to strengthen the contribution of universities to national development-oriented research.
- All parties (in particular the universities, relevant ministries, and research institutions) are **strongly committed** to contributing to the process.
- All parties are ready to commit **adequate human and financial resources** to the exercise.

Even more important, the management of the university must be both willing and able to change or influence changes in the university’s mandate, organization, resources, and program-planning procedures.

The Informed-Judgment Approach

It is the reluctance to change that allows many public-sector institutions to drift into crisis. When this happens, the instinct for self-preservation takes over and the possibilities for, and interest in, establishing and maintaining linkages diminish. It is therefore essential that universities undertake to manage their research function, to develop strategic alliances, and to establish sustainable modes of cooperation with other institutions in the research field. Once the management of a university takes this fundamental decision, it is often obvious what actions need to be taken. The informed-judgment approach is based on the idea that the major constraints that prevent a university from doing the best possible research and establishing and maintaining effective linkages can be identified without in-depth studies. The major constraints can often be identified and useful recommendations made to alleviate them without an exhaustive collection of data. Moreover, many of the actions recommended can be implemented by consensus among the staff or by decision of the university administration. Many examples of potential strategies and actions are provided in chapter 5: Strategies and Actions.

Basic assumptions

The informed-judgment approach is based on the following assumptions:

- Members of the review committee already understand the context of their internal and external environments.
- Members of the review committee have many ideas about what can be improved and how improvements can be made.
- The background knowledge and opinions of review committee members are sufficient to produce specific and targeted strategies and actions.
- Changes generated from within an institution, such as the university or NARO, are more likely to succeed than those imposed from the outside.

Strengths and weaknesses

Compared with the data-oriented and opinion-oriented study approaches, the informed-judgment approach has the following strengths and weaknesses:

Strengths of the informed-judgment approach	Weaknesses of the informed-judgment approach
It is relatively simple.	Important data or information may be overlooked and more information may subsequently be required as a basis for deciding appropriate recommendations and actions.
Carrying out the review is less expensive .	Members of the review committee may not be fully informed about constraints affecting the research performance of the university.
It requires a modest investment of time and effort by the members of the review committee.	New ideas may not emerge from within the review committee.
It minimizes the time and effort needed for collecting and analyzing data and reporting.	Staff may not own and accept the decisions.
It bases recommendations more directly on the opinions, ideas, and feelings of members of the review committee, who may already command wide respect.	Opinions may be biased by political and personal considerations.
	The outcome may not include adequate input from all stakeholders.

Collecting information

After reviewing strategies and actions presented in chapter 5, a review team following the informed-judgement approach mainly requires background information that can be found in existing publications and statistics (see annex 3.3 for details). No information is collected from individuals.

Reporting the results

The review committee summarizes background information in tables, charts, and lists. An overview of the required background information and their potential sources are given in the CD-ROM, annex 3.3.

The Opinion-Oriented Study Approach

At the core of the opinion-oriented study approach is the idea that the knowledge and opinions of various groups of people in the university and throughout the NARS can play a key role in identifying constraints on the university's research performance and its linkages. It also assumes that these groups of people can be an important source of suggestions for improvements. Opinions are collected through surveys, the results of which serve as a basis for developing an action plan to strengthen the contribution of the university to national agricultural research. This low-cost approach can also be used in combination with the more intensive data-oriented approach if the results of the opinion surveys reveal areas where more information is required.

The opinion-oriented study approach is particularly useful when there is much knowledge among policymakers, leaders, and staff about the functioning of the higher education system, the NARS, and the external environment in which they operate. **This approach should be chosen when policymakers and managers are convinced that change is desirable and that this can only be achieved when staff and other stakeholders are asked about their opinions and ideas.** In following this approach, staff and stakeholders can claim ownership of the action plan, which facilitates implementation.

Although this approach is less complex and time-consuming than the data-oriented approach, it nevertheless involves a substantial investment of staff time and other resources. It is therefore strongly recommended that a decision to take this approach should be made only after studying the potential strategies and actions (see chapter 5) and gathering and analyzing appropriate background information (see CD-ROM, annex 3.3).

Basic assumptions

The opinion-oriented study approach makes the following assumptions:

- Respondents already have a good grasp of the internal and external environment.
- A representative sample of respondents can be developed, providing a reliable reflexion of opinion.
- Predefined surveys can capture the most important issues (see annex 4.1).
- Key informants have many ideas about what can be improved and how these improvements can be made.

- Changes generated from within an organization, such as the university or NARO, are more likely to be successful than those imposed from the outside.
- The information generated is sufficient to produce specific and targeted strategies and actions.

Strengths and weaknesses

Compared with the other (data oriented) study approach, the opinion-oriented approach has the following strengths and weaknesses:

Strengths of the opinion-oriented study approach	Weaknesses of the opinion-oriented study approach
It is relatively simple to develop and apply.	Important information may be missed because surveys consist of closed questions.
Each survey form can be filled out relatively easy (within about 15 minutes) encouraging respondents to participate.	Respondents may not be sufficiently aware of some important factors constraining the university's research performance.
The study team can collect and analyze the data quickly and easily and report the results.	Managers may fear or not value the opinions of staff.
Recommendations are based more directly on the opinions, ideas, and feelings of those who, in the end, are most affected by the changes (such as staff and other stakeholders).	New ideas may not emerge from within the institutions.
There is a sense of participation in the change process and therefore the likelihood that participants will feel ownership of the results.	Persons interviewed outside the university may not be sufficiently familiar with university issues.
Financial requirements for implementation are relatively low.	Political and personal considerations are very likely to influence opinions.

Collecting information

Once the review committee has decided to use the opinion-oriented study approach, it becomes responsible for its full implementation, from collecting information to reporting the results. The committee has to explain the purpose of the study to the institutions involved, identify staff to conduct the study, monitor progress, and assure a quality product. It then has to prepare a study brief (see CD-ROM, annex 3.7), which should be approved by the executive officer of the university and endorsed by the appropriate minister(s). The brief includes details of the study, such as its timetable, the roles of key persons, and communications.

To ensure that staff in the various institutions in the NARS cooperate fully, it is necessary that institutions' top managers (such as deans and directors of research) endorse and support the study. They should provide the staff of their institutions with information about the purpose and procedures of the study, and they should state that the study team will treat the information as confidential. This can be done in a letter to all the staff who may be approached by the study team (see annex 3.4 for details of the study team).

Participants

The decision on who should participate in the study depends on the study's intended focus. If the study is focused primarily on the university, then the opinions of staff may be given primary emphasis, with less input from external groups. If the study is focused on the entire NARS and the university's role in it, then many groups may be in-

vited to express their opinions. In either case, both internal and external opinions are valuable. The following groups could be invited to participate in interviews:

University staff. The opinions of university staff on the situation within the university are of crucial importance. Staff may have useful ideas on how to improve the NARS and the validity of their perceptions should be recognized. Even if their opinions are not shared by managers, this may at least be a signal that managers need to improve their communication of information to staff. Moreover, the staff's participation in the early, information-gathering, stage of the review-and-change process may encourage them to cooperate with the decisions to be taken later by management. People who feel that they have had a chance to contribute to making the decisions will feel that they are part-owners of the plans.

Graduate students. Graduate students are required to conduct research as part of their degree program. In fact, much of the research at universities is conducted by students, and their opinions should therefore be taken into consideration. If students and staff are asked the same questions, their responses can be compared.

University managers. With their view from the top, vice-chancellors, deans, and heads of departments are also an important source of information. It is recommended that they be asked questions about the same issues that were put to university staff (see CD-ROM, forms 1, 2, and 7 in annex 4.1). Thus, responses from management and staff can be compared. Another useful activity in the opinion-oriented approach is to ask managers to respond to some widely-held opinions of university staff. Interviews with university managers are therefore ideally held after the staff responses to the opinion survey are summarized. For the sake of efficiency, managers should receive these summaries of staff opinions in advance (see Reporting the results, below). During the interview, they can be asked to comment on the opinions expressed by staff and to provide suggestions. This will help managers to evaluate the situation from the point of view of staff and to formulate ideas on how to improve the research performance and linkages of the university. These interviews should be taken into account in the report.

NARO staff. The staff of the NARO constitute an external group whose opinions are particularly important for the university. Most of the issues the NARO staff are asked about should be the same as those for university staff, so the responses can be compared.

NARO managers, such as directors general, program leaders, and heads of research stations, are another external group whose opinions may be interesting. The comments on university managers (above) also apply to this group.

Managers in other stakeholder institutions and organizations. There are several other stakeholder groups whose opinions may be helpful. They include, for example, ministries, apex bodies for agricultural research, users of research results (farmers' organizations, extension services, NGOs, and development projects), international research organizations, international donor organizations, and private enterprises.

It is usually sufficient to include in the survey one key person in a particular stakeholder institution or organization. The survey forms should be complemented by interviews, to obtain a deeper understanding of stakeholders' ideas about how the university's performance and the linkages of the university with the stakeholder institute or organization can be strengthened.

Methods for collecting information

As it would take too long to collect the opinions of all the staff, students, and management of the university, a representative set of opinions must be sought. This can be done through a stratified, random sample of respondents. To identify this sample, the following issues have to be addressed:

(1) *Population of respondents.* The potential population to be surveyed is described above under the heading “participants.” To facilitate comparison of the opinions of various groups, the responses should be reported separately by group.

(2) *Sampling.* All university and NARO managers should complete the survey, as well as one key person per selected group of stakeholders. For university and NARO staff, a 30% sample of the total target population should be sufficient.

(3) *Stratifying the population.* The most efficient way of stratifying the respondent population is to divide the university up into units (e.g., departments), ensuring that there is a balance in terms of rank (e.g., professor, lecturer). Once the individuals in the sample have been identified, each should be sent a letter indicating why they have been selected and requesting their cooperation.

Several forms have been developed to solicit opinions on issues related to the respondents’ university and the respondents’ personal situation (for the full sample forms, see CD-ROM, annex 4.1, tables 4.2–4.8):

- Form 1. Factors constraining the research performance of the **university**
- Form 2. Factors constraining the research linkages of the **university**
- Form 3. Factors constraining **my personal** research performance
- Form 4. Factors constraining **my personal** research linkages
- Form 5. **My personal** linkages with research institutions
- Form 6. **My personal** research linkage types
- Form 7. **My personal** suggestions for strengthening the performance of research and linkages

These forms can and should be modified to suit specific situations. For example, form 5 (My personal linkages with research institutions) should be adapted to list actual names and types of institutions. Note that form 6 (My personal research linkage types) is designed to be used by both university staff to describe their linkages with the NARO and by NARO staff to describe their linkages with the university.

These opinion forms about the university may be used in different combinations for different participants, depending on the objectives and scope of the study.¹ Table 4.2 shows which forms should be used for which groups.

1. If it is decided that a more comprehensive study of the NARS should be carried out, these forms may be adapted to focus on the performance and linkages of the NARO (and other NARS component institutions). In that case, it is important to learn the opinions of university personnel with regard to the performance of the NARO’s research and the NARO’s linkages with the university. For example, Forms 1 and 2 would be changed from an evaluation of the **university’s** performance and linkages to an evaluation of the **NARO’s** performance and linkages.

Table 4.2: Use of Opinion Survey Forms on University Research Performance and Linkages

Participating group	Forms	Interview needed?
1. University staff (stratified random sample)	1–7	No
2. Postgraduate students (stratified random sample)	1–7	No
3. University managers (all)	1, 2, and 7	Yes
4. NARO staff (stratified random sample)	1–7	No
5. NARO managers (all)	1, 2, and 7	Yes
6. Other stakeholders (one key person per selected group)	1, 2, and 7	Optional

Analyzing the results

After collecting the survey data, the study team summarizes the responses in summary tables (see CD-ROM, annex 4.2, tables 4.9, and 4.10). For forms 1 to 6, overall averages are calculated for the responses of each group to each opinion item. For each item, it is important to divide the total score only by the number of responses provided to that item, because not all respondents will mark all items.

To compare the results, the study team prepares 12 “comparison tables” (one for each question on each survey form) with the average scores from the summary tables (see CD-ROM, annex 4.3, tables 4.11, and 4.12). Using the average scores for each group that was surveyed, listed in the columns of the tables, the study team can identify areas of consensus and divergence on certain issues and review constraints within the MORP categories. This helps the team focus on the most critical issues that need to be addressed.

The next step is to summarize, for each group of respondents, the responses to the open-ended questions in form 7 (which ask for three suggestions on how to strengthen the research performance of the university and three suggestions on how to develop/strengthen the university’s research linkages). These responses should also be grouped in the MORP categories. This begins the process of identifying areas for improvement in both performance and linkages. The analysis should focus on the most frequently mentioned areas. It is possible to prepare tables of responses to form 7.

Reporting the results

On the basis of the summaries and analysis, the study team prepares a report with conclusions about the problems identified and possible ways of addressing them.

The report should have a clear focus and provide options on how to approach key constraints. It should present a careful analysis of opinions and present convincing arguments for change. The report tables should be concise and brief (see annex 4.4, tables 4.13 and 4.14). To achieve this, they should focus on what, according to the various groups surveyed, are critical areas. The report tables rank items in terms of the seriousness of each constraint. Where possible (forms 1 and 2), the report tables should be organized according to the MORP categories. In this way, the information can be used at, for example, a national workshop to develop strategies and actions. Summary or comparison tables can be placed in an annex to the study report.

