

Report of a Workshop

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IMPROVING AGRICULTURAL RESEARCH ORGANIZATION AND MANAGEMENT: IMPLICATIONS FOR THE FUTURE



International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the 13 centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on organization, planning, manpower development, staff requirements, financial and infrastructure requirements, and related matters, thus complementing the activities of other assistance agencies. ISNAR also has active training and communications programs that cooperate with national agricultural research programs in developing countries.

ISNAR also plays an active role in assisting these national programs to establish links with both the international agricultural research centers and donors.

ISNAR is supported by a number of the members of CGIAR, an informal group of approximately 30 donors; it includes countries, development banks, international organizations, and foundations. In 1986, funding for ISNAR's core program was provided by:

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European Economic Community
Federal Republic of Germany
Ford Foundation
France
Ireland
Italy
Netherlands
Philippines
Spain
Sweden
Switzerland
United Kingdom
United States Agency for International Development
World Bank

Citation:

International Service for National Agricultural Research. Improving Agricultural Research Organization and Management: Implications for the Future. 1986. The Hague, Netherlands.

Report of a Workshop

03691113 21
1987-31089
11-10-1987

**IMPROVING AGRICULTURAL RESEARCH
ORGANIZATION AND MANAGEMENT:
IMPLICATIONS FOR THE FUTURE**

8 to 12 September 1986
The Hague, The Netherlands

ISNAR

International Service for National Agricultural Research

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Schedule of Workshop

IMPROVING AGRICULTURAL RESEARCH ORGANIZATION AND MANAGEMENT: IMPLICATIONS FOR THE FUTURE

ISNAR

September 8 – 12, 1986

Monday, 5 September

Theme:	STRENGTHENING NARS – AN EMERGING ISNAR STRATEGY	
Chairman:		H.K. Jain
Rapporteur:		P. Sivan
Co-Rapporteur:		A. Fletcher
08:45 – 09:30	Welcome and Introduction to ISNAR	A. von der Osten
09:30 – 10:15	The ISNAR Research Program	H.J.C. Elliott
10:15 – 10:45	Coffee Break	
10:45 – 11:00	Training for Research Managers	D.M. Wood
11:00 – 12:15	Considerations for Strengthening NARS	T.A. Taylor
12:15 – 1:00	Lunch at ISNAR	
1:00 – 15:15	A Data Base for NARS	P. Pardey
15:15 – 15:45	Coffee Break	
15:45 – 16:00	ISNAR Slide Show	

Tuesday, 9 September

Theme:	ORGANIZATION AND STRUCTURE	
Chairman:		G. Hariri
Rapporteur:		S. Parasram
Co-Rapporteur:		B.T. Mook
08:45 – 10:15	Structure and Organization in NARS	H.K. Jain
10:15 – 10:45	Coffee Break	
10:45 – 12:15	Efficiency and Effectiveness: A Managerial Perspective	S.H. Hobbs
12:15 – 1:00	Lunch	
1:00 – 15:15	Organization and Structure in: Kenya The Gambia Sri Lanka Togo	W.W. Wapakala M. Sompo-Ceesay S. Gunawardena T. Aithnard & Nguyen-Vu
15:15 – 15:45	Coffee Break	
15:45 – 17:00	Discussion on Organization and Structure Discussion Initiators	D. Gapasin E. Madrid M. Touré
19:30	Dinner Atlantic Hotel	

Wednesday, 10 September

Theme:	PLANNING AND PROGRAMMING: INFORMATION SYSTEMS AND PROCESSES	
Chairman:		G. Rocheteau
Rapporteur:		T. Aithnard
Co-Rapporteur:		C.B. Johnson
08:45 – 10:15	Management Information Systems for Planning and Programming in NARS	R. King
10:15 – 10:45	Coffee Break	
10:45 – 12:15	Computerized Program Budgeting System	R. Devred
12:15 – 14:00	Lunch	
14:00 – 15:15	Planning and Programming in: Morocco Madagascar Indonesia	H. Faraj C.P. Ravohitrarivo S. Karana
15:15 – 15:45	Coffee Break	
15:45 – 17:00	Discussion on Planning and Programming Discussion Initiators	C. Serghiou C. Moran M. Coulibaly
17:00 – 17:45	Evaluation of Agricultural Research	M. Dagg

Thursday, 11 September

Theme:	HUMAN RESOURCE DEVELOPMENT AND MANAGEMENT	
Chairman:		C. Valverde
Rapporteur:		A. Vasquez
Co-Rapporteur:		D.M. Wood
08:45 – 10:15	Key Issues in Human Resource Planning and Management	B.T. Mook & P. Bennell
10:15 – 10:45	Coffee Break	
10:45 – 12:15	Human Resource Development in: Thailand Zimbabwe	Tanongchit W. P. Chigaru
12:15 – 12:45	Coffee Break	
12:45 – 13:30	Discussion on Human Resource Development Discussion Initiators	C. Lopez S. E. Tebong O. Leiva

Friday, 12 September

Theme:	SUMMARY AND CONCLUSIONS OF WORKSHOP	
Chairman:		R. Contant
Rapporteur:		D. McLean
08:45 - 10:15	Report by Rapporteurs and Group Discussion: Recommendations for Future ISNAR-NARS Collaboration	
10:15 - 10:45	Coffee Break	
10:45 - 12:15	Continuation of Rapporteurs Reports and Discussion	
12:15 - 12:30	Concluding Remarks	A. von der Osten
13:00 - 19:30	Bus tour to Delta Expo	

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WELCOME ADDRESS

A. von der Osten

A cordial welcome to ISNAR. I am delighted to greet you this morning and to open our workshop on “Improving Agricultural Research Organizations and Management: Implications for the Future”.

My colleagues and I have high expectations regarding the outcome of this event. We count on you, on your participation, on your discussion and on your guidance for the future evaluation of our program. We consider this to be your meeting.

Let me remind us briefly of the purpose of this workshop:

1. to share your experiences on management issues with your colleagues from other regions and countries. We shall listen;
2. to review with us ISNAR joint progress (or the lack thereof) on common issues and projects. We hope for a critical assessment;

3. to identify priority areas for future collaboration;

4. to identify topics in which additional research is needed. This could lead us to an agenda for future work.

I need not comment on the agenda. The three main topics on our schedule for this week represent issues common to all of us. They are important to any system.

The program for our workshop – in particular the timetable – is meant to be indicative. It should serve as a framework, allowing flexibility, rather than a straightjacket. Let us adjust the length of individual sessions in accordance with needs for discussion.

Let me end this brief welcome by thanking you for having come to ISNAR to work with us during this week. We know how busy your schedule is, and we appreciate the time you dedicate to this event. I look forward to lively discussions and to a productive meeting.



IMPROVING AGRICULTURAL RESEARCH ORGANIZATION AND MANAGEMENT: IMPLICATIONS FOR THE FUTURE

A. von der Osten

RECENT DEVELOPMENTS AT ISNAR

The key event during the last year clearly was ISNAR's first external review. It constitutes a milestone in the young history of ISNAR. The particular significance of this event is due to the "sunset-clause" which ISNAR had in its constitution. This clause called for a review after a five-year trial period and a decision by the CGIAR on the continuation of ISNAR after that period.

The review was thorough. The outcome was a certificate of good health. In May this year, the CGIAR formally accepted the review reports. It decided to continue ISNAR and to accept it as a full-fledged member of the CGIAR system.

For us at ISNAR, this decision has important implications. It defines the setting in which we shall work, it defines ISNAR's place in the global context, and it determines the need to plan for the next phase in ISNAR's life.

We consider that the decision to endorse ISNAR reflects two important trends.

It reflects a growing recognition in the donor community that strong national research capacities are the key to success in the global battle against poverty and hunger. Only with strong capacities at the national level will research efforts elsewhere be successful. And it reflects the conviction that a specific institution-building effort, directed at the strengthening of national agricultural research systems (NARS), is needed in the CGIAR.

THE ISNAR STRATEGY

A comment about strategic planning. The need to plan is obvious. Our planning effort was greatly stimulated and assisted by the review. ISNAR was fortunate in having

an outstanding panel with lots of vision. It provided excellent advice and guidance.

In presenting the ISNAR strategy, I shall focus on three broad areas:

- the profile of the institution;
- the ISNAR program;
- ISNAR's management structure.

THE PROFILE OF ISNAR AS AN INSTITUTION OF THE CGIAR

We have defined the goal of ISNAR as follows:

"to assist developing countries to improve the effectiveness and efficiency of their agricultural research systems through enhanced capacity in the areas of research policy, organization, and management".

We have described the institution with the help of seven salient institutional characteristics:

1. *Clarity of focus.* We concentrate our effort on three clearly defined areas: research policy, organization, and management.
2. *Multidimensional approach.* Our approach in dealing with these three areas integrates knowledge and expertise from three different fields: the organizational and management sciences, agricultural research, and developing countries.
3. *Research-based service.* ISNAR is essentially a service organization dedicated to institution building. We made it a research-based service. Our research effort supports and backstops our advisory service and our training program. It represents a systematic effort at expanding the knowledge base and at developing the appropriate management concepts and tools that NARS require.

4. *System perspective.* ISNAR is dedicated to the concept of system building. It employs a holistic approach in working to strengthen NARS.
5. *Independence.* Its status as an independent center, supported by the CGLAR, allows ISNAR to offer unbiased, objective advice. We see ourselves as a partner of NARS and try to stay clear of undue external influences.
6. *Worldwide mandate.* ISNAR has a global mandate, and it operates under the principle of universality of access. Its services are potentially available to any developing country requesting collaboration (subject to resource availability and to priority considerations).
7. *Service to developing countries.* ISNAR's services are limited to developing countries.

GUIDING PRINCIPLES

In its collaboration with NARS, ISNAR is guided by six operating principles. They define our approach to responding to requests for collaboration and to working with countries.

1. *Partnership with NARS.* ISNAR sees itself as a partner of NARS. It supports developing countries in their system-building efforts. National commitment is essential. NARS must initiate the collaborative process. All planning is done jointly, on a partnership basis.
2. *Flexible response to NARS's needs.* Needs and demands of NARS differ widely - in accordance with their levels of institutional development. In response to these needs, ISNAR must offer a wide range of products and services. These vary from full (long-term) assistance in the case of less-developed systems, to the provision of pointed advice (and training) on specific subjects in the case of more advanced systems.

Similarly, flexibility in response is needed over time. System building is a long-term process. In our collaboration with any given country, periods of intensive interaction will vary.

3. *Regional balance.* It is essential for ISNAR to work in all four of the world's developing regions. This is not only an implication of its mandate, but also an important efficiency consideration. If ISNAR is to perform its functions effectively and offer relevant advice, it must build up its knowledge base on research policy,

organization, and management issues across all regions. It must analyze and synthesize the wide range of experiences of NARS in order to distill knowledge and concepts for transfer across regions and countries.

4. *Priority-driven response.* ISNAR's approach is priority driven, not demand driven. We use a set of priority indicators to ensure that scarce resources are used for maximum benefit and impact in a way that reflects the needs of NARS. These priorities are discussed in forums such as this meeting.
5. *Advisory role.* ISNAR's key function is that of an adviser to NARS. It will not assume direct management responsibility in their functions, or provide long-term technical assistance as a substitute for weak systems. It will assist countries, on a long term basis, in their efforts to strengthen the organizational and management capacity of their research systems.

6. *Catalytic role.* To extend its collaboration beyond the limited number of countries it can work with directly, ISNAR attempts to play the role of a catalyst. It helps NARS to establish a number of important linkages:

- horizontal, i.e., with other NARS;
- upstream, i.e., linking NARS and specialized institutions in relevant fields of competence;
- with donors and development agencies.

In brief, we act as a bridge builder, or facilitator of contacts. Finally, we encourage research by specialized management institutions on specific issues in research policy, organization, and management.

THREE FUNCTIONAL APPROACHES – THREE PROGRAMS

The ISNAR goal is complex. In operational terms, we have broken it down into three specific program objectives:

- improved management concepts and tools (for use by NARS);
- more efficient national research systems;
- more effective managers.

Our three programs – Research, Advisory Service to NARS, and Training – are targeted at these objectives.

Our research program is aimed at generating improved concepts and tools for research management in

developing countries. It develops the knowledge base for ISNAR's overall program and hence supports the other two functions.

Our advisory service to NARS, which represents the central thrust, is aimed at making research systems more efficient and effective. It does that through a concentrated effort to build up the system's capacities in the areas of research policy, organization, and management. It provides a broad range of functions in assisting NARS in their system building efforts.

Our training program is aimed at making NARS leaders and scientists more effective managers. It assists them to develop their management capacities. It complements the other two programs and acts as a multiplier of our efforts.

All three programs contribute to the goal. They are targeted at three essential requirements for reaching that goal: better tools, better systems, and better managers to run these systems.

The three make up a unified program to strengthen NARS, in which all ISNAR staff will participate to some extent in each of the functions. Interaction among the three program components is essential. They are interdependent.

A brief comment now on the principal activities of each of these three programs.

Our research program concentrates on the following:

- developing a knowledge base on NARS;
- identifying common constraints among NARS, and opportunities for system improvements with high-impact potential across countries and regions;
- developing or adapting analytic methods;
- generating improved management concepts and tools that fit the specific requirements of NARS in developing countries;
- keeping abreast of developments in related fields. This implies maintaining contact with specialized institutions in the field of organization and management.

Under our advisory service to NARS, we collaborate with national systems in:

- diagnosing key system constraints. The main tool for this is the system review that diagnoses constraints and identifies opportunities for system improvements. Such comprehensive system reviews generally constitute the first step in our collaboration with NARS;
- designing system-building strategies;

- improving specific system components or processes;
- testing, adapting, and applying improved concepts and tools to the specific circumstances of NARS;
- monitoring and evaluating specific system-building projects;
- developing effective linkages. These linkages concern the systems' clients, policy makers, sources of expertise and knowledge as well as sources of external funding.