The Data-Oriented Study Approach

The data-oriented approach to studying the contribution of universities to national agricultural research is a refinement of the approach used by ISNAR and others for the case studies conducted in the University in NARS project. The approach provides a firm factual foundation and is inclusive, involving the cooperation of many individuals from within and outside the university and other NARS components. As the review process can reveal compelling reasons for change, its outputs can serve as an effective basis for the development of an action plan that will strengthen the contribution of universities to national agricultural research.

This approach is particularly useful when high-level officials need convincing evidence of the advantages of a better-coordinated agricultural research system, with universities as fully integrated partners. The extensive knowledge base resulting from the approach provides a solid foundation for very specific recommendations to strengthen the performance of the university and, eventually, the NARS. The approach also helps to identify problem areas in the internal and external environment that were previously unknown, unclear, or not fully recognized by staff, management, or policy-makers. It is also useful for approaching and convincing donors who are interested in assisting in strengthening agricultural research systems. Finally, the approach entails a participatory process involving a broad base of staff and stakeholders. This ensures the highest possible level of acceptance by those most affected by the changes resulting from the recommendations and actions.

It should be noted that the approach is relatively complex and time consuming. It is worthwhile reiterating here that a decision to take this approach should be made only after studying the potential strategies and actions (chapter 5) and gathering and analyzing appropriate background information (see CD-ROM, annex 3.3).

Basic assumptions

The data-oriented study approach is based on the following assumptions:

- Decision-makers need substantive data and information from individual staff members and managers to get a clear understanding of the internal and external environment of the universities.
- Significant and reliable information can be gathered through a sufficient number of questionnaires (written) for researchers and interviews (oral) with managers.
- Predefined questionnaires and interviews can capture the most important issues (see annexes 5.1 and 5.2).
- Key informants in the NARS have many ideas about what can be improved and how improvements can be made.
- Changes generated from within an organization have more chance of success than those imposed from the outside.
- The information generated is sufficient to produce specific and targeted strategies and actions.

Strengths and weaknesses

Compared with the opinion-oriented study approach, the data-oriented approach has the following strengths and weaknesses:

Strengths of the data-oriented study approach	Weaknesses of the data-oriented study approach
<p>All important information is collected.</p> <p>New ideas are collected from both within and outside of the relevant institutions.</p> <p>Facts cannot be so easily biased by political and personal considerations.</p> <p>There is a high level of participation in the process of change and the participants are therefore likely to develop a sense of ownership.</p>	<p>A considerable amount of time and effort is required from respondents.</p> <p>The study team needs a substantial amount of time and effort to collect, analyze, and report the data.</p> <p>The facts may not reflect the opinions, ideas, and feelings of the respondents, who, in the end, are most affected by the process.</p> <p>Interviewed persons from outside the university may not be sufficiently knowledgeable about university issues.</p> <p>The approach is relatively expensive to implement.</p>

Collecting information

Once the review committee has decided to follow the data-oriented study approach, it becomes responsible for the entire implementation, from collecting information to reporting the results. Another task of the committee is to explain to the institutions involved the purpose of the study, identify staff to conduct the study, monitor progress, and assure a quality product. It has to prepare a study brief (see annex 3.7), which needs to be approved by the executive officer of the university and endorsed by the appropriate minister(s). The brief includes details of the study, such as timetable, roles of key persons, and communications.

To ensure that the staff of the relevant NARS institutions cooperate fully, it is necessary that senior managers of these institutions (such as deans and directors of research) endorse and support the study. They should provide the staff of their institutions with information about the purpose and procedures of the study, and they should explain that the study team will treat the information that is provided to them as confidential. This can be done in a letter to all the staff who may be approached by the study team (see annex 3.4 for details of the study team).

Participants

The appropriate range of participants to be included in the study is determined by the intended focus of the study. If the study is centered on the university, then data on the activities of staff and information from university managers may be given emphasis, with minor input from external groups. However, if the study is intended to cover the entire NARS and the university's role in it, then many groups should be included in the collection of information. In either case, both internal and external data are valuable.

In this approach, four institutional sources of information for identifying constraints to the university's contribution to national agricultural research are distinguished:

University staff and managers. The primary sources of information are the faculties and departments of the university that are identified as having the potential to contribute to national development-oriented agricultural research. The review committee should identify the university faculties and departments to be included in the study. Options include all faculties with a direct focus on agriculture (especially faculties of agriculture, veterinary medicine, and forestry) and/or agriculture-related departments (that is, faculties with an indirect focus on agriculture and departments in other faculties that conduct research related to agriculture, such as science and engineering departments). The committee also needs to decide whether all professional staff of the selected departments should be included as informants or only staff in the higher echelons, such as professors, associate professors, and senior lecturers. University

managers are the vice-chancellor, deans of faculties, and heads of departments and holders of other key management positions at the university.

NARO staff and managers. Other major sources of information are other NARS component institutions (such as NAROs, private-sector entities, and science-and-technology policy units). However, for simplification we refer here only to NAROs. They are actual or potential partners of the university. The review committee should identify the NAROs to be included in the study. The options are to include all NAROs or only the main NAROs. The committee further needs to decide whether, within selected NAROs, all professional staff responsible for agricultural research projects and activities should be selected as informants or only senior researchers and researchers. NARO managers are the director general, program leaders and heads of stations, and holders of other key management positions.

Key actors involved in linkages. Staff who are already involved in existing linkage mechanisms between the university and other NARS component institutions are another important source of information. Various types of formal and informal linkage mechanisms exist, each with different characteristics. There are mechanisms based on functions (such as, planning and review, collaborative professional activities, exchange of resources, dissemination of knowledge and information, training, feedback, and coordination) or based on different levels of formality (such as informal cooperation between individual members of staff and more formal mechanisms such as national or regional committees).

The study team should consider as many of these mechanisms as possible. To select linkage mechanisms and corresponding informants for the study, the committee should start by identifying and classifying the existing linkage mechanisms. Their options are to examine the linkages either between the university, the NAROs, and other important NARS components, or only those between the university and the main NARO. The following actions will help to identify key persons involved in these linkages:

- Decide how many of the same type of identified linkage mechanisms will be analyzed (for example, one joint project or more).
- Choose a key actor from the university for each linkage mechanism.
- Choose a key actor from the NARO or other NARS component for each linkage mechanism.

Key actors of stakeholder institutions. The final source of information to be considered includes all institutions and interest groups that are regarded as stakeholders of the university and that influence its performance. The review committee should identify the other stakeholder institutions for the study and then select and interview managers from each identified organization. Examples are ministries; the national apex body for agricultural research; users of research results (farmers' organizations, extension services, NGOs, development projects); international research organizations and networks; international donor organizations; other universities; regional organizations and networks; and private enterprises.

Methods for collecting data

The primary modes for data collection are questionnaires and interviews. Complete examples of questionnaires and interview forms are provided on the attached CD-ROM (annexes 5.1 and 5.2). The following six modes can be distinguished: questionnaires for university staff; questionnaires for NARO staff; interviews with manag-

ers of universities; interviews with managers of NAROs; interviews with key actors involved in linkage mechanisms; and interviews with key actors of other stakeholder institutions.

Before beginning the process of collecting information, the study team needs to get organized for the study. The following recommendations may facilitate preparations:

(1) *Examine the forms.* The questionnaires and interview forms should be examined to determine whether the information requested is not already available (in which case the questions can be removed from the form) and whether the questions are appropriate for the given situation (if not, adjustments should be made).

(2) *Pretest the forms.* Two or three individuals should test all draft questionnaires and interview forms to see whether they are clear and complete. Improvements should be made as necessary to suit the specific situation and to address any problems revealed by the test.

(3) *Inform respondents about the study.* First, the study committee—or, perhaps for maximum impact, the appropriate minister—needs to send a letter to those who are identified as potential respondents. The letter informs them about the study (especially its goal, purpose, expected outputs, and potential benefits), requests their full cooperation, and introduces the study team (see also study brief, annex 3.7). Second, to ensure that everybody extends their fullest cooperation, the goal, purpose, outputs, and benefits of the study should be explained in meetings with groups of selected respondents at the university and at the NARS institutions involved in the study. Staff should be given time to study the questionnaires and to ask questions. The questionnaires are designed to be filled out in 20–30 minutes, so one option is to allow respondents to fill out the forms at these meetings.

(4) *Aim for a high response rate.* A rate of response of 80% or higher ensures that data are comprehensive and reliable. To achieve this high rate, the study team must create awareness among the identified respondents that the study is important and can have a very positive impact.

(5) *Plan for effective interviews.* Suggestions to ensure that interviews are as effective as possible include the following:

- Provide selected respondents with interview forms prior to the face-to-face interview. This helps the interviewee to be better prepared.
- Reiterate the purpose of the study and the interview at the beginning of the interview.
- Follow the questions on the interview form closely. This way, the interview can be completed in one hour.
- Allow time for some discussion at the end of the interview. Take notes during these discussions.

Building on the opinion-oriented approach

The data-oriented approach can be used as an extension of the opinion-oriented approach if it becomes clear that the latter approach has not provided enough information to develop firm recommendations and action plans.

When the review committee opts for combining the approaches, it must decide whether it is necessary to conduct the entire data-oriented exercise or to use selected

parts only. The data-oriented approach can focus on factors that have already been identified as needing further attention in the opinion-oriented approach. Also, it is possible to provide questionnaires to the same randomly selected staff as for the opinion-oriented approach. Once more, the review committee needs to decide how many persons are to be interviewed and who these should be.

Annex 5.0 on the CD-ROM provides overview tables that summarize information required on factors influencing a university's research performance and on factors influencing a university's linkage performance using the data-oriented approach. These tables help to identify the relevant information for each factor. This will allow the study team to concentrate the data collection on the most influential factors that have already been identified by using the informed-judgment approach or the opinion-oriented study approach.

For example, if the review committee or team decides that planning, monitoring, and evaluation is not a relevant factor, then the interview form for university and NARO managers could be shortened by leaving out questions relating to this issue. Similarly, specific questions could be dropped from the interview form for key persons of other stakeholder institutions.

In this way, the overview tables can be used to shorten the different modes of data collection, particularly the interview forms of the data-oriented approach. However, the questionnaires for university and NARO staff are best used unchanged, because they can provide a great deal of information on the current outputs and linkages of key NARS component institutions. It is also recommended that all information in the general category be collected, as it relates to various key factors that influence performance.

Analyzing the results

To compare the results of the questionnaires and interviews, all the data and information must be entered into a relational database such as Microsoft Access or dBASE. For ease of comparison, data and information must be converted into codes (if no code is provided). Short titles or the number of the questions can be used as field names (e.g., 2.1), so long as they are unambiguous. We also recommend preparing an entry mask for the different database files.

After all the data has been entered, it is important to check for errors. Depending on the database program, check variables (automatic calculations) can be included in the database file. We also recommend that a printout of the total database should be checked for input errors.

Once all the information from the questionnaires and interviews has been collected and coded, tables of data can be prepared for analysis. Annex 5.3 on the CD-ROM provides examples of specific tables for many of the factors influencing research and linkage performance. The following paragraphs give some suggestions on managing the data from the questionnaires and interviews.

Questionnaires for staff of the university and NARO

The information from the questionnaires for university and NARO staff members should be entered into one database file. To get a good overview of the data, separate tables should be prepared for each question in the questionnaire (see, for example, annex 5.3 on the CD-ROM, tables 5.3, 5.4, and 5.9–5.14).

Interviews with key persons

The information from interviews with key persons from the university and the NARO should also be entered into one database file. Separate tables should be prepared for each question in the interview (see, for example, annex 5.3 on the CD-ROM, tables 5.2, 5.5, 5.6, 5.7, 5.8, and 5.15).

Interview information from key persons involved in linkages should be entered into a separate database file. Some of the questions from the interviews for key persons involved in linkages can be summarized in tables (see, for example, annex 5.3 on the CD-ROM, tables 5.22–5.26). Interviews with key persons from other stakeholder institutions of universities and NAROs should also be entered into a separate database file. Most of the questions from these interviews can also be summarized in tables (see, for example, annex 5.3 on the CD-ROM, tables 5.1, 5.28, and 5.30).

Reporting the results

We recommend that the collated information be organized according to the influencing factors. As described in the analytical framework, the influencing factors are grouped according to whether they relate to the university's research performance or to the university's linkage performance (see chapter 2, tables 2.1 and 2.3). The information collected in the data-oriented study approach helps to address questions and issues related to each of these influencing factors.

Tables A5.1 and A5.2 in annex 5.0 on the CD-ROM are examples of tables reporting the factors influencing the university's research and linkage performance, respectively. Selected examples from the countries that participated in the ISNAR study, using a similar approach, are presented in the CD-ROM, annex 5.3. It should be noted that, due to improvements in the data-collection methodology during the course of the ISNAR study, the sample tables described in CD-ROM, annex 5.3 draw more heavily on the study of the countries that participated in the second phase of the project.

Summary

This chapter describes in detail the three different review approaches that university administrators can use to formulate specific recommendations and develop appropriate action plans to improve the contribution of universities to national agricultural research. Basic assumptions, strengths, and weaknesses of each approach, as well as issues related to collecting information and reporting results, are discussed in detail. The three approaches clearly build on each other and, therefore, can be used in a complementary manner. This is particularly important given the different resources required by each of these approaches.

Consequently, we recommend that the review committee should first assess whether the informed-judgment approach might be appropriate for the specific national circumstance before engaging in a more expensive review process, using the opinion-oriented or data-oriented approaches. The informed-judgment approach is based on the idea that there is no need to collect exhaustive information from a wide range of sources to identify the major constraints and to make useful recommendations and that many of the recommended actions can be implemented on the basis of consensus or management decision. Chapter 5 now presents examples of, and ideas for, potential strategies and actions that a university may be able to implement in order to improve its contribution to national agricultural research.

Chapter 5: Strategies and Actions

This chapter presents a wide range of strategies and corresponding actions that universities can implement to improve their contribution to national agricultural research. The strategies and actions presented are based on our experience from ISNAR's University in NARS study. However, they are also quite consistent with the recommendations and best practices published by the World Bank (Alex and Byerlee 1999), USAID (Hansen 1989), and FAO (FAO 1993 and 1996).

It is recommended that this chapter be read before embarking on any of the approaches detailed in chapter 4. There is often no need to collect exhaustive information from a wide range of sources to identify the major constraints and to make useful recommendations to improve the contribution of universities to national agricultural research. Consequently, a review committee might decide not to engage in an expensive review process. If a review committee decides to engage in a review process, these strategies and actions may provide additional ideas for recommendations that address constraints already identified.

Strategies

For each of the MORP categories, strategies for addressing constraints and improving performance are described. All 15 strategies are presented in table 5.1. The systems perspective and analytical framework used for the University in NARS study allowed participants to develop country-specific solutions in an organized way. Accordingly, these strategies are not all relevant to all countries, because the national situation and the current constraints differ from country to country. Some of the strategies may also require certain preconditions that cannot be met in a country and, consequently, the strategy cannot be implemented. Some of the strategies might have been implemented in the past without success. It is recommended that the members of the review committee or the members of a stakeholder workshop study the different strategies first and determine which of these are most relevant in their national context. Based on this assessment a priority list of strategies to be implemented can be established.

Actions

For each of the strategies presented, a background rationale is provided, covering the problem to be tackled and its context, and some possible actions are identified. Where feasible, examples from the case study countries are provided in separate boxes. They describe the specific action taken and its impact. An overview of strategies, actions, and examples is provided in table 5.1.

Actions described to implement a strategy may complement each other or they may offer alternatives. Again, these actions might not be relevant to all countries. Accordingly, in particular circumstances, other actions may need to be defined to implement the strategy. For each of the actions, an **explanation** (including specific preconditions) is given. Selected **implementation issues** and **potential benefits** are provided in annex 6 (CD-ROM) attached to this document.

Table 5.1: Strategies and Actions for Improving the University Contribution to Agricultural Research

Category	Strategies	Actions	Example*
Mandate, objectives, and policies	1. Clarify the research mandate, objectives, and policies of the university 2. <i>Involve the university in the national agricultural research system</i>	1.1. Develop or strengthen the university mandate for development-oriented research	
		1.2. Establish policies to integrate teaching and research activities	
		2.1. Encourage the clarification of the mandates of other relevant NARS institutions	
		2.2. <i>Participate in the development of a national strategic plan for agricultural research</i>	
		2.3. Encourage policies that promote linkages between NARS component institutions	Benin: a new agricultural policy
Organization, structure, and linkages	3. <i>Establish or strengthen a structure for organizing university research</i>	3.1. <i>Promote intra-university research collaboration</i>	
		3.2. Form interdisciplinary research units for development-oriented agricultural research	Uganda: establishing a university agricultural research institute
		3.3. Establish at university and faculty levels an office for the coordination of agricultural research (and extension)	
		3.4. Establish a scientific council or committee at university and faculty levels	Benin: the scientific council
		4. Organize for postgraduate research	
		4.1. Establish a postgraduate center to promote and coordinate postgraduate studies	
		4.2. Establish postgraduate programs in collaboration with regional and international universities	Nigeria, UI: postgraduate studies for agricultural economics SACCAR: promotion of regional centers of specialization
		5. Establish or strengthen formal linkages with NARO and other research institutions	
		5.1. Support the establishment or strengthening of an apex body for agricultural research	Nigeria, ABU: a unique institutional arrangement Burkina Faso: CNRST as the coordinating body for agricultural research
		5.2. Institutionalize national commodity and resource committees and networks	
		5.3. Formalize cross representation on boards and councils	Uganda: cross representation of NARO-Ug** and University
5.4. Develop mechanisms for joint research activities	Uganda: a memorandum of understanding		
5.5. Establish a mechanism for joint (university and NARO) supervision of theses	Benin: students get practical training at the NARO		

Table 5.1: Strategies and Actions for Improving the University Contribution to Agricultural Research (Cont'd)

Category	Strategies	Actions	Example*
	6. Establish or strengthen linkages with technology users	6.1. Establish at university and faculty levels an office for the coordination of extension (and research) 6.2. Establish organizational mechanisms for dissemination of research results	Burkina Faso: joint presentation of research results Burkina Faso: getting research results to farmers
	7. Establish or strengthen linkages with international institutions	7.1. Participate in regional research organizations 7.2. Establish cooperative research agreements with universities in developed countries and international agricultural research centers 7.3. Strengthen relationships with international donors and development agencies	ASARECA: meeting of the deans' committee
Resource and information	8. <i>Improve university human resource capacity and incentives for research</i>	8.1. <i>Allocate time for research in individual staff contracts</i> 8.2. Establish a policy on consultancies for staff members 8.3. <i>Ensure that promotion criteria provide incentives for staff to conduct development-oriented research</i> 8.4. <i>Encourage staff to improve their research skills</i> 8.5. Introduce research awards and rewards for staff	Nigeria, ABU: development-oriented research recognized in promotions
	9. Promote human resource exchanges	9.1. Introduce joint appointments 9.2. Encourage university staff to take sabbatical leave at NAROs and vice versa 9.3. Promote traineeships of students at NARO and other research stations	Uganda: teaching by NARO-Ug staff Zimbabwe: training of students at NARO
	10. <i>Improve funding for agricultural research</i>	9.4. Promote teaching by external lecturers 10.1. <i>Establish a research budget for the university</i> 10.2. <i>Identify alternative funding sources for agricultural research at universities</i> 10.3. <i>Establish a national agricultural research fund accessible to universities</i>	Benin: a research budget at the national university Nigeria, ABU: getting research funds through the NARO
	11. <i>Improve physical resources for research</i>	11.1. Improve the physical environment for research 11.2. <i>Adopt a policy on the repair and maintenance of equipment</i> 11.3. <i>Establish procedures for joint use of facilities and equipment</i>	Zimbabwe: good infrastructure is a precondition for good research

(Cont'd on next page)

Table 5.1: Strategies and Actions for Improving the University Contribution to Agricultural Research (Cont'd)

Category	Strategies	Actions	Example*
	12. Improve university research information flows	12.1. Improve coordination and management of existing agricultural libraries 12.2. Establish university/faculty research seminars for academic staff and students 12.3. Develop and share information on human, physical, and financial resources available for agricultural research 12.4. Prepare and share an annual report of university staff and student research activities (completed, ongoing, and proposed)	Zimbabwe: getting libraries to work together
	13. <i>Improve linkages to national agricultural information systems</i>	13.1. <i>Participate in national management information systems for agricultural research</i> 13.2. <i>Consolidate and publish sustainable national scientific journals</i> 13.3. <i>Contribute to national research and extension activities and publications</i>	Côte d'Ivoire: a joint journal to disseminate research results Benin: an agricultural research bulletin
Program planning and management	14. <i>Improve university agricultural research planning, monitoring, and evaluation (PM&E)</i>	14.1. <i>Formulate faculty-level research strategic plans and program priorities</i> 14.2. Integrate student research into the national agenda 14.3. <i>Establish a PM&E process within the university or faculties</i> 14.4. <i>Conduct periodic department-level program reviews</i>	Benin: planning strategically for university agricultural research
	15. Participate in national agricultural research program planning, monitoring, and evaluation processes	15.1. Participate in national priority-setting activities 15.2. Encourage cross-participation of staff of NAROs, universities, and other research institutions at their respective research program reviews 15.3. Contribute to the development of common research program evaluation criteria for all national agricultural research activities	Uganda: benefit from joint planning and review

* Details of these specific examples of actions, and of the organizations concerned, are provided in boxes with the corresponding title, below.

** NARO-Ug: In Uganda, the NARO (in the generic sense of the term used throughout this document) is actually called the National Agricultural Research Organization. To avoid confusion, we use here the abbreviation NARO-Ug to refer to this specific organization, even though this is not the official acronym used in Uganda.

Note: The strategies and actions italicized in the table are those recommended by at least four of the six countries participating in the University in NARS study.

Implementation issues relate to the following questions:

- What actions are required?
- What is the time frame?
- Who has the authority to implement the action?
- What are the financial implications?
- What human resources are needed?
- Are special materials or equipment required?
- Is continued monitoring or follow-up required?
- How feasible is the implementation of the action?
- How important is the implementation of the action?
- Who or what will be directly or indirectly affected by this action?
- What will be the negative or positive effects on them?
- What can be done to improve the positive effects and compensate for the negative effects?

The answers to these questions will determine the specific costs and benefits that can be expected from the implementation of the action, its feasibility, and relative importance in the specific country. Although all these questions need to be answered before implementing any specific action, they cannot be answered in this publication as most of the answers will vary from country to country. Therefore, it is recommended that the members of the review committee or the interinstitutional workshop answer them.¹ Based on this assessment, a priority list of actions to be implemented can be established.

Prioritizing strategies and actions

Given the different context in each country, it is not easy to prioritize the possible strategies and actions presented here. However, to give an idea of the importance and relevance of the different strategies and actions presented, we have listed the recommendations that were identified by at least four of the six countries participating in the University in NARS study² (Michelsen and Petry 2001; see also Burkina Faso 1997b; Republic of Nigeria 1995b; Republic of Uganda 1997b; Republic of Zimbabwe 1997; République de Côte-d'Ivoire 1998b; République de Bénin 1995b):

- Formulate and put into operation a national strategic vision and master plan for agricultural research and training (see Strategy 2, Action 2) .
- Promote interfaculty linkages (see Strategy 3, Action 1).
- Determine the optimal allocation of staff time between training, research, and other activities (see Strategy 8, Action 1).
- Change promotion criteria to provide incentives for more research and to emphasize the value of local publications (see Strategy 8, Action 3).
- Train/re-train staff on research methodologies, project formulation, and scientific writing (see Strategy 8, Action 4).

1. A format is provided in annex 3.9.

2. The strategies presented in this document are of a more generic nature than the recommendations agreed upon in the countries participating in the ISNAR University in NARS study.

- Improve research funding and establish a competitive fund for agricultural research favoring joint projects (see Strategy 10, Actions 1–3).
- Improve access to physical resources for research, through repair, replacement, and shared use (see Strategy 11, Actions 1–3).
- Develop a database on facilities and equipment available at the national level and propose ways in which facilities can be more widely utilized and more effectively managed (see Strategy 13, Action 1).
- Improve dissemination of research results and exchange of information through computer networks or a joint NARS bulletin (see Strategy 13, Actions 2 and 3).
- Formulate strategic plans for research at the faculty level in accordance with national agricultural sector needs (see Strategy 14, Action 1).
- Improve the planning, monitoring, and evaluation system for research at the university including periodic reviews (see Strategy 14, Actions 3 and 4).

These strategies and actions are indicated in italics in table 5.1.

Mandate, Objectives, and Policies

Policy-makers define the mandate, objectives, and policies of universities and other institutions of a NARS and, where an agricultural research council or apex body exists, of the NARS itself. For example, government policies on export earnings, food security, and financing research are critical determinants of how the NARS, broadly defined, operates as well as how the individual institutions function, develop, and cooperate. Under this MORP heading, the University in NARS study has identified the following major constraints that limit university contributions to national agricultural research: (1) the absence of an explicit mandate for development-oriented research at universities; (2) the absence of national research objectives, policies, and priorities; and (3) the lack of university involvement in the NARS (Michelsen et al. 1997).

Strategy 1. Clarify the research mandate, objectives, and policies of the university

Mandates, objectives, and policies provide the foundation of any organization. If research is to be legitimized, it is important that universities have a mandate for research, which is spelled out in each university's act or charter. If a research mandate exists, a clear mandate for development-oriented research may be lacking. Without a mandate for development-oriented research, universities can regard themselves as a hired resource to assist public agricultural research organizations. Also, there are often few policies in place to ensure the allocation of existing human, financial, and physical resources to research. While teaching policies may be well developed, the idea that research and teaching are complementary is often not sufficiently emphasized in university policies. Policies that encourage faculties to conduct research that contributes to recognized national agricultural development goals will allow the university to improve its image as an institution that serves the needs of society in general and the agricultural sector in particular. Such policies increase the opportunities of the university to engage in productive research.

Action 1.1. Develop or strengthen the university mandate for development-oriented research

A review of the mandate or charter of the university may be necessary on the part of faculties involved in agricultural research to ensure that research activities are legitimized and encouraged. Assuming that research is part of the mandate, it may be necessary to clarify what kinds and types of research are endorsed. Development-oriented research is defined as research that contributes to national development objectives. This orientation of university research should not be confused with different types of research (basic, strategic, adoptive, or applied) or kinds of research (disciplinary or multidisciplinary), any of which may be relevant (or irrelevant) to national development objectives.