Key activities of our training program are:

- training NARS professionals in the areas of research policy, organization, and management. The program addresses three groups of people: policy makers, senior research managers and middle-level management;
- developing methodologies for training different groups;
- developing training materials tailored to the needs of NARS;
- promoting the build-up of training capacities of NARS and regional organizations. Here, one of the ideas involved is training the trainers, to create capacity locally.

PROGRAM CONTENT – THREE AREAS OF CONCENTRATION

This brings me to the substance or content of our program: our three areas of concentration. Our program focusses on three critical factors that determine the productivity of any research system:

- research policy, i.e., the policy context in which research is conducted;
- the structure and organization of the research system;
- a set of essential management processes.

All three factors are important. They are interdependent; and they can constitute important constraints to the success of any system. In addition, they reflect the three basic approaches to studying agricultural research systems: political, structural, and functional.

Our strategy for program development is guided by three considerations:

- an assessment of present and projected demand by NARS for ISNAR services;
- an assessment of key functional and structural weaknesses in NARS;
- an assessment of the potential contribution a small institution like ISNAR can make to overcome these weaknesses.

This strategy reflects three trends that are interrelated.

The first is a move towards specificity in NARS demand and our response. In ISNAR's early days, the emphasis was on broad-based system reviews – on constraint analysis. This was logical and necessary, considering how little was known about research management in developing countries. This emphasis is shifting now towards more focussed system-building activities. The focus is on specific problems or management components that require strengthening. This shift reflects the gradual build-up of a knowledge base and the demand from clients for more specialized advice and assistance.

The second trend concerns a move towards closer integration of our three programs. Their concentration on specific issues will lead to greater depth in ISNAR's work and will thus provide the basis for ISNAR to develop gradually into a specialized institution on research management. Quality and relevance of its products – its service – will be enhanced in the process.

The third trend reflects increased emphasis on research and training. Both will ensure an appropriate multiplier effect in ISNAR's work with NARS. Particularly relevant is the build-up of a reasonable research capacity for the reasons mentioned.

MANAGEMENT THEMES

Within each area we have identified 11 management themes. Around each of these themes we have established an internal working group that is charged with the development of our knowledge base on that theme.

A few comments now on each of the three areas of concentration and the eleven themes.

1. Policy – the policy context of agricultural research

Research policy provides the context in which the research system functions and performs its tasks. It determines what is important, it sets priorities, it determines the flow of resources to the research system, and it guides the allocation of scarce resources to specific objectives. It relates national development objectives to scientific research priorities.

In many systems we find that weaknesses in research policy formulation constitute an important constraint that seriously limits the effectiveness of those systems. Problems tend to occur at two levels:

(i) *Interaction between national development policy and agricultural research*

At the national policy level we frequently find a serious lack of consistency between the stated objectives of agricultural research and supporting policies and resource commitment.

Our efforts in this area are directed at improving our understanding of this interaction between agricultural research and national policy formulation. How can the agricultural research system contribute more effectively to policy formulation at the national level?

(ii) *Formulation of agricultural research policy: priority setting and resource allocation*

At the level of agricultural research policy, problems occur with regard to priority setting and resource allocation. Research priorities often are not in line with the countries' real needs, and resources often are not allocated to the priority areas. What is lacking are appropriate mechanisms and procedures that will ensure the necessary rigor in these two processes.

Our effort is therefore directed at working with NARS to develop the appropriate concepts, tools, and procedures that will lead to more rational priority setting and allocation of resources.

2. Organization – structure and organization of research systems

The organizational structure of a research system provides the institutional framework that links research with its social, political, and economic environment. It defines the system's governance, its autonomy of decision making, the degree of centralization, and other factors that make it function. In brief, it provides:

- the setting in which the system designs its research plans, formulates its programs, develops its budgets, executes its activities and evaluates its results;
- the setting in which the system mobilizes, manages, and utilizes its resources in pursuit of its objectives;
- the setting in which the system develops, maintains, and utilizes its external linkages with both its clients and the global knowledge system.

Within the area of organization we have identified three themes. They concern the structure and two types of linkages.

(i) *Structure and organization of NARS*

I need not stress the important effects of the organizational structure on the performance of research systems. It tends to influence the system's effectiveness and efficiency in generating appropriate technologies. Our experience has shown that this tends to be an issue in most systems. We know that, as conditions change, research systems need to adapt their structure and organization. We also know that there is no such thing as the optimum model. The validity and relevance of organizational models clearly is a function of the circumstances in which they work.

Our effort is directed at developing a better understanding of the interactions between structure and the functions of the research process. We expect to assist countries in identifying and adapting those institutional arrangements that best fit their needs and circumstances.

(ii) *Linkages between NARS, the transfer system, and users*

We know that effective linkages with users and the technology transfer system are critical for the effective functioning of any research system. Yet, this is a common area of weakness that requires attention.

(iii) *Linkages between NARS and external sources of knowledge*

Clearly, national agricultural research is not an isolated effort. It is an integral part of the global research system. The development, upkeep, and effective utilization of linkages with that global knowledge is an important concern for any NARS.

3. Management – the Management of Agricultural Research

Here we deal with a set of six essential management processes. They determine the actual functioning and performance of the system. Together, they determine the system's ability:

- to conceive, plan, develop, and execute relevant programs;
- to mobilize, manage, and utilize the appropriate resources;

The first two – program formulation /program budgeting and monitoring and evaluation – relate to the management of the research process. They determine the

system's capacity to plan, program, execute, and evaluate its research program in accordance with the country's needs. The objective is to ensure that programs are relevant (in terms of the system's goals) – effective (in terms of scientific quality and impact), and efficient (in terms of resource use).

The second four relate to the acquisition and management of the system's resources:

- first and foremost its human resource base – its scientific manpower;
- second, its physical resources – research stations, laboratories, equipment, etc.;
- third, its financial resources – the funding of research;
- fourth, the flow of information that is an essential input into the process.

These four determine the system's capacity to mobilize, manage, and utilize effectively and cost-efficiently those resources that are essential for the conduct of its program.

PRIORITIES FOR PROGRAM DEVELOPMENT

Obviously, we cannot pretend to develop expertise simultaneously in all eleven thematic areas. With the help of a set of criteria, we selected an initial set of priorities and decided to move ahead on five of them:

1. formulating research policy, in particular priority setting and resource allocation;
2. structure and organization of NARS;
3. program formulation and program budgeting;
4. monitoring and evaluation as a tool for management;
5. development and management of human resources.

In these five priority themes we shall:

- develop in-house expertise required for specialized advice and training;
- develop or adopt management concepts or tools for use by NARS;
- generate training materials;
- contribute to advancing the state of knowledge.

In the remaining six themes we shall maintain a minimum capacity, which allows us to diagnose problems in the area and recommend solutions, or means for developing solutions. In practical terms this entails:

- synthesizing the state of knowledge on the subject;
- synthesizing our own experience in working with NARS;
- maintaining contacts with relevant sources of knowledge on the subject, to keep abreast of developments.

ISNAR'S MANAGEMENT STRUCTURE

Once our program was defined, we looked at the organizational and management implications. We concluded that for an organization of the size, program structure, and staffing composition of ISNAR, a flat, non-hierarchical structure is the most appropriate.

We have no divisions, departments, or other organizational units. Our programs represent thrusts of specific activities – not organizational units.

All of our senior program staff are combined in a single resource pool. They contribute to all three programs. Specialization will be developed on the basis of our management themes. The working groups I mentioned are the primary vehicle for this.

The key advantages of this flat structure are that:

- it favours interaction among staff and collegiality;
- it facilitates the integration of knowledge and experience among people from different disciplines and professional backgrounds;
- it facilitates the mobility of staff between programs;

- it favours decentralization in operational decision-making and project management;
- it avoids polarization and fragmentation.

Program management and coordination is the responsibility of two deputy directors general, who serve as program directors: one for collaboration with national systems – our advisory service (Dr. H.K. Jain) – the other for research and training (Dr. H. Elliott).

The management of our activities – under the three programs – is highly decentralized. It is the responsibility of senior program staff. To facilitate effective program management and coordination, we have decided to adopt the project approach along with other management tool.

CONCLUDING REMARKS

I have tried to tell you:

- how ISNAR and its program have evolved during the last year;
- how we see ISNAR developing further – guided by its strategy;
- what we think our program priorities should be.

We look forward to your reaction. Your comments will help to improve both our program and our strategy statement. As I said before, one of the key purposes of this meeting is to assess the relevance of our program.

THE ISNAR RESEARCH PROGRAM

H. J. C. Elliott

The ISNAR strategy is an outline for the development of a research-based service in which all staff members contribute to the research function. Since the strategy for the research program itself is discussed in depth in that paper, this presentation will deal with the evolution of the research program to date and the basis it has laid for future development.

The specific objective of the research program is:

to develop improved concepts, tools, and analytical methodologies in the areas of research policy, organization, and management appropriate for developing country situations.

Research is fundamental to ISNAR's capacity to provide an effective service to NARS in assisting them to better plan, organize, and manage their activities. It is needed to develop methodologies for analyzing systems in order to determine key constraints and opportunities for improvement. It is needed to generate and adapt concepts and tools in the areas of agricultural research policy, organization, and management appropriate for developing-country situations. And, it is needed as a critical input for the development of training materials used to extend improved management techniques and concepts to ISNAR's clients.

Research is also essential to ISNAR's development as a recognized authority in agricultural research policy, organization, and management in developing countries. It seeks to advance the state of knowledge in this relatively young field and to develop a conceptual framework on which to base advice and assistance to NARS in their system-building efforts.

As discussed in the strategy paper, the primary activities and responsibilities of the research program are:

- * development of a knowledge base on NARS;
- * identification of common constraints or problems shared by NARS as well as opportunities for high impact in strengthening NARS;
- * development or adaptation of analytic methods;
- * generation of improved management concepts and tools for NARS;
- * maintenance of up-to-date information on developments in related fields.

The development of an enhanced research capacity is central to the successful implementation of ISNAR's program strategy. The critical issue underlying the need to strengthen ISNAR's research program is the limited knowledge about agricultural research policy, organization, and management in developing countries. Only a few concepts and management tools can be said to be fully developed and ready for direct application in NARS. Much more research is needed both to improve our understanding of the nature and functioning of research systems in developing countries and to develop and adapt appropriate concepts and tools which can be applied in NARS to increase their effectiveness and efficiency.

Most knowledge of agricultural research management comes from the experiences of research systems in developed countries. Although these experiences may offer some insights for institution-building strategies for NARS, direct extrapolation is impossible and may be dangerous. The policy environment, institutional conditions, and resource situations of these research systems were and are qualitatively different from those characterizing NARS in developing countries.

Many of the basic principles underlying existing organizational models and managerial concepts and tools can contribute to system-building efforts in developing countries. But they will need to be adapted to these countries' particular problems and resource constraints. ISNAR, with its close collaborative relations with NARS, clearly has a comparative advantage in undertaking this adaptive research. Its role in this capacity will continue to be strengthened in the future.

To achieve maximum benefit from the fortification of research at ISNAR, four important principles will be followed:

- * greater integration of research with other programs;
- * increased collaboration of client countries in the design and execution of research projects;
- * strengthened catalytic role to stimulate relevant research in specialized institutions;
- * expanded capacity as an information service on research policy, organization, and management in NARS.

The contribution and support of research to the other programs will be strengthened through closer integration of efforts. Research will develop the means to capitalize more fully on ISNAR's permanent contacts with a wide range of NARS. Greater efforts will be devoted to capturing and systematically analyzing information generated through the collaborative work with countries.

ISNAR will encourage client countries to actively collaborate in the design and implementation of research projects aimed at analyzing specific issues in research policy, organization, and management in NARS. ISNAR will assist NARS researchers by developing conceptual guidelines and methodologies and by backstopping their research, but scientists in the NARS will be responsible for carrying out the research. This approach is currently being used in a research project, involving nine countries, on the organizational and managerial implications of on-farm research.

The research program will strengthen its catalytic role to stimulate the interest of specialized institutions in the developed and developing world in carrying out basic research on selected topics in research policy, organization, and management that are of high significance to NARS. ISNAR, with extensive contacts

with both NARS and specialized institutions, can translate the needs of NARS into research agendas for specialized institutions and ensure that the results of such research become available to NARS.

ISNAR will develop its role as an information center and service on agricultural research management in developing countries. Efforts will continue to develop and maintain a data base on the allocation of resources to national agricultural research. This activity is important to both ISNAR and NARS. The systematic collection and analysis of this information enhances ISNAR's ability to provide comparative information on the evolving resource situations of NARS to national policy makers, international donors, and scientists working in the area of research policy. It also provides useful information on the past and present resource endowments of NARS for ISNAR's advisory service. At the same time, by collaborating in the data base project, NARS can draw on ISNAR expertise to develop permanent mechanisms for collecting and processing information on resource allocation. Because this kind of information is essential for effective planning and programming processes, this interaction represents a direct contribution to improving the management capacities of NARS leaders. The long-term objective is for the data base to become an independent information system with institutionalized mechanism for systematic updating from NARS.

ISNAR will also develop an agricultural research management information service. Its function will be to select, organize, and facilitate access to information on agricultural research policy, organization, and management in developing countries. Its primary objective will be to assist research policy-makers and administrators in the developing world in keeping abreast of the rapidly evolving information and knowledge in the field. The service would draw on ISNAR's resident expertise and experience in the policy, organization, and management fields to review and pre-select information entries relevant to important problems and issues confronting NARS. Selected abstracts would be disseminated to NARS, and ISNAR would facilitate interested clients' access to information. This is a crucial service for NARS leaders and scientists whose access to information is often limited by poor library facilities.

A key thrust of the research program in the near term will be the development of the conceptual foundation for the eleven management themes which will structure ISNAR's program development. As discussed in ISNAR's strategy paper, the eleven

themes reflect the basic elements of the research system-building process

The thematic approach is the foundation for ISNAR's development as a recognized authority in the field of agricultural research policy, organization, and management in developing countries. The themes provide the structure for implementing ISNAR's program strategy. Through work in selected themes ISNAR builds expertise and channels its effort to develop and refine analytical methodologies for studying NARS, as well as management concepts and tools for application in developing-country situations.