Action 1.2. Establish policies to integrate teaching and research activities

Experience shows that the quality of teaching is enhanced by teaching staff participating in research activities and that the quality of research is enhanced by the teaching activities of research staff. Policies that make it clear to faculty and staff that they are expected to engage in both teaching and research are necessary to ensure this integration. Staff policy areas that may need review include contracts, remuneration, evaluation, and promotion. Other policy areas for possible review include financial support, facilities, and equipment for research.

Strategy 2. Involve the university in the national agricultural research system

The University in NARS study showed that universities normally have considerable potential for conducting agricultural research and, through linkages with NAROs, they can improve their research performance and the overall performance of the NARS. Often, however, universities do not have explicit policies that promote their integration into the national research system, particularly in agriculture. Also, national research policies need to identify the university as a component of the NARS and should encourage linkages between the different components of the NARS in order to enhance its overall performance. Without linkage policies, research institutions and universities tend to become isolated from each other, and when interactions do occur, they are haphazard and left to the initiative of individuals (Crowder and Anderson 1997). NARS institutions often function independently rather than interdependently, which is a critical factor in determining their contribution to national development efforts. National policies could give clear guidelines as to the kind and type of research that is expected of the university, to ensure the most effective use of available resources.

Action 2.1. Encourage the clarification of the mandates of other relevant NARS institutions

Effective cooperation within a national system requires that the strategic roles and mandates of all participating institutions be clarified, and that an understanding of the dimensions of institutional interdependence and institutional boundaries be established. Each institution has strengths and resources that can be applied to the development needs of the country. Clear and transparent mandates should state the mission and objectives of each institution and the basis on which it will interact with others to meet national goals. Clarification of the mandates of other research institutions (particularly of the apex organization or coordinating body, and of the NARO) requires action by top-level managers and policymakers.

Action 2.2. Participate in the development of a national strategic plan for agricultural research

More and more countries are developing a strategic plan to define their strategy for agricultural research. If there is an apex organization for research, it is likely that the university will be involved. Whether or not there is an apex organization, however, it is important that the university seek representation on the committee developing the strategic plan.

Action 2.3. Encourage policies that promote linkages between NARS component institutions

Given the need for institutional interdependence, linkages are required for optimal system performance. Some linkages are informal and individual in nature. All agricultural research institutions, including universities, should ensure that policies and procedures support the continuation of such informal linkages. However, these linkages can be transitory and are often not sustainable. Therefore, institutions need to develop policies that encourage and support formal linkages as well. The policies and mechanisms that are required relate to sharing of resources (staff, facilities, and funds), information access and exchanges, and joint program development (see strategies and actions below).

Benin: a new agricultural policy

In 1993, the Ministère du Développement Rural in Benin started a process to develop a new agricultural research policy. Key areas of concern addressed in the policy and some of the actions proposed were (1) the link between agricultural development policy and agricultural research policy; (2) a review of the components of the Benin NARS and of the relations among the components to improve coordination of the national agricultural research policy; (3) setting priorities, identification of principal research approaches and subjects, and preliminary breakdown of resources across programs; (4) the financial capacity of Benin relative to the size of its NARS, alternative sources of funding, and the cost of research; and (5) greater effectiveness, efficiency and sustainability for the Institut National des Recherches Agricoles du Bénin (INRAB), the main NARO, as the prime mover of the Benin NARS. Participation of all stakeholders in developing this new policy was a basic criterion for its success. Broad participation ensured that the policy takes into account all relevant opinions and positions and covers all relevant issues. It was also important to identify practical issues regarding implementation of the new policy. The resulting new agricultural research policy defines a national agricultural research program that consists of regional and commodity programs. It is expected that entities other than INRAB, the university in particular, will execute 10–15% of the program. (Janssen et al. 1997)

Organization, Structure, and Linkages

The structure and organization of a NARS institution influences the extent of its involvement in development-oriented research and its linkages with other institutions. For example, universities are typically organized along disciplinary lines, while NAROs typically have a commodity-based structure. The staff of institutions can bring about some internal changes, particularly in relation to their linkages, but policymakers traditionally play the most important role in determining how an institution is organized. Under this MORP heading (organization, structure, and linkages), the University in NARS study has identified the following major constraints that limit university contributions to national agricultural research: (1) an organizational structure which does not promote research at universities; and (2) poor or non-existent linkages with NAROs, other research organizations, technology users and potential clients of research, and international organizations (Michelsen 1997 et al.).

Strategy 3. Establish or strengthen a structure for organizing university research

While there may be formal structures for organizing research activities at the university level, often there are no mechanisms for managing agricultural research at faculty or department levels. Individual faculty must secure their own funds and receive little or no administrative support for their research activities. Where structural mechanisms exist, they are often not very effective due to lack of financial resources. Organizing a university's agricultural research (1) gives internal and external visibility to the university's research function; (2) allows for the development of policies to support research; (3) serves to encourage staff to engage in research activities; and (4) allows for the development and management of important external relationships. The following actions are recommended to realize these benefits.

Action 3.1. Promote intra-university research collaboration

Most university researchers conduct their research activities within their own departments and faculties. They operate in isolation and may even compete for the same national or international funds. However, researchers in departments and faculties related to agriculture need to collaborate, because most problems addressed by researchers have interdisciplinary dimensions. The University in NARS study demonstrated that there were underutilized human resources at universities that could be applied to development-oriented research. Universities should find an organizational mechanism to ensure that faculties of economics, agriculture, veterinary medicine, social science, science, and forestry have opportunities to collaborate. More important, staff from these faculties could be encouraged to develop joint projects to solve critical agricultural problems in an interdisciplinary way. New information and communication technologies provide unprecedented opportunities to link these faculties, departments, and individual staff with a view to improving the overall research performance.

Action 3.2. Form interdisciplinary research units for development-oriented agricultural research

Most agricultural problems have multidisciplinary dimensions, but most research continues to be conducted along disciplinary lines. Commodity committees, regionally-based programs, and other such entities can be formed within faculties and across faculties to ensure that problems are addressed in an interdisciplinary fashion and that the results are more useful. It is recommended that such units be established first in faculties of agriculture and then extended to other relevant faculties and NARS component institutions at a later time. For major long-term programs, it may be advisable to establish specialized institutes.

Uganda: establishing a university agricultural research institute

Makerere University (MU) established the Makerere University Agricultural Research Institute, Kabanyolo (MUARIK), within the Faculty of Agriculture and Forestry. The mission of MUARIK is to undertake basic, strategic, and applied agricultural and forestry research, and technology development and transfer. MUARIK supports both disciplinary and multidisciplinary research. Included in its portfolio of activities are joint research programs based on national priorities involving staff of MU and Uganda's National Agricultural Research Organization (NARO-Ug).¹ Representatives from NARO-Ug and from the Ministry of Agriculture, Animal Industries and Fisheries sit on the MUARIK Policy Committee. (Republic of Uganda 1997a; Makerere University-FAF 1995)

1. In Uganda, the NARO (in the generic sense of the term used throughout this document) is actually called the National Agricultural Research Organization. To avoid confusion, we use here the abbreviation NARO-Ug to refer to this specific organization, even though this is not the official acronym used in Uganda.

Action 3.3. Establish at university and faculty levels an office for the coordination of agricultural research (and extension)

Universities with a mandate for research need to establish an organizational mechanism, at both university and faculty level, to coordinate their research activities. This may be provided by an office for research, an assistant dean for research or a part-time assignment for a faculty leader. Such an entity or individual serves as the focal point for all research activities of the university or faculty. The same office can also take responsibility for extension, if the university includes this function in its mandate.

Action 3.4. Establish a scientific council or committee at university and faculty levels

One way to encourage both single-discipline and interdisciplinary research is to establish scientific councils or committees at both university and faculty levels. These entities would have the responsibility for defining research policy, seeking political and financial support for research, encouraging staff to conduct research, and ensuring that high standards are maintained. They could also provide a focal point for encouraging collaboration with other NARS component institutions, particularly if their membership includes NARO representation.

Benin: the scientific council

Planning and coordination of research activities at Benin's national university, UNB, is the responsibility of the Conseil Scientifique (scientific council), which is organized into six sectoral committees, including one for agricultural sciences. The sectoral committees each include department heads and other interested parties. The limited funds available for research through the scientific council have constrained its activities. (République du Bénin 1995a)

Strategy 4. Organize for postgraduate research

The existence, scope, and size of a university's postgraduate programs are closely correlated with its contribution to development-oriented research. The fact that there is a postgraduate program in the first place implies that the research mandate and function is well established within the university. Thereafter, postgraduate students increase the availability of human resources and, normally, the amount of funds available for research. Consequently, postgraduate students influence the number of research activities that can be undertaken and the research outputs that can be expected. These points were emphasized by the results of a survey involving faculties of agriculture and veterinary medicine in SSA (Michelsen 1998). Most of the 26 deans responding indicated that MSc and PhD programs are either important or very important to the overall contribution of the faculty to development-oriented national agricultural research.

Action 4.1. Establish a postgraduate center to promote and coordinate postgraduate studies

Given the importance of postgraduate programs to development-oriented research, an obvious first step is to establish a center to promote and coordinate postgraduate studies—or to strengthen such a center, if it already exists. A postgraduate center would be responsible for postgraduate student program policies, procedures, promotion, finance, monitoring, evaluation of progress, and financial accountability. It would also rationalize research proposals for the purpose of allocating funds as effectively as possible, basing the selection criteria on relevancy, likely benefits, and costs. Another im-

portant function of the center would be to develop a strategy for documenting research results generated by postgraduate studies. The center would be managed by a high-ranking senior staff member who would be responsible to the executive manager of the university and/or the dean of the appropriate faculty.

Action 4.2. Establish postgraduate programs in collaboration with regional and international universities

Wherever universities lack sufficient strength in key disciplines, cooperative postgraduate degree programs may be established with other universities in the region or with universities in advanced countries. In such cases, part of the program is conducted elsewhere, but the degree is awarded by the national university. Such arrangements are often called “sandwich” programs.

Nigeria, UI: postgraduate studies in agricultural economics

In the mid 1970s the University of Ibadan (UI) started an MSc program in agricultural economics, with sustained support from the Rockefeller and Ford Foundations as part of their institutional development programs. Key components of this program were (1) long-term and substantial external support from the two foundations; (2) support for a cooperative relationship with the International Institute of Tropical Agriculture, where students could carry out their thesis-related research; and (3) scholarships for graduate students throughout francophone West Africa that included language training and continuous monitoring of their progress. This program provided, for example, students from Benin with an alternative to going to France to complete their training for the degree of Ingénieur Agronome Diplômé (IAD). This provided them the opportunity to learn English, complete a full year of MSc course work at UI, and obtain a Master's degree in addition to their IAD. For several years, the entire graduating class from Benin followed this pattern. The program was recognized as a successful, locally based, postgraduate program and UI was recognized as a regional center of excellence. However, when external support stopped in late 1970s, the program was inherently vulnerable to serious erosion in quality and capacity. Problems that developed included the following: (1) funding became dependent on the Nigerian Government which did not support UI as a center of excellence; (2) many senior Nigerian staff transferred to career-enhancing positions in the proliferating newer universities; and (3) senior expatriate staff departed. (Court and Coleman 1993)

SACCAR: promotion of regional centers of specialization

The Southern African Centre for Cooperation in Agricultural and Natural Resources Research and Training (SACCAR) promoted the concept of regional centers of specialization through their support for regional postgraduate programs (at MSc level). This initiative made significant contributions to the improvement of research facilities and research output since university research is closely associated with postgraduate training. Since 1989, four regional MSc programs have received support under this initiative, which provided financial support for both student and staff research. A further three regional MSc programs were approved in 1998. (Woodend and Ndunguru 1998)

Strategy 5. Establish or strengthen formal linkages with the NARO and other research institutions

The University in NARS study showed that many university staff members have more linkages with international organizations such as universities in developed countries and donors than with national ones such as NAROs, users of research results, and the private sector. Linkages among all national research institutions should be designed to avoid duplication of effort, to ensure a “critical mass” of expertise and resources, and to close existing gaps in the national research agenda. This coordination allows research to be conducted in those NARS component institutions with comparative ad-

vantage in the relevant fields and it facilitates interinstitutional research collaboration wherever such arrangements increase effectiveness. At the same time, coordination may provide access to additional financial, human, and physical resources, upgrade skills, and improve the knowledge and experience of staff involved. Through these linkages, the university can become an active, properly integrated component of the NARS.

Not all linkages need to be formalized, as individual initiatives should not be suppressed by rules and regulations. However, the success of individual linkages is determined by the engagement and motivation of individuals—which can change at any time and, therefore, may not necessarily be sustainable (Eponou 1993). It is important for the success of any linkage that all actors involved stand to benefit, that there is a net gain for the institutions involved, and that the transaction costs are minimized.

In any case, coordination has to be formalized at a national level—or at least at a level that unites the different NARS component institutions—if it is to be effective and sustainable. There are many possible forms and intensities of linkages that can be considered, including apex coordinating organizations, networks, cross representation on councils, joint research planning and reviews, and more specific mechanisms for joint activities (such as workshops, field days, NARO staff teaching at the university, and university staff working at the NARO). It is also possible to integrate research, education, and extension functions as is done in the United States. While few countries have adopted this model, one state in Nigeria has had considerable success with an integrated approach (see Nigeria, ABU: a unique institutional arrangement, below).

There are several factors that can influence the effectiveness and efficiency of these linkages. They include clear objectives and policies, the availability of financial and human resources, the ability of the individuals involved to work together, and a capable administration of the linkage mechanism.

Nigeria, ABU: a unique institutional arrangement

Ahmadu Bello University (ABU) in Nigeria has an agriculture and veterinary medicine complex that is unique in that the university includes not only academic faculties (Agriculture, Veterinary Medicine), but also three national research institutes (the Institute for Agricultural Research [IAR], the National Animal Production Research Institute [NAPRI], and the National Agricultural Extension and Research Liaison Services [NAERLS]). This unusual institutional arrangement has resulted in a very high degree of university-NARO integration, particularly as regards the relationship between the Faculty of Agriculture (FOA) and IAR. Five of the six departments in FOA are also joint departments of IAR, and split faculty-institute appointments exist alongside full-time faculty appointments and full-time institute appointments. The staff tends to engage in applied, development-oriented research. Access to funding through the research institutes (in an environment where university funding for research has declined to very low levels) enhances the research activity of university staff. Promotion criteria for both teaching and research staff are similar, placing heavy emphasis on publication activity, but with weight given to the quality of research and its contribution to knowledge and national development. Formal linkage mechanisms exist in the form of faculty boards, curriculum-development committees, joint research committees, joint supervision of theses, and joint management of journals. Informally, a good deal of joint use of research facilities takes place. The close linkages, in turn, facilitate a significant contribution of ABU academic staff to national agricultural research. (Republic of Nigeria 1995; ISNAR 1985)

Action 5.1. Support the establishment or strengthening of an apex body for agricultural research

To enable researchers from various institutions in a country to share information, exploit complementarities between institutions, and avoid duplication of effort, a coordinating apex body is needed. In many countries, an apex body exists, but they differ in mandates, objectives, policies, structures, and availability of resources. For example, in some countries most national research funds are channeled through such an apex body while in others this entity has little or no direct control of funding. The composition of these apex bodies also varies. Sometimes it is comprised of individuals serving in their own capacity; however, more typically, it consists of representatives of different NARS components. In some countries, the major function of the apex body, which is to coordinate all national research activities, has been assumed by the NARO.

Burkina Faso: CNRST as coordinating body for agricultural research

The coordinating body for agricultural research in Burkina Faso is the Centre National de la Recherche Scientifique et Technologique (CNRST). The administrative council of CNRST is composed of 15 members, including the Rector of the University of Ouagadougou and representatives of the government, workers, the scientific community, NGOs, and the private sector. The scientific and technical council is the consultative body of CNRST, consisting of 10–15 members. It addresses questions of scientific policy. The management council of CNRST is composed of both CNRST staff and directors of agricultural research institutes. Planning of research activities for the NAROs falls under the aegis of CNRST, within the context of a national strategic plan for research. (Burkina Faso 1997a; Burkina Faso 1996.)

Action 5.2. Institutionalize national commodity and resource committees and networks

The lack of a critical mass of researchers can limit their research performance, especially when researchers are dispersed among independently operating national institutions. One way of concentrating research resources is to form commodity research committees and networks that address interdisciplinary aspects of agricultural problems. Commodity committees and networks usually include the participation of many institutions. This brings universities and NAROs together to focus on priority commodities or natural resources (for instance, water). If there is a national apex body for agricultural research, there should be a clear link between the national commodity- or resource-based committees or networks and the apex body to avoid further fragmentation of decision making and influence on policy.

Action 5.3. Formalize crossrepresentation on boards and councils

Cooperation between organizations requires specific organizational policies to create the enabling environment and generate “pressure” for organizations to work together. Most organizations have a governing board or council that provides policy guidance. Many boards are composed of stakeholders from other organizations. It is recommended that universities, NAROs, and other research institutions allow crossrepresentation on their councils, boards, or committees that deal with research in order to encourage cooperation.

Uganda: crossrepresentation of NARO and university

Agriculture ministry and NARO-Ug officials are represented on the relevant faculty boards of the principal university (MU), specifically those of the Faculty of Agriculture and Forestry, and the Faculty of Veterinary Medicine. NARO and university professional staff are also involved in the planning and review of NARO-Ug activities at the program, institute, management committee, and board levels. (Republic of Uganda 1997a)

Action 5.4. Develop mechanisms for joint research activities

Joint research activities involving both university and NARO staff require policies (see Strategy 2, above) and mechanisms that facilitate joint participation. Possible mechanisms include establishing a cooperative agreement or memorandum of understanding (MOU), procedures for joint use of resources, procedures for monitoring, reporting, and evaluation, and protection of intellectual property rights.

Uganda: a memorandum of understanding

In 1996, a memorandum of understanding (MOU) was signed between MU and NARO-Ug. The purpose of the MOU is to strengthen ties between MU and NARO-Ug, particularly with respect to three faculties: the Faculty of Agriculture and Forestry, the Faculty of Veterinary Medicine and the Faculty of Science. The MOU provides for collaboration in planning and conducting research based on national priorities. In particular, university staff may participate in NARO research programs in the priority areas approved by the NARO board, and they may also conduct basic research on problems referred to them by the NARO. Collaboration in the provision of higher degrees and of specialized short-term training, as well as in the exchange of expertise and information, is covered as well. The MOU also spells out linkages in terms of crossrepresentation on various committees, participation in training activities and seminars, conferences, and special events organized by either party, as well as sharing of costs for collaborative activities. (Republic of Uganda 1997a)

Action 5.5. Establish a mechanism for joint (university and NARO) supervision of theses

In many universities, a significant proportion of the institution's research program is conducted by postgraduate students as part of their degree requirements. In order to involve postgraduates more closely in development-oriented research, cooperation with NAROs is recommended. At present relatively few members of NARO staff are involved in thesis supervision, particularly at PhD level. If NARO researchers are to become involved in such supervision, those who assist the students will have to receive some form of recognition for their efforts. One mechanism for this is to give courtesy or honorary appointments as university staff for the duration of the student research and final evaluation. Potential thesis topics could be discussed at the beginning of each academic year between university and NARO staff to ensure that topics of mutual interest are addressed.

Benin: students get practical training at NARO

Some university students in Benin receive practical training at INRAB, the country's principal NARO, and this serves as the basis for their thesis for the degree of Ingénieur Agronome. These theses are supervised jointly by a professor from the Université Nationale du Bénin (UNB) and an INRAB researcher. INRAB proposes research themes for students, students are matched to themes based on their areas of specialization, and the students then carry out the research work under dual supervision. Financial resources for this activity come primarily from INRAB, but UNB also makes a contribution to support academic advisor travel and various other costs. (République du Bénin 1995a)

Strategy 6. Establish or strengthen linkages with technology users

Members of university staff involved in research often have no linkages, or only weak linkages, to users of agricultural technology (such as farmers and extension agents). In fact, ISNAR's University in NARS study showed that university staff believe that the most important beneficiaries of university research results are not the users, but rather the researchers themselves, for the purposes of promotion and status. They also believe that weak links with farmers and extension workers are a constraint to the application of their research results. Other important reasons cited for the lack of up-take of the results of university research included the type of the research conducted, lack of funds for new inputs or new technologies, the unwillingness or inability of farmers to use new technologies, and poor communication of research results to policymakers. Based on this experience, the study concluded that the establishment and development of linkages with users of technology could enhance the development-oriented nature of university agricultural research. The benefits of closer linkages to users are that (1) the relevance of university research is enhanced as researchers become aware of users' needs; (2) on-station research is reinforced with on-farm trials; (3) a common understanding of problems is developed; and (4) technology transfer and the impact of research can be improved. Furthermore, better links with technology users can strengthen the public perception of a university as an institution effectively working to serve society.

Action 6.1. Establish at university and faculty levels an office for the coordination of extension (and research)

The objective of national agricultural research is to make effective and sustainable technologies available to farmers. Whether or not the university has an official extension function, it is recommended that the university establish an outreach or extension office with a senior manager to achieve this objective. The purpose of this office would be to allow the university the opportunity for two-way interaction with the users of research results, mainly farmers. In most cases, it would be appropriate to combine this position with that of research coordinator at both university and faculty levels.

Action 6.2. Establish organizational mechanisms for dissemination of research results

Very often, university research results are only found in the office of the researcher or, if published, remain in scientific journals waiting to be discovered by potential end users. If the university is to make a contribution to agricultural development, it needs to establish ways of disseminating research results. The establishment of an office for the coordination of extension (as above) is one possible mechanism. Another is some form of partnership with user groups (such as farmers' associations) that serves to inform the university of critical problems, possibly helps to conduct joint trials and experiments, and then keeps farmers abreast of research results through field days, seminars, and workshops. Other mechanisms relating to joint publications are discussed below.

Burkina Faso: getting research results to farmers

The Agence Nationale de Valorisation des Résultats de Recherche (ANVAR) was created in 1996 as a semi-autonomous institution of the national apex body for agricultural research, CNRST, with the twin objectives of promoting the dissemination of research results and enhancing the market value of those research results. ANVAR has established a database with information on research results and provides technical assistance in the form of feasibility and market studies for particular research applications. The assistance that ANVAR provides in identifying technologies for release to farmers promotes improved linkages among the different actors concerned with technology generation and use. (Burkina Faso 1998a)

Burkina Faso: joint presentation of research results

Joint scientific days have been organized biennially since 1994 under the Ministry of Higher Education and Scientific Research of Burkina Faso by the Forum National de la Recherche Scientifique et des Innovations Technologiques (FRSIT). The forum has a permanent secretariat and its own resources. Research results from the agricultural research institutes and from the agricultural component of the University of Ouagadougou are presented and discussed during a week-long forum that consists of workshops on development constraints and trends, presentation and discussion of research findings in seminars, conferences by policy makers, and exhibits of technology. FRSIT, which is headed by a professor from the University of Ouagadougou, has organized joint scientific days focused on the role of scientific research in national socioeconomic development, environmental problems, and sustainable development. The forum is open to all national researchers, policy makers, and development leaders, and to regional and international participation as well. FRSIT constitutes a mechanism whereby university and NARO researchers are able to disseminate research results to technology users, policy makers, and other interested parties. (Burkina Faso 1998b)

Strategy 7. Establish or strengthen linkages with international institutions

In an increasingly interdependent world, linkages with international donors, universities elsewhere, development agencies, and regional organizations are important for improving the research performance of national universities. While many universities are involved in some relationships of this kind, these linkages are not usually coordinated within the university or with other institutions in the national system. Universities and NAROs often have linkages with different stakeholders all over the world. Different departments of a university often have linkages with different organizations. Even if they link with the same organization, they may link with different departments in that organization. Consequently, information about the nature and content of this collaboration remains at department or institute levels and is not accessible to other NARS entities that might other benefit from being involved in the collaboration. Universities and NAROs need to establish international relationships that not only provide external support, but also contribute to their institutional effectiveness and sustainability.

Action 7.1. Participate in regional research organizations

There is a strong rationale for NARS institutions to link into the regional research system to capture inflowing technology, gain access to additional resources, and share the cost of technology development. Regional research organizations are being formed in some areas and are maturing in others. These organizations can help to conserve resources by allocating responsibilities to the best supplier(s) of research services to solve common problems.

ASARECA: meeting of the deans' committee

In 1996, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) convened the first meeting of the directors of NAROs and deans of faculties of agricultural sciences from the entire Eastern and Central African Region. It was recognized that while the faculties of agricultural sciences in the region employed a large number of highly qualified scientists, their participation in regional agricultural research network activities was quite minimal. It was also recognized that the priority must be to strengthen NARO/university links at the national level, although regional research organizations could also play a helpful role in strengthening such linkages. Based on this meeting, a committee of deans was established under the auspices of ASARECA, which provides a mechanism for the deans to meet regularly and to participate in regional activities. (Mrema 1998)

Action 7.2. Establish cooperative research agreements with universities in developed countries and international agricultural research centers

Another way of taking advantage of incoming technology, gaining access to additional resources, and capturing the benefits of globalization of research is to develop cooperative research agreements with international universities and international agricultural research centers (such as those of the Consultative Group on International Agricultural Research). Such agreements can be set up in a way that promotes joint research to meet national needs.

Action 7.3. Strengthen relationships with international donors and development agencies

In many countries a significant proportion of research resources come from external donors and development agencies. Donors and development agencies are often interested in supporting development-oriented research. A university can often improve its chances of securing external support by joining with a NARO to submit proposals.

Resources and Information

Human, financial, and physical resources, together with information management, determine how much an institution can achieve in the area of development-oriented agricultural research. These factors are managed at the institutional level, but are influenced or determined, by policymakers at a higher level. Under this MORP heading, the University in NARS study has identified the following major constraints that limit university contributions to national agricultural research: (1) the heavy teaching load borne by university research staff; (2) the absence of incentives (monetary and otherwise) for university staff to do research; (3) limited or non-existent funding for university research; (4) poor or non-existent physical facilities for research at universities; and (5) the lack of information on current and proposed research.

Strategy 8. Improve university human resource capacity and incentives for research

From ISNAR's University in NARS study, it appears that university staff are often pressed to meet teaching requirements, leaving research as a secondary, less-supported activity. As a result, some of the staff who are otherwise qualified to do research are not up-to-date in their professional area or are not involved in research at all. Furthermore, universities may not provide monetary or nonmonetary incentives for staff to conduct research. Although especially productive researchers are likely to receive promotions and invitations to national and international conferences, they do not always receive higher salary increases. Incentives for staff should be sufficiently attractive to reduce staff turnover (which is currently high in some countries) and so guarantee continuation and completion of research projects. If a university is to make a significant contribution to national agricultural research, the persons actually conducting research must be provided with an enabling administrative and legal framework and be motivated to conduct research that is development-oriented. The following are several actions that the university may take to increase the involvement of university staff in agricultural research.