To develop ISNAR's capacities in each of these areas, working groups of three or more senior research officers have been formed. One staff member is designated convener of the group. The convener of each group assumes principal responsibility for the development of the topic. With the advice of the members of his working group, he defines the scope of the theme, works out the division of labor among members, and determines the relationship of the theme to those treated by other working groups. The fact that staff members generally have principal responsibility for one theme and participate as members of two or more groups facilitates the integration of the work of the different themes. Staff members have been initially assigned to working groups on the basis of their special knowledge of the area and of the relevance of such a theme to their work.

ISNAR cannot pretend to develop expertise simultaneously in all eleven thematic areas. It has therefore adopted an incremental approach to building capacities in the identified themes. A basic capacity is maintained in all eleven, but resources are devoted to selectively developing expertise in certain themes on the basis of a set of priority criteria. As discussed in the strategy paper, these criteria relate to the importance of the problem for NARS that the research will address and ISNAR's ability to make a lasting contribution through its research. The priorities determine the intensity and immediacy with which the theme will be developed and the level of human and financial resources ISNAR allocates to work in the area.

The "basic coverage" of the individual themes involves maintaining a capacity within ISNAR to diagnose problems in the area and recommend solutions or the means for developing solutions. This entails:

- synthesizing the state of knowledge in the area and identifying key issues for further analysis;
- synthesizing ISNAR's experience in working with NARS;
- identifying and maintaining contacts with external sources of knowledge to keep abreast of professional and academic developments;
- identifying materials that could be developed into training aids;
- developing proposals for in-depth ISNAR research on selected topics.

In the themes given high priority for intensive development ISNAR will:

- develop in-house expertise required for providing specialized advice and training in the topic;
- develop or adapt management concepts and tools, and analytic methodologies, appropriate for application in developing countries;
- generate training materials;
- contribute to advancing the state of knowledge within the thematic area.

Based on its priority criteria, ISNAR has selected five of the eleven themes for intensive developments in the near term:

- formulation of agricultural research policy; priority setting and resource allocation;
- structure and organization within NARS;
- program formulation and program budgeting;
- development and management of human resources;
- monitoring and evaluation as a tool for management.

The content of these research areas has been presented in detail in the strategy paper.

ISNAR RESEARCH PROGRAM, 1986

GOAL	OBJECTIVES	RATIONALE	APPROACH
<p>** A.01. Database of National Agricultural Research Systems 1. Create a tool for research planners and policy makers which would allow them to compare effort and productivity of different systems. 2. Provide a means of testing hypotheses about NARS 3. Provide support to ISNAR training and service activities.</p>	<p>1. Assemble from primary and secondary sources a documented database of information which is comparable across countries and over time. 2. Relate NARS data to supplementary data from IMF, IBRD, FAO. 3. Assist NARS in establishing data management system.</p>	<p>1. Existing data on NARS was poorly documented and often non-comparable. 2. Data were not current. 3. There was no basis for regular updating of information at an institutional level.</p>	<p>1. Direct survey of NARS. 2. Assemble and synthesize other primary and secondary sources included in indicator series. 3. Develop machine readable ISNAR DATA FILES 4. Analysis of longitudinal and cross-country data on financial and human resources.</p>
<p>** B.01. Working Group on Research Planning and Resource Allocation Assist NARS in improving research planning.</p>	<p>1. Evaluation of current methodologies used in research planning and resource allocation keeping in mind their relevance, usefulness, and applicability to developing countries.</p>	<p>1. Clear national strategies and plans needed for efficient use of own and donor funding. 2. Need for clear understanding of issues and problems in research planning.</p>	<p>1. Review of methodologies identification of key issues in assessing an actual situation. 2. Methodology for establishment a national agricultural research plan. 3. Study of decision-making processes partners in decision-making process.</p>
<p>** B.02. Resource Allocation and Priority Setting in Agricultural Research 1. Develop practical, economically rational procedures for allocating research investments.</p>	<p>1. Develop rigorous method to integrate efficiency and other objectives in the allocation process. 2. Work with NARS in development of approach that is consistent with their resource availability.</p>	<p>1. Decision makers have few operationalized guidelines for allocating funds among commodities, research units, and disciplines. 2. Allocations between short and long term payoff are hard to make 3. Data limitations and analytic capacity scarce.</p>	<p>1. Synthesis of literature 2. develop components (modular analytics) 3. satisfy information needs 4. operationalize methodology, develop instruments of analysis. 5. field test model and refinement. 6. collaboration with ACIAR, Universities, IICA.</p>
<p>** B.03. SPAAR Guidelines for National Agricultural Research Strategies 1. Help NARS make better use of its own and donor resources allocated to research.</p>	<p>1. Develop a comprehensive set of guidelines for strengthening national agricultural research systems in SSA with special emphasis on translating agricultural sector goals into a research strategy that is technically and economically achievable.</p>	<p>1. Donor support is often ad hoc due to lack of national strategies. 2. Developing national strategies for strengthening NARS requires guidance written guidelines are the most efficient in facilitating regional and in-country discussion and training.</p>	<p>1. Synthesis of ISNAR experience. 2. Discussion with SPAAR working group. 3. Revision of Draft Guidelines. 4. Presentation to SACCAR group. 5. Revision and presentation to SPAAR meeting.</p>
<p>** B.04. West African Agricultural Research Review 1. Diagnosis of the state of National Agricultural Research Systems in West Africa</p>	<p>1. Diagnosis of the structural evolution of systems in West Africa. 2. Study of the current organizational situation of NARS. 3. Growth of human and financial resources. 4. Comparison with other regions.</p>	<p>1. Contribution to synthesis of knowledge of agricultural research systems in West Africa. 2. Input to multi-donor efforts to plan assistance to African countries.</p>	<p>1. Review of consultant studies commissioned by World Bank. 2. Synthesis of ISNAR experience and information with consultant information. 3. Discussion of draft report with NARS leaders.</p>

ISNAR RESEARCH PROGRAM, 1986

GOAL	OBJECTIVES	RATIONALE	APPROACH
<p>** B.05. Determinants of the level of investment in agricultural research 1. Understand the critical factors which influence the level of support afforded agricultural research. 2. Improved indicators of the "appropriateness" of a country's effort.</p>	<p>1. Develop quantitative model which seeks to account for differences between developing countries over time in the level of support to public sector research. 2. Define structural and institutional variables to include in empirical analysis.</p>	<p>1. Current rules of thumb for the appropriate level of investment in agricultural research do not take account of the structural and fiscal differences among countries. 2. Need to understand determinants in order to act on policy parameters.</p>	<p>1. Review of literature and sources of data. 2. Choice of empirical technique (panel data). 3. Estimation of model using data from ISNAR database and published sources in collaboration with Michigan State University.</p>
<p>** B.06. Project on the Policy Environment Improved understanding of the impact of policy at the macro level which influence the productivity of NARS.</p>	<p>Develop material which will be presented at the 1987 Agricultural Research Policy Seminar and distributed in published form to various policy makers.</p>	<p>1. The policy environment within which NARS operate influences the nature of both the technology demanded of research systems and that supplied by public sector research systems. 2. The role of the private sector in the research process needs study.</p>	<p>1. Identify key policy issues confronting NARS and undertake appropriate analysis (using ISNAR files to quantify where possible). 2. Complementary contributions from leading experts outside of ISNAR. 2. Report on the State of NARS in a policy context.</p>
<p>** C.01. Working Group on Structure and Organization 1. Improved methodology for determining when recommendations for strengthening NARS should stress structural and organizational changes or changes in procedures.</p>	<p>1. Elucidation of the importance of structural and organizational factors in the way a NARS performs certain functions. 2. Identification of strengths and weaknesses of different organizational models in performing similar functions</p>	<p>1. The performance of a NARS may be improved through improvements of a structural and organizational nature as well as by improving procedures. 2. Research is needed to help decide when one approach is superior to another.</p>	<p>1. Develop typology of NARS organizational models. 2. Comparative analysis of cases with different characteristics. Study of governance structures and the way they affect the performance of functions.</p>
<p>** C.02. Organizational and Managerial Implications of On-Farm Research 1. Improve the contribution that client-oriented on-farm research can make in developing countries.</p>	<p>1. Develop guidelines for research managers on the planning, organization, and management of on-farm client-oriented research to facilitate the integration of this type of research into NARS in developing countries.</p>	<p>1. Integration of OFCOR into national research effort has been inadequate. 2. Inadequate attention given to institutional implementation.</p>	<p>1. Case studies of selected NARS with different organizational and management systems. 2. Analyze a. information flow and linkages, b. financial and managerial needs c. Human resources d. management of decentralized programs.</p>
<p>** C.03. Agricultural Technology Management Systems (ATMS) 1. Formalize a methodology for identifying opportunities to improve agricultural technology management systems. 2. Verify the usefulness of methodology in field situations.</p>	<p>1. Develop a diagnostic approach which moves from the holistic to the micro level, testing the consistency of findings at each level with findings from other levels.</p>	<p>1. Need for methodology to identify constraints that NARS and donors can address through programs. 2. Need for diagnostic tools at the system, institute, and program levels.</p>	<p>1. Holistic view of system and its constraints integrating policy, structure, and management processes of system. 2. Institutional improvement analysis. 3. Case studies of selected crops. 4. Testing of approach in several countries.</p>

ISNAR RESEARCH PROGRAM, 1986

GOAL	OBJECTIVES	RATIONALE	APPROACH
** C.04. Working Group on Linkages to farmers and extension 1. Improved understanding of critical factors in the technology transfer process. 2. Guidelines to improve the research-extension and research-farmer linkage to increase the efficiency of the technology transfer process.	1. Clarification of the role of scientists in technology transfer. Study: 2. The role of on-farm client oriented research. 3. Feedback from extension. 4. Preparation of packages. 5. Extension literature. 6. Training of extension specialists for research.	1. In cases where improved technology does not reach the farmers' fields, ISNAR requires diagnostic tools to identify major constraints to the technology transfer process and information on successful measures to alleviate these constraints.	1. Review of literature and ISNAR experience. 2. See also OFCOR special project.
** C.05. Working Group on Linkages to Sources of Knowledge Identification of strength and weaknesses of in-country and external knowledge systems with respect to critical functions of the research system. Guidelines for the development and strengthening of NARS linkages to world knowledge systems.	1. Document the comparative advantage of different sources of knowledge and nature of linkages that exist in NARS. 2. Study the mechanisms in place to contribute to key functions of the research system. 3. Inventory relevant knowledge linkages for NARS.	1. Identifying key institutions in the agricultural knowledge system and the potential contributions each can make will provide guide to NARS on new relationships to explore.	1. Review of ISNAR experience. 2. Inventory of relevant linkages. 3. Case studies of beneficial interactions of NARS with World Knowledge Systems. 3. Collaboration with working group on networking processes.
** D.01. Working Group on Program Formulation and Program Budgeting 1. Develop improved tools for decision-making at institutional and research station levels (program formulation) in line with socio-economic policy at the macro level. 2. Develop MIS for program budgeting and allocation of human and financial resources	1. Improved information system and program formulation methods at institute and station levels. 2. Permit assessment of priorities and relevance of program. 3. Develop adaptable system using micro computers to match program to resources and monitor progress	1. Program formulation and research program are poorly linked with national development objectives and with producers' immediate needs. Program budgeting is practically non-existent in most NARS.	1. Synthesis of literature and review of methodology. 2. Synthesis of NARS' experience in program formulation. 3. Propose methodology for program formulation in different situations. 4. Adapt PBS to systems at different stages of institutional development
** D.02. Working Group on Monitoring and Evaluation Appropriate methodology for monitoring and evaluation of agricultural research to provide information to management at all levels to improve research performance. Design component monitoring and evaluation techniques for use as management tools.	1. Define monitoring and evaluation in NARS. 2. Describe the types of information needed by managers at different levels to serve the needs of NARS specify indicators. 3. Relate monitoring and evaluation to work on program budgeting and on-farm research.	1. There is inadequate knowledge about monitoring and evaluation of agricultural research. 2. The problem of defining the type of indicator and the time frame in which information is required is particularly difficult in research.	1. Adapt M&E methods used in research and development projects. 2. Identify appropriate indicators of progress to serve various management levels. 3. Collaborate with former ISNAR Staff Member in IBRD. 4. Action research with willing NARS on methodology.
** D.03. Working Group on Human Resources 1. Further refinement and application of diagnostic and management tools for planning the development and increasing the productivity of human resources in NARS. 2. Cross-country analysis of human resource issues.	1. Improve method for human resource planning. 2. Study training and recruitment issues. 3. Study conditions of service, motivation, productivity. 4. Information systems for HR management. 5. Monitoring and evaluation of human resource situation in NARS.	1. Human resource issues are adequately studied but appropriate tools for planning the development and management of human resources by NARS leaders need continuous improvement. 2. Database on human resources reaching a stage where comparison is possible	1. Manual of approaches used in ISNAR studies. 2. Refinement of methods for creating human resource databases. 3. Cross-country analysis of conditions of service.

ISNAR RESEARCH PROGRAM, 1986

GOALOBJECTIVESRATIONALEAPPROACH**** D.04. Working Group on Development and Management of Physical Resources**

Refinement of diagnostic approach to the development and management of physical resources. Guidelines for planning and development of NARS infrastructure.

1. Identification of "balance" among land, buildings, equipment, and supplies. 2. Establishment of criteria for planning infrastructure in line with mandate, scientific staff, and resources. 3. Training issues for management of physical resources.

1. Imbalance of infrastructure with mandate and availability of human and financial resources is a critical issue for NARS particularly where structure is inherited from colonial system.

1. Review of literature and station management training courses of other IARCs. 2. Prepare general strategy for planning and development of physical infrastructure.