Action 8.1. Allocate time for research in individual staff contracts

According to the University in NARS study, the proportion of staff time devoted to research ranged from 29% to 37%. In no case, however, were individual staff members given a specific time allocation for research that was recommended as the basis for promotions and other rewards. Given that members of staff have different capabilities and

strengths, it is recommended that each be given a specific figure (or range of figures) for the proportion of time they should allocate to research and that this should form part of their contract.

Action 8.2. Establish a policy on consultancies for staff members

While many university staff engage in consultancy assignments, most universities either have no consultancy policy or have no way to enforce or monitor their policy in this area. Based on results of a survey of universities in six countries in SSA, between one-third and two-thirds of all university staff members are involved in consultancies (Michelsen et al. 1997). Consultancies should be encouraged as a way to get university staff involved in solving national problems, as this can only enhance their research and teaching programs. Policies are needed, however, to ensure that the consultancy is contributing to national development and that the time spent does not detract from meeting normal teaching responsibilities.

Action 8.3. Ensure that promotion criteria provide incentives for staff to conduct development-oriented research

Promotions for university staff are mostly based on publication of research results and not on teaching performance. However, promotion criteria may not take into account the special characteristics of the agricultural sector nor recognize a mandate for development-oriented research. Promotions are often discipline-based while interdisciplinary and development-oriented research is not necessarily seen as contributing to excellence in a particular discipline. Moreover, preference is often given to articles in international journals over those published in local journals that are more likely to be development-oriented and accessible to end-users within the country. Finally, departments that seek to direct research activities may have relatively little influence over promotions, because these are usually determined at a higher level in the university administration. It is recommended that faculties and departments be given more authority to define the criteria for promotions and that participation in development-oriented research be given higher value when assessing the merit of staff for promotions. One way to accomplish this would be to recognize research and extension articles in national and regional publications when assessing promotions.

Nigeria, ABU: development-oriented research recognized in promotions

Publications are the principal criterion in considering academic staff for promotions at ABU in Nigeria. However, reflecting the applied nature of much of the university's work, at both the Faculties of Agriculture and of Veterinary Medicine, emphasis has been given to publications based on applied, development-oriented research. The quality of the research and its contribution to knowledge and national development are the key elements in evaluating research. In this context, therefore, the criteria for promotion are likely to stimulate development-oriented research. (Republic of Nigeria 1995a)

Action 8.4. Encourage staff to improve their research skills

Developing and maintaining staff capacity for research requires paying attention to both the technical and process skills of researchers. Members of staff usually acquire and enhance their technical capacity by pursuing advanced degrees. Process skills, on the other hand, such as project formulation, project-proposal preparation, scientific writing, and presentation can often be improved through short-term training. Such training may be important to improve the access of research staff to national and foreign funding and to enhance their capacity to manage research projects. A training-needs assessment at the faculty level could help to identify existing gaps in the

expertise of staff. Another way to improve research skills is through participation in national and international conferences and seminars. University managers should encourage participation in such events, especially when the individual is to present a scientific paper.

Action 8.5. Introduce research awards and rewards for staff

University staff participating in the ISNAR case studies often cited the lack of monetary and other incentives as a reason for not becoming involved in more research. Here we focus on salary increases, other financial rewards, prestige awards, and additional degree training. It is recommended that outstanding scientific achievement, at least partly based on contributions to development-oriented research, be recognized with both monetary and nonmonetary awards.

Strategy 9. Promote human-resource exchanges

The University in NARS study showed that university staff spend about a third of their time on research which, in sum, constitutes a significant proportion of the human-resource potential of a country (Michelsen et al. 1997). University research staff usually have higher degrees and are working in a wide range of different disciplines and areas of specialization. The demand for, and supply of, staff with different qualifications and experience varies among the different NARS component institutions. In some cases, the need for a specific human resource—a person or team with a special combination of skills—may not justify the employment of a new staff member. In these cases, an exchange of staff can be of benefit to all institutions involved. For example, staff members of NAROs may have practical experience that is important for training students. Also, university staff may have qualifications and experience that are needed in the NAROs for conducting certain types of research. By encouraging exchanges of staff, a university can significantly increase its contribution to development-oriented agricultural research. Some actions that can be taken to accomplish this are as follows.

Action 9.1. Introduce joint appointments

Joint appointments allow researchers to make formal contributions to more than one institution. It is recommended that universities make it possible for suitably qualified NARO staff and those of other institutions to teach and conduct research at universities. Joint appointments, whether official or courtesy, are the best way to legitimize the participation of qualified external staff in university programs. Also, encouraging university staff to take joint appointments with NAROs and other research organizations will benefit both these organizations and the university.

Action 9.2. Encourage university staff to take sabbatical leave at NAROs and vice versa

Most university staff and some NARO staff take sabbatical leave. This often allows the staff member to become more involved in research activities and to learn new skills. When university staff spend a period of time in a NARO, they become familiar with the problems of national development and the programs designed to alleviate these problems. It is quite likely that they can complement NARO staff in addressing key national problems.

Uganda: teaching by NARO staff

The arrangement under which NARO-Ug staff give lectures at MU complements the human resources available at the university and implements the collaboration policy between MU and NARO-Ug, as stipulated in the 1996 MOU and in job descriptions for NARO scientists. A total of 10 NARO professional staff participate in this linkage mechanism. In terms of outcomes of the linkage mechanism, NARO staff contribute up to 15% of their working time to teaching students and student consultations. On a regular basis, student practicals have been conducted at NARO institutes. A number of students receive instruction and practicals at NARO institutes during each of the four academic terms of the year. Overall, this linkage is regarded as highly effective. (Republic of Uganda 1997a)

Action 9.3. Promote traineeships of students at NARO and other research stations

Often NAROs have more extensive research facilities around their countries than do the national universities. It is recommended that universities seek opportunities for students to get involved in high-priority national research programs and to utilize the associated NARO facilities.

Zimbabwe: training of students at the NARO

As the Faculty of Veterinary Science (FVS) of the University of Zimbabwe was established only in 1982, while the Central Veterinary Laboratory (CVL) had been in existence for nearly 60 years, a system was introduced in the early years of the FVS to expose veterinary students to pathology and other laboratory diagnostic disciplines practiced at the CVL. Students can rotate through the CVL facilities to gain hands-on experience. Students are attached to specific projects where they are assigned specific studies and write their student projects for their final-year qualifying examination. Students are assisted by their NARO supervisors with project formulation, documentation, and presentations. CVL, in supporting these interactions, meets some of its research needs and can increase the pace of progress. Students gain relevant practical experience and research skills while NARO staff update their knowledge. (Republic of Zimbabwe 1998)

Action 9.4. Promote teaching by external lecturers

On the one hand, university teaching staff are often pressed to meet their teaching obligations; on the other, universities sometimes need a lecturer with a special discipline for a specific course that may not justify employing a new staff member. In these cases, teaching by external lecturers can be of benefit to all parties involved. For example, staff members of NAROs may have practical experience and skills that are particularly valuable to university students.

Strategy 10. Improve funding for agricultural research

A university needs well-trained and motivated staff if it is to conduct research successfully—but it also needs adequate financial resources to support their research activities. Universities often have access to research funds through their own budgets but such funds tend to be more limited than other funds available nationally for agricultural research. Many universities receive research grants from international sources, development agencies, or donors. If universities have a clear mandate for research, they should also have a budget for this purpose. The lack of a research budget at many universities may be explained by their falling under the ministry of education, whereas national research funds are channeled through the specialized ministries, such as the ministry of agriculture. Ministries of agriculture which provide funding for university research are often able to direct such research towards their own, development-

oriented objectives. International funding sources that may be available to individual members of university staff, may not take into account national development-oriented research objectives.

Action 10.1. Establish a research budget for the university

Most universities have the mandate for research, but only limited funds to support that mandate, and must rely primarily on individual researchers to secure funds for their projects. If a university wants to make a significant contribution, particularly to respond to national priorities, it will need to establish a fund for research. It is recommended that the university establish a competitive grants system, with priority going to projects that clearly respond to national priorities.

Benin: a research budget at the national university

Since the early 1990s, 15% of the Benin government's subvention to UNB has been allocated to the university's scientific council to support scientific activities. There have been some problems with irregular payments that do not always match planned expenditures, and the rather modest total available (US\$100,000 for the entire university) means that resources for agricultural research are strictly limited. However, within these limitations the scientific council has established a balanced program: 40% of the total to support research projects, 20% to support scientific gatherings at the university, 20% for publications, 10% to support participation of researchers at seminars and colloquia, and 10% to support excellence in research via competitive grants. (République du Bénin 1995a)

Action 10.2. Identify alternative funding sources for agricultural research at universities

With dwindling funds available for research in most ministries of agriculture and low priority being accorded to research in most ministries of education, universities now need to be proactive in seeking financial support for their research programs. Potential sources include other ministries, special networks for selected commodities, the private sector, NGOs, local and international donors, sales of produce, and the proceeds from intellectual property generated by the university (via patents and licensing agreements). In recent years, a major funding initiative for SSA has been the Special Program for African Agricultural Research (SPAAR). SPAAR was established in 1985 by a consortium of donors under the auspices of the World Bank but in 2001 the program was merged with the Forum for Agricultural Research in Africa (FARA). In its new form, FARA provides a single apex organization for African sub regional organizations and NARS.

Action 10.3. Establish a national agricultural research fund accessible to universities

A national agricultural research fund that is accessible to universities, NAROs, and other entities is only available in a few countries. Such a fund should be competitive in nature and organized in such a way as to encourage all research organizations, including universities, to address national priority research topics. At least a portion of this fund should be earmarked for joint research projects that exploit synergies achieved by linking universities and NAROs.

Nigeria, ABU: accessing research funds through the NARO

The joint research committees of the IAR and NAPRI at ABU in Nigeria constitute a linkage mechanism that makes financial resources available to university staff. The operation of this linkage mechanism is greatly facilitated by the unique institutional arrangement at ABU under which three NARO institutes (IAR, NAPRI, and NAERLS) are part of the university. The research committees consider new research proposals, monitor progress, and prepare annual reports on current research. They draw their members from both the NARO research programs and the relevant university departments, and the financial resources they administer come from institute research funds. Faculty members benefit by having greater access to institute research projects for collaborative research, while the institutes benefit by gaining access to faculty expertise. (Republic of Nigeria 1995a)

Strategy 11. Improve physical resources for research

Well-trained staff need access to appropriate facilities (laboratories, equipment, land, and supplies) if they are to conduct research and train postgraduate students successfully. Without adequate physical resources, little productive research can take place. The University in NARS case studies found that the working environment, research facilities, and other physical resources varied tremendously among universities. The universities and faculties that had received substantial support from international donors over recent decades often had better physical infrastructure in selected areas. However, most universities are not able to maintain such infrastructure over the longer term. The following are some actions that may help to improve the access of university staff to the research facilities they need.

Action 11.1. Improve the physical environment for research

Universities need adequate, up-to-date and well-maintained facilities for both research and teaching. Key elements of a favorable physical environment for research include laboratories, field stations, research farms, and equipment for all these installations. It is recommended that project budgets include funds for physical facilities and equipment so that universities always have adequate funds to ensure that the physical environment for research is of a high quality. However, project research budgets may need to be supplemented by additional core funding to universities. Also, because telecommunications infrastructure is still weak in many countries and travel is indispensable to field research, universities also need access to adequate transport. Further, it is recommended that a university-level committee be formed to manage the physical resources needed for research and to obtain equipment on a priority basis.

Zimbabwe: good infrastructure is a precondition for good research

The physical facilities for research at the University of Zimbabwe are generally in good condition. For both FOA and FVS, laboratory space and equipment, office space and equipment, vehicles, and field equipment are, for the most part, in good-to-excellent condition. This reflects the substantial investments in physical facilities for agricultural research at the university that have been made in recent years. (Republic of Zimbabwe 1998)

Action 11.2. Adopt a policy on the repair and maintenance of equipment

It has often been observed that university equipment suffers from lack of repair and maintenance. Appropriate policies and adequate funds are needed to ensure that equipment remains serviceable. Purchase of service contracts, hiring of maintenance staff, and budgeting for repairs and maintenance are some of the policy options for consideration. It is recommended that all project budgets include line items for equipment maintenance.

Action 11.3. Establish procedures for joint use of facilities and equipment

Although physical resources may be limited at universities, some resources (such as land) may be relatively abundant and could be shared with staff members of NAROs and consequently be used more efficiently. The same applies to the physical resources of the NAROs. Both universities and NAROs often own specialized equipment that is currently underutilized. Agreements on joint use can optimize its use and may permit the establishment of a maintenance fund for necessary repairs. Such agreements are often necessary when joint research projects are to be implemented.

Strategy 12. Improve university research information flows

The quality and quantity of scientific information flows into, and out of, a university are strongly correlated with its research performance. Scientific information flows into a university in the form of journals and books, through participation in local and international seminars and conferences, as well as via direct researcher-to-researcher contact. Electronic communication channels, like e-mail and the Internet, are becoming increasingly important sources of scientific information for university researchers. Although information costs in general are declining, the cost of certain items may still increase—as in the case of some journals available through the internet. In any case, strategies for information access and use must be developed and optimized to support research activities. The rapid changes in information technology underline the importance of training of agricultural researchers in general and of specialists responsible for helping those researchers to find the information they need.