**** D.05. Working Group on Networking Processes**

Guidelines for improving the contribution that networks can make to NARS. Methodology for monitoring and evaluating the functioning of networks.

1. Taxonomy of networks. 2. Strengths and weaknesses of different types of networks. 3. Division of labor among partners. 4. Methodology for reviewing achievements of networks.

1. Networking is a process which small or resource-constrained systems can use to increase their productivity. 2. Analysis of the contributions and potential dangers of networking needed to improve design of networking projects.

1. ISNAR experience with PRECODEFA and CONOSUR documented. 2. Participation in development of methodology for evaluation of CONOSUR. 3. Theoretical basis for networking.

**** D.06. Working Group on Information Management**

Improve understanding of the contribution of communications to research systems in NARS.

Establish and quantify the role of information management (communication) in successful research systems. Identify criteria for diagnosing communications strengths and weaknesses in NARS.

1. Research often does not reach users because of inadequate communication systems. 2. The contribution of formal communication expertise to successful systems needs study.

Review of communications literature relevant to NARS in developing countries. Collaboration with working group on research-extension linkage. Documentation of cases of successful and unsuccessful communications within NARS.

TRAINING FOR RESEARCH MANAGERS

D. Wood

The ISNAR training program is designed to promote improved agricultural research management in national systems by drawing upon ISNAR's eleven management themes and using them in specific training activities. We believe that the eleven themes are of key importance in agricultural research management and are a good foundation on which to build training programs. These do not exclude new themes that may arise, but they cover topics in which ISNAR is actively working and where it has a comparative advantage.

ISNAR's training objectives are:

Develop training materials. ISNAR develops and adapts material for training events. Materials come from in-house-generated documents and reports, and from the experience and materials of other institutions;

Develop appropriate training methodologies for particular client groups. Because ISNAR's target audiences are diverse, several different approaches are used to effectively reach them. Techniques include combinations of lectures, group problem solving, slide presentations, case studies, skill-building exercises, and panel discussions;

Organize and deliver training events. Different mechanisms are used in training: short-term courses, workshops, seminars, and conferences;

Strengthen agricultural research management training. In organizing events, ISNAR works with national, regional, or international institutions with the purpose of strengthening their own agricultural research management training capabilities. At the same time, ISNAR benefits from their expertise and materials.

These objectives are mutually reinforcing and synergistic. The strategy depends upon mobilizing ISNAR's institutional and staff capabilities in training

design, methodology, delivery, and upon ISNAR's areas of concentration.

Our experience in NARS indicates that ISNAR must work with three distinct group of leaders:

Policy-makers. Ministers, legislators, permanent secretaries, deputy ministers, and other high government officials;

Senior Management. Directors general, deputy directors, directors of agriculture, directors of research, directors of veterinary services;

Middle Management. Directors of research stations, national commodity program leaders, department heads, project leaders.

Each of these groups has different requirements: ISNAR must respond to each with appropriate materials, organizational approach, venue, and duration.

Policy-makers are reached primarily through workshops and policy seminars held in association with other organizations involved in the policy sphere. The objectives for activities with this target audience are to build internal support for agricultural research, sensitize them to the needs and requirements and what they can reasonably expect from agricultural research, assist them in their understanding of how agricultural research serves the proposed development and, essentially, to be more receptive to and supportive of senior management (the second group). In particular, this audience must be sensitized to the managerial and organizational issues and problems that cannot be solved at lower levels.

Senior Management are reached by seminars which offer understanding of the research process and enhance the capability to analyze and define overall research

strategies and plans. Many senior managers have gained the management skills and perceptions necessary for their positions through long years of experience; but they may benefit from an increased awareness and understanding of research management.

Middle Management are reached primarily through in-country training events. These are the decision-makers at the station and project level, where research is actually conducted. They are well-trained and successful scientists who have been given managerial responsibilities for which they have had little, if any, formal preparation. Training for middle managers is essential if agricultural research is to be strengthened at the operational level.

ISNAR delivers its training in several ways:

Direct Training. ISNAR designs the curricula and goes directly to the clients. ISNAR staff may be supplemented with consultants in particular fields;

Coordinate Training. ISNAR takes a guiding role in curriculum design, workshop planning, and selection of trainers, but leaves most of the training to others;

Strengthen Training Institutions. ISNAR works to strengthen existing institutions that can, with some help from ISNAR, incorporate agricultural research management training in their curriculum;

Publications. ISNAR also disseminates its managerial and organizational knowledge through publications of various kinds, including auto-tutorial manuals and research management cases.

The appropriate approaches are carefully considered in

planning each training event. In addition, ISNAR plays an important role by identifying and incorporating local management trainers into training efforts. Incorporating these individuals into courses also results in a strong element of "training trainers".

The projected size of ISNAR (senior staff, core funds, and special project funds) over the next several years sets a frame of reference for ISNAR activities. Training is part of an overall effort to strengthen NARS, and activities and resources will have to be carefully selected.

The objectives of training, target audiences, and materials for the various activities, coupled with the anticipated funds, dictate that training be pursued through a number of different approaches, in different locations, and with different institutions.

Donors have shown a strong willingness to support training activities, and individual countries have demonstrated their support for in-country training by providing in-country resources such as transportation, secretarial, and logistical support. The number of events will depend on staff resources and available extra-core support.

The training program is consistent with ISNAR's mandate, overall strategy, and the stated desires of client countries and donors. The program encompasses a number of elements and associated activities that together form an integrated problem designed to enhance ISNAR's ability to strengthen the organization and management of NARS. It will enable ISNAR to identify training needs and explore ways in which these needs can be met. As such, it will be dynamic and responsive to changing circumstances.

CONSIDERATIONS FOR STRENGTHENING NARS

T. A. Taylor

ISNAR's studies and analyses of national agricultural research systems over the last 5½ years have produced information on considerations critical for strengthening NARS in the developing countries. Most developing countries depend on agriculture as the basis for growth and development, and agricultural research is a major vehicle for promoting and accelerating them.

Agricultural research must therefore be directly linked to the process of technological change and improvement and, through a continuum involving information on resource base, planning effective policies and programs, putting research resources in place, execution of research, and testing and transfer of research findings, should ensure that the agricultural industry is effectively served.

The major considerations for NARS to function efficiently and contribute effectively to the development process fall into three fundamental areas:

- Policy environment,
- Basic processes of an agricultural research system,
- Organization and structure.

Policy Environment. This area is weak in many developing countries. Agricultural research leaders and scientists need to pay greater attention to the mustering of political support for agricultural research. Only through such support can enlightened science and agricultural policies, strong and stable scientific institutions, and research capabilities be effectively developed. Agricultural research as a scientific activity requires creativity and scientific quality in the utilization of allocated resources, and a favorable policy environment that facilitates the adoption of resulting new and improved technologies.

Although the size of the research effort, which is essentially an economic question, would vary from

country to country, some national capacity with minimum infrastructure, financial resources, and competent researchers able to diagnose local problems, identify, adapt or generate, and test solutions, will always be required. The establishment and maintenance of this capacity requires political commitment and a critical mass of stable, continuous resources. Political commitment and policy support to agricultural research have borne fruit in impressive returns to investment in research.

Basic Processes of Research. NARS must be able to translate policy support to research into processes that will produce results useful to farmers and society as a whole. Eight such broad processes identified are:

Directing research activities towards the country's priorities, problems, and opportunities. This requires the matching of research objectives with both short- and long-term development objectives.

Mobilizing and effectively utilizing the needed financial resources. This requires that attention be paid to adequacy, continuity, and stability of resources.

Developing and maintaining infrastructure. This requires the development and maintenance of basic physical facilities and equipment needed for program execution.

Well-qualified scientific personnel. Developing and keeping scientific personnel is the most important element of a research system. Investment in training human capital must be matched by the creation of a favorable work environment for improved performance. A human resource development plan has been found to be an appropriate strategy for dealing with this issue.

Promoting national and international scientific interaction ensures that a NARS is not isolated and is able to benefit from internal and external pools of relevant knowledge.

Executing a responsive research program leads to appropriate outputs. Researchers would need to be free to concentrate time and effort on program formulation and execution.

Assuring flow of research information to extension, farmers, policymakers, and the public. Emphasis in technology transfer must ensure a two-way flow of communication with users of technologies, diagnosis and testing of methodologies, and documentation of results in usable forms.

Monitoring and evaluation of program execution as a key management function ensures that programs are maintained in the context of set objectives, goals, and expected output.

Organizational Structure. The organizational structure, as the institutional form by which human, physical, financial, and information resources are brought together to carry out the research process, should facilitate the processes of planning, formulation, execution, and delivery of research. No single model is expected to meet the needs and situations of all countries; there are

strengths and weaknesses in all models analyzed. By concentrating on the essential functions of research, models should be evolved which are coherent with the country situation; are capable of adapting to change; provide for interaction with a broad range of interests; have desirable organizational autonomy, along with responsibility and accountability; feature a desirable balance of centralization and decentralization; and facilitate an interdisciplinary approach.

An example of how these key factors are provided for in the reorganized NARS for Kenya was discussed. It was concluded that NARS could benefit by focusing on the mutually reinforcing interactions between policy environment, the basic processes of research, and organization structure in their future development.

A DATA BASE FOR NARS

P. Pardey

ISNAR's data base activities are presented under five headings as follows:

1. Brief History of Data Base Activities at ISNAR
2. Rationale for a Data Base
3. A Brief Appraisal of the Global State of Agriculture
4. A Preliminary Look at some Research Indicators
 - a. Financial Resource Indicators of Research Activity
 - b. Research Personnel Indicators
 - c. Factor Mix
5. Concluding Comments

ISNAR has been involved in formal data base activities almost from its beginning. The joint ISNAR/IFARD publication by Peter Oram and Vishva Bindlish, "Resource Allocations to National Agricultural Research: Trends in the 1970s" was published in November 1981. Present activities began in late 1981, when an ISNAR/IFARD survey was mailed to 116 countries, along with a follow-up survey to Arab countries which was undertaken in cooperation with the Arab Organization for Agricultural Development.

About 60 countries have replied to date, and this survey information is being combined with additional data from hundreds of primary and secondary sources to generate the ISNAR DATA FILES. All of the figures are cross-referenced with a SOURCE file, allowing us to keep track of the original data sources, and a COMMENT file which attempts to document and clarify each figure recorded in the data files. These files contain baseline, yearly research expenditure, and personnel figures, back to 1960 where possible. A substantial amount of effort has been invested into cross-checking and 'cleaning' the data in order to derive the most representative data series that could be constructed from the available figures.

In committing resources to the development of a

database on NARS, ISNAR was responding to several key issues. They include:

- There was a clear demand for this service from national systems, donors, and international agencies, as evidenced, in part, by the widespread use of the results presented in the November 1981 report;
- Many of the existing data sources were fragmented in scope and coverage, difficult to access, uneven in quality and varying in documentation. There was a need to develop an ongoing, institutionalized data base effort which capitalized on ISNAR's relatively frequent system-level contact with NARS, combined with its global mandate;
- There was a need to provide data-based information to assist national research managers through the provision of various agricultural research activity indicators, and to assist donors and other agencies to improve their coordination and priority-setting mechanisms;
- ISNAR needed to develop a data base to assist in its own research on problem-oriented issues related to cross-commodity allocations, geo-climate allocations, size-related factors, factor shares, etc.

Our preliminary analysis documents a declining rate of growth in total support going to public-sector agricultural research systems for many countries, in both absolute terms and relative to their levels of support during the 1960s and early 1970s. These declining financial resources are concomitant with an increase in research personnel resources. This suggests that numerous research systems may at present be experiencing substantial distortions in the factor mixes (i.e., research labor, capital, operating expenses) of their NARS. However, historical evidence from the U.S.

suggests that there have been substantial shifts in the factor mixes of states within the U.S. system over time, and as yet the impact of these shifts on research productivity is unclear.

Considering the long time lags between investment in agricultural research and the subsequent impact of research on agricultural production, it is clear that decisions taken yesterday and today will have substantial long-term impacts on the agricultural productivity of

national systems. Recent IFPRI projections indicate possible net annual food deficits, by the year 2000, of around 6.3 million metric tons for the developing countries as a whole. These projections were formed on the assumption that there would be virtually no structural changes in these systems during this period. Improvements in agricultural research systems can provide the elements necessary to induce the structural change that is required to belie these projections.

STRUCTURE AND ORGANIZATION IN NATIONAL AGRICULTURAL RESEARCH SYSTEMS

H. K. Jain

DEFINING NATIONAL AGRICULTURAL RESEARCH SYSTEMS

In considering the organization and structure of the national agricultural research systems (NARS), it is important that we begin to define them more clearly.

In a broad sense, a NARS consist of all those organizations and institutions in the country carrying out research in various fields of agricultural sciences. These institutions are often very diverse and are distributed in the various ministries of the government, parastatal bodies, faculties of agriculture and other science faculties of the universities, and in the private sector having close links with agribusiness.

For practical purposes, however, the core of the NARS is more restricted. The core consists of the organizations and institutions created and/or funded by the governments to generate improved production technologies to provide support to their development programs of agriculture. The government (through its ministry of agriculture and sometimes other ministries) is the promoter of the interests of the farmers – their largest constituency in most developing countries. As a guardian of these interests, and recognizing the crucial place of agriculture in the process of economic development, the governments have (or should have) a deep interest in making science and technology an instrument of social and economic advance. For this reason, most governments create their own research infrastructure for the development of agriculture, and it is this research service created by the government which forms the heart of the national agricultural research system.

The research apparatus consisting of experiment stations may function under the ministry of agriculture and/or other ministries. In some cases, the governments prefer not to create research institutions of their own, but hand

over responsibility for agricultural research to faculties of agriculture to which they extend funding and other support. These core groups of institutions often link up with other research institutions in the country, which may not be directly involved in terms of commitment, but all of which have a potential to make some contribution.

BASIC COMPONENTS OF NARS

A successful national agricultural research system is built around three main components. First, it must have the needed experiment station infrastructure, and this means:

- qualified scientists and technicians;
- field and laboratory facilities in the form of well equipped stations;
- a stable budgetary support consistent with the needs of the evolving research programs.

Second, it must have the organization and structure to use these resources effectively. Third, the NARS must have the management skills, tools, and techniques to use their scientific and national resources more efficiently.

EFFECTIVENESS AND EFFICIENCY

Organization and structure help to create the potential for a NARS to be effective. Once we have created this potential for effectiveness, we can build on it the additional dimension of efficiency. We can do this by giving it the management techniques and tools which the NARS leaders and other scientists can use in the course of their work. Some national agricultural research systems, including many in the developed countries, are highly effective in achieving their objectives, but they are

not particularly efficient in the use of their resources. Conversely, there are NARS which the management scientists would consider as highly efficient – they do not waste resources – but they are not necessarily very effective.

TYPES OF NARS ORGANIZATIONS

This distinction between effectiveness and efficiency is something which we may find useful for operational purposes. I would define organization and structure in NARS as the institutional framework and entities, and the governance mechanisms and decision-making processes created to make use of the human and physical resources of NARS for the research process. They determine the potential for effectiveness. The institutional framework and the governance mechanisms may or may not provide the right environment in which improved management tools can be used. To take one example, a national research system may be doing an excellent job of determining research priorities and programs, but if its governance mechanisms do not give it any control over its scientific manpower – selection procedures and personnel policies – it cannot use these management skills very effectively.

What are the different kinds of institutional models characterizing the organization of NARS around the world, more particularly the developing part of the world? There is a great deal of variation, but it is possible to identify a number of them, recognizing at the same time that they represent only some of the dominant characteristics.

THE AGRICULTURAL RESEARCH COUNCIL (ARC)

The response of the larger Asian countries in terms of reorganization and strengthening of their agricultural research in recent years has been to set up semi-autonomous agricultural research councils. These councils have increasingly taken up responsibilities which earlier belonged to the department of agriculture. The basic concept underlying this transfer of responsibility has been to free the research service from the constraints of the larger government bureaucracy and from operational procedures designed more for built-in checks and counter-checks in the use of government funds and playing it safe, rather than taking major initiatives and some risks. The new concept has been to hand over much of the administrative and managerial responsibility to the scientists themselves, recognizing that research requires a different kind of administrative culture. At the same time, the governments have made

sure through various devices that the councils are not independent of them in terms of accountability. They must remain fully committed to the governments' policies of agricultural development and must provide technical support for these policies. It is autonomy combined with commitment.

An important point which must be recognized is that not all the ARCs have taken the same route in evolving their structure and organization. It is already possible to recognize at least three types of councils in terms of their mandates. I will call them.

- administering councils,
- coordinating councils,
- funding councils.

NATIONAL RESEARCH INSTITUTES (NRI)

The Latin American countries were prompted in reorganizing their research services by considerations which were very similar to those of the Asian countries. Their newly set up national research institutes are fundamentally not very different from the agricultural research councils of Asia. Perhaps, they enjoy greater autonomy, decentralization, and a wider resource base. Unlike Asia, the national research institutes in Latin America control and manage all of the public-funded research infrastructure in the country. Two kinds of national institutes can be broadly recognized: semi-autonomous and autonomous. The semi-autonomous national institutes receive strong direction in terms of their management and research policy from a board of governors; the president (director general) of the institute reports to the board. The minister of agriculture – however, appoints the board, and in this way makes sure that the interests of his ministry are safeguarded. The fully autonomous institutes have no such board, and the president of the institute reports directly to the minister of agriculture.

MINISTRY OF AGRICULTURE MODEL

The agricultural research services in developing countries have traditionally formed an integral part of the department of agriculture in the government, and in a majority of countries this position continues. This form of research organization continues to be predominant in the smaller African, Latin American, and Asian countries, including the countries of the South Pacific.

THE UNIVERSITY FACULTIES OF AGRICULTURE

Some developing countries, recognizing the ready availability and concentration of highly trained manpower in their universities, have found it more realistic to mobilize their colleges of agriculture to provide research support to the country's agriculture. Agricultural education and research are fully integrated in these systems.

A COMPARATIVE ANALYSIS

For the purpose of a comparative analysis of the different systems and their organizations, we must consider some of the governance mechanisms and decision-making processes determined by the organizational autonomy, distribution of authority and power, and linkages at different levels. The different systems which we have considered do differ significantly with regard to mechanisms and decision-making processes.

Do the different research systems based on their organization and structure also differ in their potential to be effective for the functions they must perform? It is the performance of these functions which is expected to determine their success or failure. This obviously is the more important question. We may consider here some of

these functions and undertake a comparative analysis. This has been done in Table 1.

It is possible to suggest from this analysis that the organizational structure does determine the effectiveness of the research service in performing some of its important functions. The problem, of course, is the element of subjectivity involved in an analysis of this kind. We need a great deal of analysis of the different types of research systems to establish these relationships, and that is why ISNAR is developing a strong research group. We do know, however, that many of the research services, following their reorganization in the last 20 years, have made a significant contribution to the process of agricultural development in a number of developing countries. The adoption rate of technology developed by the scientists of these research services has been high. Vernon Ruttan, based on 23 studies of agricultural research productivity in developing countries, speaks of an average annual rate of return on investment of 55 percent. Agricultural research has thus been found to be highly rewarding. The problem is one of defining those components of the research system which contribute to its success. If our subjective assessment in Table 1 is not entirely off the mark, it seems reasonable to suggest that organization and structure constitute one of these components.

Table 1. Relative Potential of NARS for Research Functions

Effectiveness for Research Functions	ARC (Administering)	ARC (Coordinating)	ARC (Funding)	NRI (Semi-autonomous)	NRI (Autonomous)	MAF	University Faculties of Agriculture
1. Research Priorities and Resource Allocation	+++	++	++	++	+++	++	+
2. Program Formulation	+++	++	+	++	++	++	+
3. Program Implementation	++	+	+	++	+++	++	+
4. Monitoring	+++	+	++	++	++	++	+
5. Evaluation	+++	++	+++	++	++	+	+
6. Research Coordination	++	+++	+++	++	+++	+	++
7. Links with Extension	+	+	+	+++	+++	+++	+
8. Links with Academic Community	+	++	+++	++	++	+	+++
9. Integration of Research, Teaching and Extension	++	+	+	++	++	++	++
10. Links with Policy Makers	+++	+	+	+	++	++	+
11. Staff Development	++	+	+	++	++	++	+++

+++ strong
 ++ average
 + weak

EFFICIENCY AND EFFECTIVENESS: A MANAGERIAL PERSPECTIVE FOR AGRICULTURAL RESEARCH

S. Huntington Hobbs

The challenge the world places on agricultural research will have to be led by the agricultural research manager. To meet this challenge the agricultural research manager will have to do two critical tasks:

- maximize the research output obtained from the combination of the resources and knowledge at his disposal, that is maximize efficiency;
- maximize the social benefit resulting from the solutions it provides to the world's food problems, that is maximize effectiveness.

Efficiency is the quality of performing a task in the best possible manner. Efficiency measures the internal use of resources and knowledge of an organization.

Effectiveness is the production of results; it is the quality of the performance on the outside of the organization. Effectiveness measures the impact of the organization on the environment. It is outside the organization that the product or service offered will be used, bought, or rejected. The resources that the organization requires also come from outside. It is from outside that the organization will replenish and acquire the resources it requires: the money, the people, the infrastructure to sustain the organization. It is outside the organization where the decision is being made on the economic well-being of the organization.

But if so much happens outside the organization, what is distinctive inside the organization? All organizations use funds, utilize physical resources, hire people. What is distinctive about an organization is how it applies knowledge. An organization is unique in how it applies scientific, technical, social, economic, and managerial knowledge. An organization captures resources from outside, applies its knowledge to convert those resources into products and services, and then offers these products and services to the environment outside.

FACTORS OF EFFECTIVENESS

The effectiveness of the organization will be determined by three factors:

- product,
- market,
- channel of distribution.

Of these, the organization only has control over the product. The organization can alter or change the product or range of products it is providing.

The market is composed of a large number of elements such as: number and type of users, socio-economic profile of users, user organizations, seasonality of product use, prices for crops, commercial law and practices, etc. All of these are outside the organization. The organization can try to influence these elements, but it generally has no control over any of them.

The channel of distribution is usually outside of the control of the organization. Very few organizations control distribution of their products to the ultimate user, but the product of an agricultural research organization may go through many hands before it reaches the ultimate user.

Channels of distribution are also critical customers of the organization's products and services, and the product or service must also meet the needs of the channel of distribution. Effective organizations recognize that they first have to make believers in the product, to sell the product to the channel of distribution before it can be sold to the ultimate user.

EFFICIENCY, EFFECTIVENESS, AND THE USE OF RESOURCES

All organizations use resources. Unfortunately, in most

organizations, resources are misallocated, and therefore used inefficiently. An organization may have:

- 100 products, but 10 products represent 90% of sales;
- 100 researchers, but 10 researchers produce the most important innovations;
- 100 seed varieties, but only 10 varieties may have an impact.

In most organizations, results are in an inverse relationship to the costs:

- 10% of the products, 10% of the staff will produce 90% of the results;
- 90% of the products, 90% of the staff will produce 10% of the results.

This ratio may be changed to an 80%-20% relationship in very good organizations, and 70%-30% relationship in extraordinary cases. But the implications of these ratios are clear. On the one hand, resources will generally be allocated to the number of events rather than to results, resulting in a very inefficient use of resources. On the other hand, a minority of the organization's resources will produce the products and services on which the organization survives and competes, the effectiveness of the organization depends on the concentration of a few key resources. Effort and resources must be concentrated where impact can be maximized.

THE EXPLOITATION OF OPPORTUNITIES

Allocating resources to opportunities can bring greater effectiveness. Allocating resources to organizational problems can bring greater efficiency. Focusing of resources where impact can be maximized implies that effectiveness, rather than efficiency, is essential. In seeking greater effectiveness, there are two kinds of key opportunities to focus on: the opportunity to achieve extraordinary results, and the opportunity for abandonment.

The opportunities to achieve extraordinary results are in the areas where the organization has, or can develop, a competitive advantage in meeting specific clientele needs. They can involve developing the products and services that will sustain the organization in the future, or accelerating the development work on a technical breakthrough.

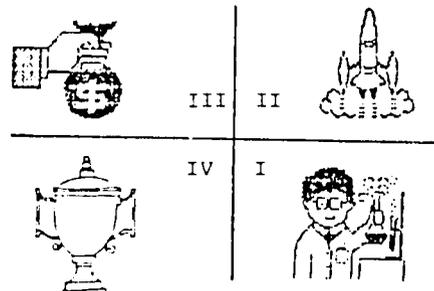
The opportunity for abandonment may be the key to successful innovation. Abandonment, the closing and elimination of research activities, will permit the freeing of resources which can be focused on products that might achieve extraordinary results.

The formula for success seems obvious: concentrate on the winners, discard the losers. A very useful tool for identifying winners and losers is called "the Product Portfolio Matrix".

THE PRODUCT PORTFOLIO

Two different tasks, maximizing the present business and preparing for the future, must be carried out at the same time, with the same resources, with the same people. The product portfolio helps conceptualize how resources should be shared between these tasks.

Two product characteristics, growth potential and product maturity, can be used to create the product portfolio matrix on which all products can be mapped according to these characteristics.



On the lower left-hand quadrant are the mature products with low growth potential. These are the winners of yesterday, the products that carried the organization in the past. These products were successes but no longer represent a large volume to the organization. As yesterday's success, they pass to the display case, and can therefore be called "trophies".

On the upper left-hand quadrant are the mature products with high growth potential. These products are the successes of today. In financial circles, they are called "cash-cows" because they generate a lot of cash and resources for the organization.

On the upper right-hand quadrant are the "rockets", the new products with high growth potential. The "rockets" represent the potential winners of tomorrow. Rockets, if

successful, can reach the stars (and become the cash-cows of tomorrow), but rockets are volatile things and can explode at any moment, sometimes with catastrophic results.

On the lower right-hand quadrant are the new products with low growth potential. These products consume resources, but have little potential of creating any return on investment. Products in this category are called "pet-hobbies" to represent that these products are usually the pursuit of individual interests.

Many organizations focus on the "trophies" long after these products are no longer generating any significant resources for the organization. They are, after all, the successes for which the organization has become known, and may often be the products on which the current leaders of the organization developed their careers. Investments in trophies are an investment in nostalgia. However, it is true that public sector organizations can live longer than private-sector organizations on the reputations accumulated in the trophy display case. Occasionally bringing in outsiders to help evaluate the organization's products may help identify more clearly the trophies, but cutting back the resources made available to these products will inevitably generate resistance from within the organization from those who have become emotionally attached to the product.

Emotional attachment is, of course, also a problem with the pet-hobbies. The justification is usually on the possible potential of the product, or the scientific importance of the work being done, or the value to mankind of the task at hand. But too many research activities are satisfying or occupying researchers and

research managers, and not leading to satisfying clientele needs. Recall that 90% of the people and the resources may be producing only 10% of the results. These 90% of the resources are often focused on pet-hobbies.

Product portfolio analysis indicates that "cash cows" are exactly that, products that produce extra cash to be milked. The leadership position in the marketplace of the "cash cows" should be maintained, but "cash cows" should also be providing the necessary resources to invest for the future of the organization. "Cash cows" are providing the support, the fuel for the "rockets" of today which can be the "cash cows" of tomorrow.

The ability of the organization to focus its resources on "rockets" will lead to increasing the effectiveness of the organization, to producing the products and services the organization will offer tomorrow. The ability of the organization to focus on eliminating "pet-hobbies" will lead to increasing the efficiency of the organization as wasteful activities are eliminated.