Adequate means to share information about a university's own research activities and resources, internally and among partners, also need to be developed in order to maximize the use of university resources. Most important, information about completed research activities must reach intended users if the results are to be utilized for the benefit of the country. The following are some actions that can facilitate university information flows.

Action 12.1. Improve coordination and management of existing agricultural libraries

Many university libraries are evidently suffering from lack of funds and are unable to keep up with scientific literature. The Internet offers libraries new options for acquiring and organizing information electronically. In addition, some coordination of the purchase, storage, and use of journals—at the level of departments, faculties, and university—can reduce costs and improve information access. Coordination of access to libraries between universities and NAROs, for instance through the establishment of an interlibrary loan system, would reduce total costs and improve the access of the research community as a whole to scientific literature.

Zimbabwe: getting libraries to work together

The libraries in the FVS and the CVL are the main sources of information on veterinary medicine in Zimbabwe. As such, they cooperate in exchanging information wherever there is a need. The FVS has the advantage of receiving books by virtue of being a leading academic facility and also through its linkage programs with European universities. Through the link with FVS, the CVL library is able to access new books that would otherwise have been unavailable to it, as its own book reserve is old and it has not been able to replace or obtain new books since the mid-1980s. Second, the university holds at least six journals relevant to veterinary research that the CVL does not purchase. In return, the FVS can access various government documents and older materials that may not be obtainable in the university. It is planned to link the two facilities by computer network. (Republic of Zimbabwe 1998)

Action 12.2. Establish university/faculty research seminars for academic staff and students

Seminars and workshops are normal activities of universities but may have been reduced in scope or frequency in response to financial constraints. In the course of the University in NARS study, it was discovered that students use seminars principally to fulfil their higher-degree requirements and such seminars tended to be held at the department level. It is recommended that faculty-level seminars also be held for staff to present research proposals and results to a multidisciplinary audience of both staff and students. Opening some seminars to the public would allow NARO and other research staff to participate as well.

Action 12.3. Develop and share information on human, physical, and financial resources available for agricultural research

From the University in NARS study, it was clear that staff from NAROs and other NARS component institutions were unaware of the human, physical, and financial resources for research at the university. It is recommended that universities develop and maintain information systems that can be used for the purpose of allocating resources efficiently and that can be shared with NAROs and other research organizations to encourage cooperative research activities.

Action 12.4. Prepare and share an annual report of university staff and student research activities (completed, ongoing, and proposed)

The University in NARS study found that NAROs typically had little or no knowledge of university research—recently completed, in progress, and proposed—and, indeed, even within the university few people had this knowledge. It is recommended that faculties prepare annually a computer-based report, listing and summarizing all research activities for the year. This report could form part of a university's website. Further, it is recommended that the university's research report be freely circulated to all relevant persons and organizations inside and outside the country.

Strategy 13. Improve linkages to national agricultural research information systems

Strategies for improving information flows within a university, in support of research, should normally include an effective interface with the information systems of other research organizations in the country. Among several other benefits, this will help to ensure that a university's research output is relevant and useful. If there is an apex research organization, this entity can facilitate the sharing of relevant scientific information. If not, there is much that a university can do to ensure that it both contributes to, and benefits from, the information available within the other important agricultural re-

search organizations in the country. Most of the actions recommended below require the university to take the initiative to ensure that it remains an integral part of the national agricultural research system. This will not only improve university research performance, but will also enhance the output of the entire research system.

Action 13.1. Participate in national management information systems for agricultural research

NAROs and NARS apex organizations need an information strategy and systems to communicate research results. Universities often have the capacity to assist in the development of national research information strategies and information systems. More important, it is recommended that universities merge their agricultural research information system with those of NAROs, or at least ensure that is fully compatible and properly interfaced.

Action 13.2. Consolidate and publish sustainable national scientific journals

Many countries, particularly those that have small research systems, have few local outlets for publishing national research. Existing journals suffer from lack of funds and may not have been published for many years. It is recommended that all agricultural scientific journals be reviewed for the possibility of consolidation or reorganization into a smaller number of sustainable publications. Small countries are encouraged to produce only one agricultural journal with subsections for different disciplines. Basic, strategic, applied, and adaptive research results should all be published, using national or international peer review to assure quality.

Côte d'Ivoire: a joint journal to disseminate research results

The Association Ivoirienne des Sciences Agronomiques (AISA) has published a journal, *Agronomie Africaine*, since 1989. Responsibility for the journal is shared by the president of AISA, an editor-in-chief, the vice-president for scientific affairs, and a scientific committee with 11 members. Articles are on a broad range of topics and, while the majority of authors come from Côte d'Ivoire, almost 30% are from other African countries. AISA also publishes two bulletins aimed at information dissemination: AISA-Développement, which provides technical agricultural information, and AISA-Info, which provides information about members of AISA. (République de Côte d'Ivoire 1998a)

Benin: an agricultural research bulletin

The Bulletin de la Recherche Agronomique is a national journal initiated and managed by INRAB. The seven-member editorial committee, headed by a coordinator, is assisted by a reading committee, which includes both INRAB and UNB staff. The journal provides an outlet for dissemination of research results that is used by UNB and INRAB researchers. Direct publication costs are supported by INRAB. (République du Bénin 1995a)

Action 13.3. Contribute to national research and extension activities and publications

Another strategy to overcome the limited local opportunities for disseminating university agricultural research nationally is to use other existing publications and other media. Universities can be proactive in providing articles for NARO research publications by mutual agreement. Also, universities can make significant contributions to national

extension activities (such as field days, seminars, radio and TV broadcasts) and extension publications.

Program Planning and Management

Program planning and management processes, including setting priorities and the planning, monitoring, and evaluation (PM&E) of projects, strongly influence a research institutions' performance. Managers within an institution have considerable control over such processes, although priority setting is often a national exercise. Under this MORP heading, the University in NARS study has identified the following major constraints that limit university contributions to national agricultural research: (1) the lack of PM&E functions in research management at universities; and (2) differing PM&E procedures elsewhere in the NARS.

Strategy 14. Improve university agricultural research PM&E

As mentioned above, universities frequently do not provide any indication of their research priorities. Individual members of university staff have considerable latitude to determine their own research agenda. However, their choice of research agenda is often influenced by the availability of funds from outside sources, with the result that the a university's overall research program may be neither well focused nor closely linked to national research priorities and needs. If a university provides a budget for research, this already creates a strong incentive to prioritize research activities. More importantly, should a research planning system be put in place, there is an increased opportunity for university research to be coordinated with the research of NAROs and other research entities in the system. If there is an apex body, then its planning process can include the potential contribution of universities to national agricultural research.

A university PM&E system has additional benefits. Such a system ensures a link between national research priorities and the research actually carried out. It also ensures a greater involvement of staff in the decision making process. If technology users participate in the planning process, the likelihood of producing relevant and development-oriented research is enhanced. The research program of the university will be more coherent and focused, and duplication of effort within the broader system can be avoided. The quality of research will be improved via peer review of both research proposals and ongoing research and the PM&E process assures financial control and accountability. Further, a PM&E system makes it easier to provide information on ongoing and planned activities to external institutions (because such information has already been collated for the purposes of the internal PM&E process). Potential drawbacks include the fact that such a system may be administratively cumbersome and, therefore, lead to delays and involve heavy transaction costs. It may also discourage independent research.

The following actions may be taken to improve PM&E processes in university research.

Action 14.1. Formulate faculty-level research strategic plans and program priorities

University research is typically the sum of what individual researchers and their funding agents see as important. It is recommended that university faculties develop strategic plans for research, based on national needs and priorities, and on the resources available. Within these plans, it is recommended that universities develop priority program areas that are consistent with national priority needs. Participation by NAROs is

highly desirable, in order to get input on national priorities. This does not imply that universities should become NAROs, because both kinds of organization have their own distinct mandates, objectives, and comparative advantages.

Benin: planning strategically for university agricultural research

In 1996, the Faculté des Sciences Agronomiques (FSA) at UNB prepared a broad strategic development plan covering education, research, and extension services. The specific objective of the plan is to strengthen the FSA with respect to its ability to carry out its teaching, research, and extension functions. Programs and strategies are identified to promote FSA staff participation in development-oriented agricultural research, technology transfer, and linkages with technology users. The research component of this university plan was developed in close collaboration with INRAB and links strongly with the national agricultural research plan of INRAB. The plan also calls for implementation of crossrepresentation between FSA and INRAB with respect to participation in governance bodies. These provisions greatly enhance the prospects for FSA agricultural research being responsive to national research needs and priorities, as well as complementary to INRAB activities. (Université Nationale du Bénin 1996)

Action 14.2. Integrate student research into the national agenda

As mentioned earlier, student research output normally constitutes a significant proportion of overall university research output. It is recommended that university staff guide students towards undertaking projects that contribute directly to national priorities. In addition, there is considerable merit in having students work jointly with NARO scientists (see Action 9.3 above).

Action 14.3. Establish a PM&E process within the university or faculties

If there is a university and/or faculty research strategy that identifies priority programs, it will be necessary to set up a PM&E process to ensure that the research agenda is consistent with the plan and priorities. It is recommended that this process be conducted routinely at the faculty level and be managed by a person such as the faculty coordinator for agricultural research (see Action 3.3 above). The process would supplement the normal promotion review process and be focused on research projects rather than researchers.

Action 14.4. Conduct periodic department-level program reviews

Even with a PM&E process in place, periodic reviews (once every three to five years) of both teaching and research activities of each department of a faculty are recommended. These reviews focus on the major directions being taken by each department and usually result in significant shifts in program direction and scope to meet current and future needs. Program reviews are normally conducted by external experts, often from international institutions.

Strategy 15. Participate in national agricultural research program PM&E processes

Over recent years, most countries in SSA have defined their national agricultural research needs and priorities (Hambly-Odame and Setshwaelo 1997). As mentioned above, however, most universities in the region have not formally established their research priorities (either at the university level or at faculty and department levels). If university research priorities have been defined, these are only partly or rarely determined by national research priorities and needs. For example, the current research agenda at most of the universities participating in the University in NARS study was not substantially affected by nationally determined priorities and needs. Often, uni-

versity staff are not fully aware of these national priorities. One reason for this may be that a university has not been integrated into the process of determining national research priorities, although individual researchers may contribute as subject matter specialists. Some actions to help the university become more involved in national PM&E activities are as follows.

Action 15.1. Participate in national priority-setting activities

If a university is to increase its contributions to development-oriented research, it should participate in the process of setting the national priorities for research. This process is usually the domain of the ministry of agriculture, NARS apex body, or NARO. However, with its large pool of expertise, a university can make a major contribution to national planning. Based on its detailed, first-hand knowledge of national priorities, the university can then offer guidance to its staff on the most important areas for program and project development.

Action 15.2. Encourage crossparticipation of staff of NAROs, universities and other research institutions at their respective research program reviews

Research program reviews of all institutions generally benefit from the input of external stakeholders. As mentioned above, involving NARO staff in university research program reviews is recommended. It is also recommended that universities become involved in the program reviews of NAROs and other research institutions. NARO reviews are likely to take place annually and include reviews of current and completed research as well as planning for future research.

Uganda: benefits from joint planning and review

Since the creation of NARO-Ug in 1995, NARO-Ug and MU professional staff have been involved in the planning and review of the research organization's activities at program, institute, management committee, and board levels. The main objectives of this linkage mechanism at both program and institute levels are to plan, coordinate, monitor, and review progress of joint research activities, and to avoid duplication of effort between research institutions. At both management committee and board levels, the objectives are to explore and take advantage of the professional expertise that exists at the university, thus optimizing the use of available human and financial resources as well as implementing the research organization's policy on management linkages. This also enables the university to contribute towards research that responds to national priorities and objectives. This mechanism creates awareness of the research focus among participating institutions, generates research proposals based on national interests, improves efficiency in utilization of resources, and synchronizes activities at participating institutions. Measurable outputs include research reports, project reviews, fellowships, and postgraduate trainees. However, the major expected benefits are yet to be realized. (Republic of Uganda 1997a)

Action 15.3. Contribute to the development of common research program evaluation criteria for all national agricultural research activities

If the university adopts a PM&E system, then project and program evaluations become routine activities. Since the university is part of the national system, it is recommended that all units use a common set of criteria for research program and project evaluation. If such criteria are not in place, the university will normally have the necessary expertise to work with NARO staff to develop them.

Summary

Chapter 5 presents examples of, and ideas for, potential strategies and actions that a university may be able to implement in order to improve its contribution to national agricultural research. These strategies and actions are based primarily on the outputs of ISNAR's University in NARS study. Not all of them are relevant to all countries, because the national situation and the current constraints differ from country to country. Consequently, the strategies and actions do not constitute a model for university research and need to be applied judiciously. The ideas presented should be modified and adjusted to suit each situation individually. Just as agricultural research itself must remain flexible, these strategies and actions should also be flexible; they are not meant to be applied as rigid rules.

Concluding Remarks

The University in NARS study and other authoritative studies confirm that universities have significant resources and great potential to conduct development-oriented agricultural research. In particular, universities have highly skilled staff with a great deal of professional experience and qualifications in relevant disciplines and specializations. In fact, universities are often better endowed with human resources than other national research organizations and have comparative advantage in some research areas. Moreover, universities often have specific physical resources (such as infrastructure and equipment) which can be used for research.