More specifically for a NARS "cash cows" will require some maintenance research to defend and maintain the productivity of the product in the environment. The "rockets" will involve the strategic research to achieve breakthroughs. The pet-hobbies will generally involve a more basic orientation to the research. The "trophies" will provide the basis for the Nobel prizes and other rewards of recognition.

Efficiency and effectiveness are different sides of the same coin. Making of decisions, taking risks, adjusting to change, will dictate for the manager whether efficiency and effectiveness are his friends or his foes.

IMPROVING AGRICULTURAL RESEARCH ORGANIZATION AND MANAGEMENT IN KENYA

W.W. Wapakala

AGRICULTURE AND THE KENYAN ECONOMY

Agriculture is the mainstay of Kenya's economy. It accounts for about 30 percent of the country's GDP and 70 percent of total exports (1985). This share of agriculture in the economy has not appreciably changed during the last 10 years. About 35 percent of the country's total population, currently estimated at 20 million, lives in the rural areas. Agriculture directly supports over 75 percent of the rural population. The sector also generates employment for 78 percent of the country's economically active population of 9 million people.

It is obvious, therefore, that agricultural growth is the key to rural development and hence overall economic development. A breakthrough in agricultural production would directly raise the standard of living of those in the other sectors. As agriculture is the dominant sector, and since the non-agricultural sectors will grow relative to agriculture, there is at least an a priori case that investment resources for non-agricultural sectors must come in the first instance from agriculture.

In Kenya it is widely acknowledged that agricultural research has made significant contributions to the past success in the agricultural sector. Starting with a modest scientific establishment in the first decade of this century, the government has set up an agricultural research system that has demonstrated the critical role agricultural research can play in national development through the introduction, testing, and promotion of the production of crops and livestock, and in the maintenance of animal health services. Research results have contributed to the remarkable progress in hybrid maize production, high-yielding wheat varieties, high-quality disease-resistant varieties of coffee, improved dairy and beef animals, better technologies for the

cultivation of tea, improved forest and catchment area management techniques. All these successes have contributed in one way or another to the betterment of the quality of life of Kenyans and to the nation's foreign exchange earnings.

With the new problems that have emerged in the more recent past, the requirements for a higher level of self-sustenance in food and raw materials production, and the ever-changing world economic structure against a widening scientific and technological gap between developed and developing countries, agricultural research in Kenya now faces new challenges. Among these challenges is the realization that future gains from research will have to be small and cumulative. Large and dramatic changes such as those from hybrid maize developed in the 1960s will be difficult to achieve. Moreover, it can be expected that future research will cost more to achieve significant results. To meet these challenges, the Kenyan agricultural research system must be reorganized and rationalized with a view to establishing a system that is flexible and efficient in responding to the national development objectives and the entire agricultural policy. Such a system has been the subject of studies in recent years, particularly by ISNAR.

REORGANIZATION AND RATIONALIZATION OF THE KENYAN AGRICULTURAL RESEARCH SYSTEM

Creation of the Post of Chief Research Officer

The recognition of weaknesses in the agricultural research system dates back to 1945, when the then director of agriculture saw the need for effective research services to meet the expanding needs. The research services in the Department of Agriculture, which until 1945 were largely centered at the Scott (now National)

Agricultural Laboratories, were completely reorganized after the war. In 1952 the post of Chief Research Officer was created, and all the research services came under control of the first Chief Research Officer, Dr. C. C. Webster, who laid the foundations of the present research organization.

The Rodenhiser Report

After independence, the government emphasized increased and intensified research for the small-holder sector. By 1968, it was realized that agricultural research was not geared to meet the projected needs of Kenya's agricultural industry. This necessitated setting up an agricultural research survey team, under the chairmanship of Dr. H. A. Rodenhiser, in 1968, to critically review agricultural research and come up with recommendations as to how crop and animal production research should be organized for effective services.

The survey team in their report observed among other things:

- "The present organisation is not geared to meet the manifold current and projected needs of Kenya's growing agricultural industry;"
- "Within the research program, some projects are well conceived and executed, while others are virtually worthless. All too often there is a wasteful diversification and duplication of effort with a total disregard of priorities in the light of economic justification;"
- "The team also felt there was a lack of coordination and assessment of research priorities by both foreign assistance donors and the Kenya Government, and there seemed to be no clear-cut concept of donors' role in place in Kenya's development process;"
- "Animal husbandry research barely exists and is uncoordinated."

Among the recommendations by the team were the following:

- Organization of research – the team recommended the creation of the Department of Research, to be headed by a director;
- Research programs and priorities – the team recommended the appointment of a Research Policy Committee to advise the minister on research policy decisions, and a Technical Research Committee on priorities;

- Calibre of research staff – the team recommended setting up a scheme of service aimed at attracting and retaining qualified and experienced scientists.

Agricultural Research Advisory Council

In response to the Rodenhiser Report, the Minister for Agriculture established the Agricultural Research Advisory Council, in 1969, to advise the ministry on a wide range of issues, including:

- research priorities;
- methods and techniques of administering and coordinating research;
- adequacy and location of research facilities;
- recruitment of competent personnel and working conditions requisite to their retention;
- effective methods of disseminating research results;
- the development of appropriate inter-relationship among research, extension, and other programs of the ministry.

At the inaugural meeting in September 1969, the council discussed and accepted the recommendations of the Rodenhiser Report. Among the recommendations made at the meeting were:

- The ministry should budget for research expenses, the guiding principle being the allocation of resources in relation to research priorities;
- Socio-economic studies should be given high priority, and the ministry should build into the establishment biometrics and agricultural engineering disciplines;
- The ministry should formulate a conscious and integral products policy for the development of agriculture. (This would provide the framework for the main outlines of a coordinated and balanced research program);
- A subcommittee of the council came up with terms of service which included the creation of the post of Director of Research (in place of Chief Research Officer).

Apart from the inaugural meeting, the council never became operational, and the agricultural research system continued to exist much the same as before.

The Science and Technology Act

Several developments during the late 1970s compelled the government to critically review the management of

scientific and technological institutions, a vital resource in national development. The establishment of the National Council for Science and Technology, under the Science and Technology Act (1977), to advise the government on all aspects of science and technology for national development, was a major milestone in Kenya's aspirations to explicitly embrace modern scientific and technological processes in future development strategies. The third (1971-78) and fourth (1979-84) Development Plans recognized that the identification of scientific requirements, the use of technological advances, and the allocation and proper management of the attendant resources to promote cultural, social, and economic development are key elements for a sound national science policy. These views are endorsed in Sessional Paper No. 5 of 1981 on Science and Technology for Development.

The Science and Technology (Amendment) Act of 1979 makes provisions for the establishment of semi-autonomous research institutes. This legal instrument establishes a framework with five basic elements:

- a. a management body with the desirable independence and assured government financial support for the execution of short- and long-range research in response to present and future needs;
- b. continual improvement of ways and means whereby scientific knowledge and results are promoted and applied for the benefit of Kenyans;
- c. establishment of an environment in which creative and imaginative research can be undertaken through an appropriate management structure;
- d. ability to attract research managers of outstanding calibre, and who are sensitive to practical national needs relative to their own areas of scientific specialization;
- e. establishment of a critical mass of scientists capable of using a multidisciplinary approach to problem solving, but flexible enough to be rearranged in accordance with program requirements.

Under the provisions of this act, the Kenya Agricultural Research Institute (KARI) was created to operate as a semi-autonomous parastatal research institution under the ministry. KARI was expected to combine the research services of the Ministry of Agriculture and Livestock Development and the Ministry of Environment and Natural Resources with those of the former East African Community to form a

comprehensive research organization. It was also expected to provide national coordination, management, and execution of research in agriculture, livestock development, and forestry. These roles have not been fully realized. At the moment, KARI is limited to the functions formerly under the East African Community at Muguga.

Current Exercise (1981 to date)

From the past attempts, it is clear that numerous efforts have been made to strengthen agricultural research in both pre- and post-independence, but these have not resulted in any substantial changes; the present agricultural research system retains the same basic structure as during the pre-independence days. Several complicating factors have made the establishment of a national agricultural research organization difficult. Most importantly, there is need to rationalize the organization and functions of the existing research system, comprising a large number of centers of various sizes. Indecision on how to integrate former East African Community institutions with those under the ministry is another contributory factor to delays in rationalizing agricultural research. In an effort to resolve these issues, extensive studies have been undertaken with the assistance of ISNAR, and a number of reports have been prepared.

ISNAR STUDIES, 1981, 1982, AND 1984

At the request of the Government of Kenya, acting through the National Council for Science and Technology, ISNAR conducted a study of Kenya's Agricultural Research System in June-July 1981.

To meet the new challenges facing agricultural research in Kenya, the team recommended that there is need to:

- develop a more unified, comprehensive, and cohesive organization for the planning, promotion and execution of research;
- determine research priorities and allocate research resources according to the priorities;
- strengthen communication systems for internal organization of the research organization, and for the delivery of research results to extension workers and farmers;
- build up a local capacity of well-trained and experienced manpower, along with improving the research environment;

- provide more socio-economic inputs into the definition, execution, and implementation of research activities;
- implement the small-farmer-oriented research strategy more determinedly;
- immediately undertake a feasibility study of scientific manpower requirements and training needs.

The government accepted these recommendations, and in response to the last recommendation ISNAR was once again requested to undertake a definitive study of the manpower and training requirements of the Kenyan agricultural research system. In June 1982, ISNAR undertook the study, and the team estimated that between 1983 and 1987, about 1,635 officers would be trained at different levels, in-service, short courses at IARCS, B.Sc., M.Sc., and Ph.D. The estimated cost was US\$ 30 million over a ten-year period. The training projections were taken as a basis for manpower development and training.

Following the general acceptance of the recommendations in the two ISNAR reports, the Government of Kenya in 1984 requested ISNAR to carry out a detailed study with the general objective of evaluating the organization, management, and programs of agricultural research, and to prepare a comprehensive national research strategy and program.

The team came out with a two-volume report titled "National Agricultural Strategy and Plan (1985)". This report has been subjected to a detailed study by a task force consisting of senior Kenyan research managers, with backstopping from ISNAR and the World Bank. The team was mandated to make specific proposals on how a unified agricultural research system could best be established under the provisions of the Science and Technology (Amendment) Act. The task force came up with the "National Agricultural Research Project Proposal" dealing with a wide range of key issues which are to form the foundation for a reorganized agricultural research system. The task force report has undergone a critical study by a pre-appraisal mission consisting of Kenyan officials and donor representatives. The mission recommended modifications which have been included in a final report that will be the basis for an appraisal mission in October this year.

The report addressed a number of critical factors that have motivated the rationalization and reorganization of the agricultural research system, which are briefly discussed below.

ORGANIZATION AND MANAGEMENT

The Ministry desires to reorganize the research system within the framework of a semi-autonomous agency as provided for in the Science and Technology (Amendment) Act, 1979. The agency will integrate the research facilities in the Ministry's research divisions with those at Muguga under a single harmonized management structure (Board of Management), that will be responsible and advisory to the permanent secretary on research matters, and through him to the minister, and ultimately, to the government. It is proposed that there will be two committees (Finance and Administration Committee and Research and Technical Committee), a director, three deputy directors (Crops and Soil/Water Management, Livestock Research, and Planning, Finance, and Administration) and a total of eight assistant directors. A strong administrative base will be established to ensure proper management and utilization of the research resources.

RESEARCH COORDINATION

Coordination, which is organized cooperation between centers, will form the basis of planning, implementing, monitoring, and evaluating research. As many high-priority research activities as possible will be organized into a number of national multidisciplinary research project teams, each team being headed by a coordinator who will be an active and mature scientist, resident at any one center where the commodity or problem to be researched is most important or can best be investigated. Agricultural research has traditionally been organized on a discipline basis with little or no coordination. The coordinated research approach will be the basis for mobilizing the available scientific resources to give attention to various problems of agricultural production and to find solutions through a highly organized cooperative system.

RESEARCH PRIORITIES AND RESOURCE REQUIREMENTS

One major deficiency in the present research system is lack of a proper mechanism for the determination of research priorities and programs and allocation of research resources according to the priorities. The task force reviewed criteria for establishing research priorities and identified three levels. The required resources were determined and allocated according to the priorities.

RATIONALIZATION OF RESEARCH CENTERS

A major problem that has arisen in the recent years is the

proliferation of research stations, sub-centers, and testing sites (now totalling 43) without a proper definition of the mandate and responsibility of each. The task force agreed with the ISNAR observation that there is a need to rationalize the existing network. While ISNAR recommended 13 national and 7 regional research centers, the task force found it necessary to revise these to 17 national and 13 regional research centers. There are plans to set up another national research center to be responsible for research in arid and very arid lands of northern Kenya. A national research center will be the principal entity for generating and testing improved technologies in a commodity, limited range of commodities, or a factor of production. A regional research center, on the other hand, will be the principal research entity for identification of production problems, adapting technologies at the farm level, and interacting with extension and farmers in the testing of improved technologies. The task force endorses the ISNAR recommendation that there will be no distinction in status between national and regional centers; the only difference will be one of focus.

MANPOWER DEVELOPMENT, TRAINING, AND RESEARCH ENVIRONMENT

The task force endorses the ISNAR observation that inadequately trained and experienced manpower at the levels of research scientists, technical officers/technicians, and administrative support staff is one of the major constraints in the Kenyan agricultural research system. The training program proposed by the task force was endorsed by the pre-appraisal mission without any modification. The proposed training program was estimated to cost, over the first five years, about US\$10 million for M.Sc. and Ph.D. training, and about US\$2 million for in-service and short courses. Alongside the training program, the task force proposed terms and conditions of service that will attract and retain manpower.

DONOR COORDINATION

Although the Government of Kenya is committed to supporting agricultural research, it is unlikely that it will

have adequate resources to fund the proposed National Agricultural Research Project. Donor assistance will, therefore, be required on the medium, long-term and sustained bases. While Kenya has benefitted from externally aided projects since independence, it has been shown that to a large extent donor projects have been uncoordinated, and most of them have had little impact because of the short-term nature of the projects. Another major problem has been that a number of them have not addressed priority problems of agricultural research, with the result that funds have been spread over too many programs. In the rationalized and reorganized research system, donor-funded projects will be required to fit into a long-term national research program in which research priorities are well-defined and established.

ALLOCATION AND MANAGEMENT OF FUNDS

In the current research system, allocation of research funds has little bearing on the research priorities and programs of the research stations. This is largely attributed to the lack of a national system for planning research and establishing priorities. Fluctuations in the funding of research stations is a major cause for concern. Another cause for concern is that funds for research have been the least effectively managed resource at the research stations. This is largely due to lack of management skills among research managers, and to some extent to limited freedom to manage funds allocated because of financial instructions relating to the utilization of funds.

These deficiencies have been recognised by the government and the remedial measures include:

- development of a national system for planning research, establishing priorities and programs, and allocating resources according to priorities;
- seeking assistance to increase resources for agricultural research;
- training center directors, project coordinators, and research administrators in techniques of resource allocation and management.

ORGANIZATION AND STRUCTURE OF AGRICULTURAL RESEARCH IN THE GAMBIA

M.S. Sompo-Ceesay

Prior to 1977, agricultural research in the Gambia was organized on an ad hoc basis, except for the colonial period, when a highly focused research effort was directed at improving the production potential of the major export crop, groundnuts. No attention was given to food crops research. At independence (1965), research was carried out by individual departments, mainly as part of development projects. This research was not well coordinated, even within the Department of Agriculture, which had the most active research programs. With the advent of the Sahelian drought, it became apparent that appropriate technologies were not available to meet the crises and challenges facing the agricultural sector, despite the infusion of large amounts of donor funds.

In 1977, the Department of Agriculture created a research division headed by an assistant director, with the main objective of coordinating the research effort within its mandate; i.e., all crops. An Agricultural Research Advisory Board (ARAB) was also created which included all research officers of the department. Researchers from other departments were invited to attend board meetings, at which their research proposals could be discussed and approved before submission for funding. The hope was that duplication of effort would be avoided and the national research effort would be coordinated. This attempt at coordination and organization was not very successful. Researchers from other departments viewed ARAB as an attempt by the Agriculture Department to control their research programs and ceased to participate in its meetings. ARAB served only an advisory role and lacked the authority to enforce its decisions.

Thus, effective research planning, based on identified priorities, was not carried out efficiently, despite the government's stated aim of improving the capability of the national research system to address the serious problems confronting the agricultural sector. The

situation was further compounded by donors who tended to support research within the specific objectives of their individual projects, some of which were often seen to be competing with each other.

If one accepts that the national research system has the responsibility for providing critical information to the government to facilitate its decisions on policies and planning for agricultural development, and to producers so that they can increase production and improve their well-being, then the research system of the Gambia as currently organized is not fulfilling this responsibility. There is no effective system to establish research priorities, review ongoing and proposed research activities and allocate resources accordingly. There is no central voice that speaks for the national research system. Research is spread among seven departments: Agriculture (crops); Animal Health and Production (livestock); Crop Protection Services (crop pests and diseases); Water Resources (water management and climatology); Fisheries; Forestry and PPMU (social services) in two ministries.

Recently, recognizing the critical role of agricultural research for the development of the agricultural industry, the Government of the Gambia requested assistance from USAID to assist it in improving the capability of the national research system to tackle the many problems confronting the agricultural sector. While emphasis was to be given to technology development, the project was to give special attention to improvements in the institutional weaknesses of the research system. USAID responded favorably and the Gambia Agricultural Research and Diversification (GARD) Project was born. One of the major elements of this project is to review and reform the agricultural research management system of the Gambia in order to facilitate its operation.

An early action of the Project Management Committee

was to set up a working group to review the current situation of the Agricultural Research Management System (ARMS) and to propose specific improvements in a range of procedures affecting the agricultural research system. The Government of the Gambia also requested ISNAR to assist the working group in its task. ISNAR provided the service of one of its senior research officers to work with the working group. Each department concerned with agricultural research nominated one person to serve in the working group.

The working group met several times over the first six months of 1986, during which it held consultations with field staff, consultants, reviewing the civil service structure, and other interested parties. An early decision was to prepare an inventory and task analysis of all scientists involved in agricultural research. A preliminary report highlighting the major weaknesses of the present system and preliminary recommendations for alleviating these weaknesses was prepared and discussed with interested parties. A final draft report was submitted in July 1986.

MAJOR FINDINGS AND RECOMMENDATIONS OF THE WORKING GROUP IN RELATION TO ORGANIZATION AND STRUCTURE OF THE NATIONAL RESEARCH SYSTEM

The working group confirmed the major weaknesses of the current system described above. In particular, it found that:

- no effective mechanism exists for setting national research priorities or for reviewing and approving research programs;
- no effective use was being made of the country's available manpower;
- research programming was poor, too often reflecting the interests of the researchers or donors.

In light of the above findings, the working group made the following major recommendations for the improvement of the efficiency of the national research system:

1. Establish a National Agricultural Research Board (NARB), composed mainly of senior users of research results for policy formation, to lay down broad priorities for research. The board should be serviced by a technical secretariat (TS);

The main duties of the board will be to:

- advise the ministers responsible for agricultural development on all matters concerning the organization and execution of research in agriculture, livestock, forestry, agricultural industry, etc.;
 - formulate national agricultural research policy and priorities to support national development objectives;
 - recommend the allocation of resources to high-priority research areas and review the research programs developed in response to these priority guidelines before approval for implementation.
2. Establish Program Committees (PC) to formulate research programs for priorities identified by NARB. Representation of the Extension Service in the program committees will be essential to bring farmer perspective into discussions;
 3. Introduce the technique of program budgeting as a basis for determining budgets of programs, and for monitoring and evaluation of research performance;
 4. Introduce rules on disbursement of funds for research to give greater stability, reliability, and flexibility in research funding and disbursement procedures;
 5. Develop a systematic manpower development program to ensure availability of needed manpower for executing identified priority research programs. This includes appropriate training and a scheme of service whose promotional and reward system encourages performance rather than seniority alone.

The working group believes these to be the minimum actions necessary if improvements to the current situation are to be made.

The overall structure and organization of the national agricultural research system compatible with the national system of governance can greatly facilitate or hinder the efficiency of the research system. The working group concluded that the current structure of agricultural research in the Gambia hinders rather than encourages efficiency. Thus, in light of its findings and recommendations, it suggests that the research system be structured along one of the following four options:

- create a semi-autonomous Agricultural Research Service (ARS);

- no ARS, but NARB, TS, and PC and an agricultural scheme of structural service;
- create NARB, TS, and PC, but no agricultural scheme of service;
- no change – except introduction of program budgeting, manpower inventory, and perhaps extending the role of ARAB to include other departments.

Option 1: Create a semi-autonomous Agricultural Research Service (ARS)

At the apex of this service will be the National Agricultural Research Board, responsible for:

- advising the ministers on all matters concerning the organization and implementation of research in agriculture, livestock production, forestry, fisheries, and agro-industry;
- formulating national agricultural research policy and priorities to support national development objectives, and advise the ministers on the financial, manpower, and physical resources required to carry out an approved research program efficiently and effectively;
- recommending allocation of resources to high-priority areas for research, and review the research program developed in response to these priority guidelines, before recommending approval for implementation.

Answering to the board through the permanent secretary will be a director of research, who will direct the research service. The service will be organized on a program basis. Each of the research programs will be headed by a program leader, who will be responsible for providing leadership to the groups of scientists in their programs, and ensuring that the programs are executed within the approved budgets. The director of research will be assisted by a program advisory committee (PAC) composed of these program leaders.

The program advisory committee will assist the director in the formulation of medium (three-year) research plans for submission to the board through the technical advisory committee. While overall direction of the research service will be the responsibility of the director, the program leaders will be expected to share both administrative and technical leadership of these programs. They would be expected to assign staff time and monitor the execution of the approved programs.

Among the advantages of this option are:

- program formulation and development would be facilitated;
- development and retention of research staff could be accomplished most readily, especially if a research scheme of service which rewarded output rather than seniority was adopted;
- agricultural research would have a clear single line of funding;
- a collegiate style of management, with leadership rather than authority – being the driving force in the system, can be adopted.

A possible disadvantage of this option is that the research system may lose touch with the development agencies it is supposed to serve. This can be avoided by creating a technical advisory committee (composed of department directors concerned with agricultural development and the research director as an ex-officio member) to the NARB.

The Technical Advisory Committee (TAC) will be responsible for providing necessary information and advice to the board, to assist it in arriving at priorities for research, and reviewing research programs being submitted by the research service for consistency with stated priorities.

The working group, having reviewed the manpower available and likely to be available to the national system in the near future, proposes that the national research effort should be focused on seven priority program areas:

- upland cereals improvement;
- rice;
- grain legumes and oilseeds improvement;
- agronomy and farming systems;
- forages and livestock;
- horticulture;
- research support.

While staff will be assigned to programs in which they will be professionally most concerned, it is expected that a certain flexibility will operate to ensure that staff can provide inputs into other programs needing their services. It will be the role of the PAC to ensure this.

Option 2: Create NARB, TS, and PC, but no ARS

In this option, the National Agricultural Research Board, Technical Secretariat, and program committees will be created, but no Agricultural Research Service.

The Technical Secretariat will be made up of senior research officials or department directors.

Members of staff of different departments who were mainly concerned with research could opt for an agricultural research scheme of service.

This option would not have the advantages of a clear single-line vote for all agricultural research, or a clear departmental sphere of agricultural research service. It would be more difficult to promote a collegiate style of management. On the other hand, this option would not require as great a restructuring as option 1, and ties with development activities should remain strong with each department.

Option 3: create NARB, TS, and PC, but no Agricultural Scheme of Service

The organization structure of this option would be similar to option 2, but no research scheme of service would exist. In addition to the disadvantages discussed above, this option would forego the benefits of research

staff morale and sense of direction that an agricultural research service could give, but would still give the benefits of a much-improved system, least for defining the research program. It would disrupt the existing system least for still substantial benefits, and would go part way to improving the agricultural research management system without maintaining the fully integrated approach that links the manpower development and reward systems with determination of the program.

Option 4

No change from the present organization, except introducing the management tools of program budgeting and manpower inventory, and perhaps extending the role of ARAB to include research programs in departments other than agriculture.

This option would improve the management system least, but has the advantage of not requiring any restructuring of the current organization.

ORGANIZATION AND STRUCTURE IN SRI LANKA

S. D. I. E. Gunawardena

INTRODUCTION

Agricultural research in Sri Lanka dates back to 1822 with the establishment of the Botanical Gardens when, during the British colonial era, it was used for the introduction of tea, rubber, cocoa, citronella, and other plantation crops. Research activities on these crops led to the establishment of the Department of Agriculture in 1911, with the research division being one of the main units. Research in the Department of Agriculture was guided by the Central Board of Agriculture appointed by the Minister of Agriculture, until the 1950s, when the Ministry of Agriculture was established. Over time, numerous changes have taken place in the responsibilities of this ministry, and today its primary mandate is food crops.

STRUCTURE OF THE AGRICULTURAL RESEARCH COMPLEX

At present, agricultural research is carried out in at least 15 separate research institutes and departments which function under seven ministries and the Office of the President. All research units come under the auspices of their respective ministries. However, some are semi-autonomous, being controlled by boards. These units have greater flexibility of operation than those coming under line ministries.

Ministries responsible for research in agriculture, i.e., forestry, and fisheries are the Ministry of Agricultural Development and Research (MADR), Ministry of Lands and Land Development (MLLD), Ministry of Rural Industrial Development (MRID), Ministry of Plantation Industries (MPI), Ministry of Coconut Industry (MCI), Ministry of Fisheries (MF), and Ministry of Higher Education (MHE).

In addition, the Natural Resources, Energy, and Science

Authority (NARESA), under the Office of the President, supports agricultural research in areas deemed to be of high national priority.

MINISTRY OF AGRICULTURAL DEVELOPMENT AND RESEARCH

This ministry is responsible for research and development of all crops except rubber, tea, coconut, and cashew; and has four separate research units: Department of Agriculture (DA), Department of Minor Export Crops (DMEC), Agrarian Research and Training Institute (ARTI), and Sugarcane Research Institute (SRI).

DEPARTMENT OF AGRICULTURE (DA)

This department, headed by a director, has ten divisions, each headed by a deputy director: Research, Extension, Education and Training, Economics and Projects, Farms and Planting Material, Engineering, Seed Certification, Botanic Gardens, Administration, and Finance.

Directors and heads of divisions meet to formulate work programs and prepare budgets. The director reports to the secretary of the Ministry of Agricultural Development and Research and through him to the minister.

The Director of Agriculture is responsible for the development and dissemination of new technology for the farm sector and is specifically responsible for food crops. Improved technology generation is the responsibility of the Research Division. Because of the diverse agro-ecological conditions of the country, many crops can be grown successfully, but the area suitable for a particular crop is often small. Crops on which research is being carried out are rice, which is the staple food, coarse grains (maize, millets, wheat, and triticale); roots

and tubers (potato, cassava, sweet potato, yams, and taro); grain legumes (mung, cowpea, blackgram, soybean, pigeon pea, chickpea); condiments (chili, onions, turmeric, fenugreek, cummin, fennel); agro-industrial crops (cotton, kenaf, groundnuts, sesame, castor, sunflower, safflower); and horticultural crops (vegetables, fruits, and cutflowers).

The Research Division is responsible for the formulation of the national research strategy for these crops, including the establishment of priorities, facilities, and staff.

Research is organized on a regional basis. Three main climatic zones have been divided into eight agro-ecological regions on the basis of climate, relief and soil. The main irrigated and irrigable areas of the Mahaweli System ("C") are included as an additional region. There are nine regional research centers (RRCC), and two additional research centers are devoted to special crops or situations. Some RRCCs have smaller satellite experiment stations under their control.