There are no simple explanations for the relatively poor performance of universities in the area of development-oriented research and major constraints on performance are often closely interlinked. The constraints are themselves influenced by many other factors within the MORP categories that characterize an institution: (1) **m**andate, objectives, and policies; (2) **o**rganization, structure, and linkages; (3) **r**esources and information; and (4) **p**rogram planning and management. Consequently, there is no single strategy nor a set of actions that can be prescribed to address all constraints and improve the research performance of a university. It may be necessary to find additional financial resources to support research, but focusing all efforts in this area will not necessarily enhance performance. Improved funding will usually need to be complemented by changes in policy, structure, incentive systems, and management practices. It is important to emphasize that constraints differ from country to country, and from university to university, implying that specific strategies and actions must be tailored to each situation.

Several strategies and actions for improving the contribution that universities make to national development-oriented agricultural research are suggested in this publication. Some will be effective in eliminating existing constraints. However, universities and NAROs can be proactive in developing modes of collaboration that will strengthen them both, in their efforts to address national issues. For example, if a NARO is ready to set aside a modest amount of funding to support graduate-student research in priority areas, this will help to move the university towards conducting problem-solving research relevant to the country and to ensure properly focused training for the students who are likely to be tomorrow's researchers and research leaders.

Universities need sufficient incentive to engage in a review-and-change process to improve agricultural research and they must be aware of the potential benefits that result from such a process. These benefits are often not widely known or may be underestimated. The following are potential benefits from a successful review-and-change process:

- gaining political and financial support from local, national, and international sources for the university's research agenda and activities;
- improving the quality and quantity of teaching and research outputs by using existing resources more efficiently and effectively;

- eliminating duplication of research efforts among research institutions;
- gaining access to complementary areas of expertise, knowledge, skills, and technologies through collaboration;
- attracting nontraditional sources of national and international funding;
- improving the relevance of research and teaching activities to users;
- attracting postgraduate students and highly qualified applicants to fill positions.

Engaging in a review-and-change process to improve the contribution of a country's university or universities to national agricultural research involves decisions by key administrators on mandate and policy, organization, resource allocation, and program management. There are many potential actors involved and many possible ways of addressing the issues. The following are some key recommendations for a review committee with responsibility for the process:

- select a competent and respected senior-level review team;
- maintain strong relationships with top policymakers, particularly those at the ministerial level;
- encourage agricultural research leaders to communicate to their staff the importance of the review process;
- minimize the time that institutions and staff need to devote to providing information;
- foster a sense of ownership of the process by staff;
- bring stakeholders into the process at strategic points to provide input and feedback;
- focus on actions that are clearly defined and have reasonable prospects of being adopted;
- define, and comply with, a realistic time frame for the process.

Most of the strategies and corresponding actions presented in this study guide address major constraints. While the potential benefits of each of the actions are highlighted, it is important to note that there are costs involved in implementing them as well. Therefore, there must be a **strong commitment** from all parties to contribute to the institutional changes required and, particularly, a commitment to allocate adequate resources to support the implementation of many of these actions. Without sufficient resources, proposed changes will not be fully implemented or will not be sustainable. Furthermore, high expectations on the part of participants and stakeholders will not be realized.

The process of change is always difficult for institutions and staff. From ISNAR's University in NARS study, it is obvious that there has to be a **broad consensus** among staff and other stakeholders about the need to strengthen the contribution of universities to national development-oriented research. University managements must be willing and able to amend, supplement, or broaden the university's mandate, organization, resources, and planning procedures. The ownership of the process by staff is essential as well as the involvement of all stakeholders of the university.

Finally, it will take **time** and a **sustained effort** to increase the contribution of universities to national agricultural research. The description of the review-and-change pro-

cess presented in this study guide may convey the impression that changes can be made rapidly. However, in many cases, the fruits of strategies and actions initiated by the process will not be harvested for many years to come. To sustain the effort, it is necessary to communicate widely the strategies and actions being undertaken and to evaluate periodically the progress being made towards the implementation of the action plan.

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Annex 1: Key Resource Persons of the University in NARS Study

The following were key resource persons during the first two phases of the ISNAR study (1994–98):

Steering-Committee Chairpersons

Prof. O.A. Chivinge, Deputy Dean, Faculty of Agriculture, University of Zimbabwe, Zimbabwe

Prof. J.K. Mukiibi, Director General, NARO, Uganda

Dr. H.F. Nouwakpo, Professeur, Université Nationale du Bénin, Benin (1994–97)

Prof. L.B. Olugbemi, Director General, IAR Chair person, Nigeria (1994–97)

Dr. M.C. Ouikoun, Ministère du Développement Rural, Benin (1997–98)

Dr. M.P. Sedogo, Directeur Général, CNRST, Burkina Faso

Dr. K. Traoré, Directeur de la Recherche Scientifique, MESRIT, Côte d'Ivoire

Prof. J. Voh, Director General, IAR, Nigeria (1997–98)

National Consultants

Prof. C. Adandedjan, Doyen, Faculté de Sciences Agronomiques, Université Nationale du Bénin, Benin

Dr. J. Detongnon, Chef du Station, INRAB, Benin

Prof. A.M. Emechebe, Senior Researcher, IAR, Nigeria

Dr. Z.I. Kaboré, Directeur de Recherche, Institut de Recherche en Sciences Sociales, Burkina Faso

Prof. G.H. Kiwuwa, Professor, Faculty of Agriculture and Forestry, Makerere University, Uganda

Dr. I.K. Mariga, Professor, Faculty of Agriculture, University of Zimbabwe, Zimbabwe

Dr. M. Nabasirye, Research Officer, Kawanda Agricultural Research Institute, Uganda

Prof. O.A. Osinowo, Dean, University of Agriculture Abeokuta, Nigeria

Dr. B. Ossen, Maître de Recherche, Institut des Forêts, Côte d'Ivoire

Prof. S.J. Silué, Université Abidjan-Cocody, Côte d'Ivoire

Dr. U. Ushewokunze-Obatolu, Deputy Director, DVS, Zimbabwe

Prof. J.-D. Zongo, Professeur, Faculté des Sciences et Techniques, Université de Ouagadougou, Burkina Faso

University of Hohenheim Collaborators

Prof. F. Heidhues, Professor, Institute of Agricultural Economics and Social Sciences in the Tropics, University of Hohenheim, Germany

Prof. M. von Oppen, Professor, Institute of Agricultural Economics and Social Sciences in the Tropics, University of Hohenheim, Germany

International Consultants

Prof. D. Shapiro, Professor, Department of Economics, Pennsylvania State University, USA

Dr. H. Carsalade, Director, Sustainable Development Department, FAO, Italy (1994–95)

Prof. P. von Blanckenburg, Professor, Technical University, Berlin, Germany (1994–95)

Prof. L. Wilson, Dean, Faculty of Agriculture, University of the West Indies, Trinidad and Tobago (1994–95)

ISNAR Steering Committee

Dr. N. Bosso, Senior Officer (1996–98)

Dr. R. Contant, Senior Officer (1994–95)

Dr. H. Elliott, Deputy Director General (Chair person 1994–96)

Dr. C. Hoste, Senior Officer (Chair person 1996–98)

Dr. F. Idachaba, Senior Research Fellow

Dr. P. Perrault, Program Director (1994–95)

ISNAR Project Team

Mrs. D. Dunn, Project Secretary

Mr. F. Hartwich, Research Assistant

Dr. C. Hoste, Senior Officer (Project Manager 1994–95)

Dr. H. Michelsen, Research Associate (Project Manager from 1996)

Dr. L. Zuidema, Senior Research Fellow (1996–98)

Annex 2: Literature Review

The University in NARS study has established a computerized database that maintains a set of literature references related to the project's field of interest—that is, agricultural research in the context of higher education. The database currently contains about 600 references. However, it is continuously updated and new literature references added. These references have been derived from various sources, including the following:

- ISNAR library database: A specialized database that has a very comprehensive collection of documents on national agricultural research.
- AGRALIN: The database of the University of Wageningen, covering general agricultural science, including agricultural science in the tropics.
- CAB ABSTRACTS: A commercial database, covering worldwide issues in agriculture, forestry, and allied disciplines. Included are journals, conference proceedings and papers, books, reports, patents, and theses. It is produced by CAB International, UK.
- AGRIS: A multilingual bibliographic database covering documents on technical, economic and sociological aspects of agriculture from around the world. The data on references is compiled by national units (mostly as solicited with the Ministry of Agriculture of respective countries). It is produced by the CARIS office, FAO, Rome.
- The Konbib database: The Royal Library of the Netherlands provides a central catalogue that includes all university libraries in the Netherlands, covering almost every scientific field.
- DSE: The database of the German Foundation for International Development specializes in national and international literature on development. Many documents covering specific projects and practical experiences are available, many of them from developing countries. The agricultural sector and education are well documented.

Lines of communication have been established with various institutions, such as the World Bank, USAID, UNESCO, CIRAD, and Universities in developed countries, in order to obtain references not included in the above databases (for instance, specific project documents).

The documents in ISNAR's University in NARS study database include books, chapters in books, journal articles, notes, working papers, discussion papers, policy papers, book reviews, technical bulletins, articles published in conference proceedings, papers presented at conferences, occasional papers, concept paper, and text books. All documents in the database are available at ISNAR.

Structure of the literature database

The review includes literature that covers (1) theoretical aspects of agricultural research in higher education institutions and methodological aspects related to improving the performance of agricultural research at these institutions and (2) the experiences of other institutions involved in strengthening the agricultural research performance of universities (projects and case studies).

(1) Literature on theoretical and methodological aspects has been grouped by topic, such as

- organization—from assessing organizational performance to aspects of organizational culture;
- management—especially human and financial resource management, monitoring, and evaluation;
- economics—including political economy, institutional economics, institution-building, and economic impact assessment;
- systems approach—in particular agricultural knowledge and information systems, and the structuring of agricultural research in a systems context;
- sociology—especially behavioral science in relation to higher education and research.

(2) Literature on experiences has been grouped according to the respective organizations engaged in the experiences:

- ISNAR—particularly the University in NARS project, as well as documents covering other relevant ISNAR activities. A large number of ISNAR documents also cover theoretical aspects;
- FAO—particularly the FAO project “Promoting the role of universities in NARS in selected Near East countries.” Other FAO Case Studies are also available;
- World Bank—particularly documents on institution-building in higher education and agricultural research organizations;
- USAID—particularly case studies and reports on different USAID activities at agricultural universities in developing countries.

The literature of other organizations, not engaged particularly in case studies and projects but generally involved in promoting the role of universities in NARS, is also included. These organizations include:

- regional organizations coordinating agricultural research in Africa—ASARECA, CORAF, SACCAR;
- regional organizations concerned with higher education—the Association of Faculties of Agriculture in Africa (AFAA) and its umbrella organization, the AAU;
- UNESCO, particularly the Project “Priority: Africa – Development of higher education in Africa” and the organization’s Higher Education Division;
- OECD, which provides the theoretical background literature on the organization of research at institutions of higher learning and a general framework for the assessment of university performance.

The literature database as a basis for reviews

Literature from the database has contributed to the development of the project's methodological framework and its approach to field work. It also provides the background for more specific literature reviews. The following reviews have been undertaken to draw lessons from existing experiences in the field:

- review of agricultural higher education in three different developed countries, namely France (Carsalade 1995), Germany (Heidhues 1995), and the United Kingdom (Wilson 1995);
- review of the FAO and ISNAR approaches, leading to a comparison and a critical assessment of the two approaches (von Blanckenburg 1995);
- review of existing performance indicators for agricultural research at universities (Hartwich 1996);
- review of the findings of the FAO expert consultation on promoting the role of Universities in NARS and of the approach and country studies of the FAO project "Promoting the role of universities in NARS in selected Near East countries" (Hartwich and Michelsen 1997);
- review of an evaluation process for agricultural universities promoted by USAID. The approach has been developed by USAID in cooperation with the University of Hawkesbury, Australia (Hartwich 1997a);
- review of the World Bank's support to agricultural research at institutions of higher education in sub-Saharan Africa (Hartwich 1997b);
- review of UNESCO's special program Priority: Africa (Hartwich 1997c).

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Universities in sub-Saharan Africa have been widely criticized for being too academic and remote from the practical needs of the societies that they are supposed to serve. Yet these universities often include among their faculty a great proportion of their country's most highly trained researchers, and some of the best research facilities. How can these resources best be mobilized to contribute to national development objectives? The question is especially acute in the agricultural sector, where national agricultural research organizations, which have previously supplied the innovations on which sustainable development depends, have been severely weakened by cuts in public-sector spending.

This study guide, in ISNAR's Research Management Guidelines series, provides a wealth of practical help for policymakers and agricultural research leaders who have recognized the need for reform but who may be wondering how best to proceed. This publication synthesizes the experience of six countries whose agricultural leaders undertook a far-reaching review-and-change process, in collaboration with experts from ISNAR and the University of Hohenheim. The participating universities began by identifying the factors limiting their ability to contribute effectively to national agricultural research, and then designed and implemented action plans to remedy the situation, tailored to their specific national and institutional needs. Based on these case studies and a review of the experiences of other major development organizations, the authors provide a conceptual framework for reform that recognizes the dual research-and-

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