The Land and Water Use Unit and the Soil Conservation Unit, together with the headquarters administration and technical staff located at Peradeniya, constitute the rest of the Research Division.

Research programs are being formulated at the regional level within broadly defined operational objectives. Close linkages have been established with extension services and farmers through the formation of regional technical working groups which meet twice a year. These groups consist of staff drawn from the following divisions within the Department of Agriculture: Research, Extension, Education and Training, Farms and Planting Material. Officers and representatives from other organizations and university faculty of agriculture are invited to these meetings. These meetings, together with work in the agricultural extension and adaptive research program, ensure interaction between research, extension, and farmers. The overall program of the research division is considered by divisional committees and later as a part of the departmental program at meetings of division heads which are chaired by the director of agriculture.

There are lead stations for particular commodities and nationally coordinated programs for the major crops. The lead stations or the program coordinators establish or develop linkages with international research institutes or project agencies through the divisional headquarters in Peradeniya.

At present there are linkages with IRRI, CIMMYT,

CIP, CIAT, ICRISAT, and AVRDC. Staff from the Division of Agricultural Economics and projects are posted to the RRCC under the respective station directors. They are concerned with data collection of agricultural statistics and are required to interact with the regional research and extension staff in the study of production economics and farming systems and in planning of research programs.

An in-service training center for dissemination of information forms part of the regional research complex. There are also 24 adaptive research units, one in each district, for on-farm testing of new technology.

For funding research programs, a consolidated budget is forwarded through the secretary of MADR to the Ministry of Finance and Planning. Allocations are made to MADR under object-codes, where each covers a range of activities such as research, extension, and education and training.

DEPARTMENT OF MINOR EXPORT CROPS (DMEC)

This department was started in 1972 and is responsible for a large number of mainly non-food crops which have local and potential export markets. From these a few crops have been selected for initial attention: cocoa, coffee, cloves, nutmeg, cinnamon, cardamom. The director of DMEC is responsible to the secretary of MADR. There are two divisions: the Research Division and the Technical Division, dealing with extension and training and related activities. Each is headed by an assistant director. Administration and accountancy units complete the department. Although the main research station is at Matale, substations have been established at Delpitiya for multidisciplinary cropping of mid-country tea areas under the national Agricultural Diversification Authority, Kundasale for work on cocoa, Wariyagala for work on cinnamon and cocoa, and Gammaduwa for work on cardamom.

Research programs are formulated within the Research Division for submission to the director of Minor Export Crops and then to the secretary of MADR. Due to lack of staff, some research work has been contracted to the Coconut Research Institute (CRI), Tea Research Institute (TRI), and the Postgraduate Institute of Agriculture (PGIA). Research programs are devoted to germplasm collection and evaluation, agronomic and crop protection studies in monoculture and in mixed culture.

AGRARIAN RESEARCH AND TRAINING INSTITUTE (ARTI)

This is an autonomous unit established by an act of Parliament and is governed by a board nominated by the Minister of Agricultural Development and Research. There is wide representation on the board. Board members are the secretary of MADR (chairman) and representatives from the following ministries: Lands and Land Development, Mahaweli Development, Rural Industrial Development, Trade and Shipping, Finance and Planning, Rural Industrial Development, Plantation Industries, and Higher Education.

Ex-officio members are: the Director of Agriculture, the Land Commissioner, the Commissioner of Agrarian Services, the Director of Irrigation, the Commissioner of Cooperative Development, and the Director of Rural Development. The other members are the Director of Agrarian Research and Training Institute, a representative of the Central Bank, a representative of the Faculty of Agriculture, University of Peradeniya, and the country representative of the Food and Agriculture Organization of the United Nations (FAO). The composition of this board reflects ARTI's mandate to work on research and training, socio-economics, and institutional aspects of agriculture. ARTI is the only major state organization in this area and has the largest group of socio-economists in the country. It is organized into four research divisions: Agricultural Planning and Evaluation, Production Economics and Extension, Irrigation, Water Management and Agrarian Relations, and Market and Food Policies. The director is assisted by two deputy directors, and each division is headed by a research and training officer.

The budget is received through the MADR, but is at the disposal of the director for programs agreed upon by its board. The budget covers only staff and institutional costs. All program operating costs must be obtained from other sources. Hence the program consists mainly of contract work for development projects which provide funding.

SUGARCANE RESEARCH INSTITUTE (SRI)

Research on sugarcane was carried out by the Sri Lanka Sugar Corporation prior to 1981, following on the work being done in the mid-1940s by DA. The basic agronomic and disease control practices had been established for two small production areas. Production from these areas amounts to 10 percent of the estimated annual sugarcane consumption of 250,000 tons.

In order to increase sugarcane production and to recognize the need for research support if this industry is to expand into new areas under both irrigated and rainfed conditions, the government has established the autonomous Sugarcane Research Institute by an act of Parliament passed in 1981. SRI is controlled by a board of five members: the Director of the national Institute of Plantation Management (chairman), the Director of Agriculture, representatives of the Faculty of Agriculture, University of Peradeniya, the Chairman of the Sri Lanka Sugar Corporation (ex-officio), and a representative of the Ministry of Finance and Planning. Germplasm has been collected for breeding purposes at several research stations. Linkages have been established with the sugarcane breeding institute at Coimbatore, the sugarcane institute at Mauritius, the United States Department of Agriculture, and the Canal Point Research Station in the United States. A detailed plan for the development of SRI has been drawn up, including provision of facilities for research on sugarcane production and in-mill technology.

It is expected that most research on the crop will be of an adaptive nature because the basic agronomic requirements of cane are known, and Sri Lanka does not have any unusual pest or disease problems. Some breeding work may be needed, but initial emphasis will be on collection of varieties from other countries (subject to adequate quarantine safeguards) for testing under Sri Lankan conditions.

MINISTRY OF LANDS AND LAND DEVELOPMENT (MLLD)

Land-use policy and planning, and settlements, especially in the large irrigation schemes, are the main responsibilities of this line ministry. Two departments under this ministry carry out small research programs in addition to irrigation research on the engineering aspects of water management.

FOREST DEPARTMENT

The Forest Department's main task is to provide services, resource management and planning, and advice. It has a small research unit, which concentrates on studies of botanical characteristics of indigenous species and management of natural forests. Since 1954, the forest cover has been rapidly depleted, and replanting with fast-growing exotic species has been undertaken. Research on silvicultural practices for species grown in pure stands has also been started in recent years. Research staff depend on the cooperation of the conservators of forests in all this work. The activity of

this department includes forest management studies, which range from watershed management practices to preventing siltation of large tanks, provision of fuel wood for new settlers, and community forestry projects to provide local sources of fuel, poles, and timber.

IRRIGATION DEPARTMENT

The Irrigation Department is mainly concerned with the supply of irrigation water for crop production. The Land Use Division of this Department is responsible for the national soil survey. The Irrigation Department carries out research in two areas: designing of water supply structures and land capability surveys, and in land-use, planning, and establishment of a rational land-use policy. The Irrigation Department conducts some research on in-field water management, supported by grants. Linkages have been established with MADR and the Ministry of Mahaweli Development to identify the research problems in some areas.

Strengthening of the research capacity of the Irrigation Department, so that it may interact effectively with the newly formed International Institute of Water Management, is under consideration.

MINISTRY OF RURAL INDUSTRIAL DEVELOPMENT (MRID)

MRID is responsible for the overall development of the livestock and small industries sector. In the livestock sector, its activities are the direction and supervision of the Department of Animal Production and Health, the National Milk Board, the Ceylon Oils and Fats Corporation, the National Livestock Development Board, the Livestock Development Division; formulation of a Livestock Development Policy; preparation, implementation, monitoring, and control of plans for the livestock industry; provision of supporting infrastructure and services; and regulatory activities; and promotion of research and extension on livestock production. These activities, which constitute about 90% of the work of MRID, are under the direct control of the MRID secretary. An additional secretary is responsible for the small industries sector. The need for a strong planning unit has been recognised, and donor support for its development has been secured.

DEPARTMENT OF ANIMAL PRODUCTION AND HEALTH (DAPH)

Research undertaken by MRID is located in DAPH. Adaptive research is done in association with several

development projects. This department is headed by a director and has the following divisions: Animal Health and Extension; Animal Breeding; Education, Training and Information; Livestock Farms; Livestock Development; Research; Administration; Accounts; and Engineering.

RESEARCH DIVISION

Research staff of this division are concentrated at the veterinary research institute at Gannoruwa. The division is responsible for the vaccine laboratory, the animal virus laboratory, and the regional veterinary investigation centers. The veterinary research institute has seven subsections: pasture and fodder crops, animal nutrition, animal breeding, bacteriology, parasitology, and reproductive disorders. Linkages have been established with veterinary officers who are responsible for advising farmers and extension workers on livestock production. The research program is heavily biased towards animal health. The small amount of work on pastures and feeds overlaps with work being done in the University of Peradeniya and the Department of Agriculture of MADR. At present, there is no formal mechanism by which appropriate research programs can be formulated jointly by MARD and MRID, the ministries responsible for research on crops and livestock.

MINISTRY OF PLANTATION INDUSTRIES (MPI)

MPI is responsible for plantation crops other than coconut and sugarcane. The two main export crops, tea and rubber, are each served by a long-established specialist commodity research institute. There are differences between these research organizations, primarily because of the difference in the structure of production in the two industries. The boards and officers responsible for the tea and rubber industries come under the secretary of MPI. Operationally, however, the industries are controlled by boards established by acts of Parliament.

Legislation also provides the basis for funding the research institutes through cesses on exports. The boards are largely autonomous in their day-to-day operations, within the general policies established by the group consisting of the ministers of Finance and Planning, Plantation Industries, and Trade and Shipping.

TEA BOARD

The Tea Board is directly responsible for the Tea Research Institute, Division of the Tea Commissioner,

and the Tea Promotion Bureau. It is indirectly responsible for the tea small-holders development authority (SHDA), for which it provides funds. TSHDA, which has its own board distinct from tea board, is a semi-autonomous unit. The Tea Research Board, which assists the Tea Board in the control of TRI, consists of three research scientists, two representatives of the trade (brokers or exporters), and one representative of the private estate sector.

TEA RESEARCH INSTITUTE (TRI)

The Tea Research Institute was established at St. Coombs Estate, Talawekele, by the tea industry itself. As a consequence, it has developed as an integral part of the industry, with the producers playing a major role in determining research policy and in carrying out part of the work at minimum cost to the institute. Until recently, 12 of the 18 members of the management committee were drawn from the industry.

TRI is responsible for research on production and processing of tea. Its advisory responsibilities are limited to estates of more than 50 acres.

TRI also assists the TSHDA. Funding is provided directly by the Tea Board on the basis of the cess on exports. Linkages with other research units in Sri Lanka are mainly on an informal basis, but TRI obtains funds from DMELC for work in mid-country areas, for growing pepper as an inter-crop.

Programs are drawn up by senior scientists, and after agreement with the Director, they are submitted to the Tea Board for approval.

TEA SMALLHOLDER DEVELOPMENT AUTHORITY (TSHDA)

Its main activities are the provision of processing facilities and buying green leaf for processing in its own factories. TSHDA also administers all grants and improvement schemes for tea smallholders and provides advice on production.

RUBBER RESEARCH BOARD (RRB)

The Rubber Research Board is responsible for research and advisory services on production and processing of rubber. The members of the Rubber Research Board are chosen to represent specific interest groups. The composition of the RRB is as follows:

- Chairman elected by the members;

- Director of RRI (ex-officio) Vice Chairman;
- Director of Agriculture;
- Rubber Controller;
- One member of the National Assembly (usually from the rubber districts);
- Two members nominated by the Planters Association;
- Two members nominated by the Low-country;
- Producers Association;
- One member nominated by the Minister of MPI to represent the smallholders;
- Deputy Secretary to the Treasury of his representative.

RUBBER RESEARCH INSTITUTE (RRI)

RRI operates directly under RRB. The director and the staff of RRI develop research programs, and RRB exercises a monitoring and evaluation role through program reviews at two- to three-year intervals. These reviews are carried out by groups outside RRB. Research activities are funded by the cess on rubber exports, which is paid directly by the Customs Department to the RRB.

MINISTRY OF COCONUT INDUSTRY (MCI)

MCI is responsible for the industry as a whole. The Coconut Development Authority (CDA), which is under MCI, has a board of five full members and four observer members. The secretary of MCI is chairman of the board. The observer members are ex-officio, but the full members are nominated by the minister and act in their individual capacities. The work of the CA in relation to production and research is split between the Coconut Cultivation Board (CCB), which is responsible for the advisory and extension service and the administration of development schemes; and the Coconut Research Board (CRB), which is responsible for research on production and aspects of processing. CDA itself carries out some research work on processing and product development.

COCONUT RESEARCH INSTITUTE (CRI)

There are subcommittees of the board of CRI for research, administration, and estate management. The research subcommittee has six members: the chairman and one other from CRB; the general manager of CCB; a representative of Janatha Estates Development Board (JEDB); and the director and deputy director (Research) of CRI. This subcommittee is responsible for planning, programming, and monitoring the work of CRI.

The main station of CRI is located at Lunuwila, in a

major coconut-growing area. CRI has nine outstation units, four of which provide appropriate sites for the general program. The other outstation sites are specialist units:

- parasite breeding station for work on biological control of pests;
- adaptive research farm, mainly for work on inter-cropping;
- a unit of three farms on the east coast for work on agronomy in the dry zone;
- a nursery in Colombo for the sale of plants;
- a seed garden for the production of improved planting material.

Funds are allocated on an annual basis from the ministry to CRB, which operates essentially as a department within a line ministry in budgetary matters. The budget of CRI is, therefore, less stable than that of TRI or RRI, which depend on cess contributions.

MINISTRY OF FISHERIES (MF)

MF is responsible for overall development, regulation, and control of marine and inland fisheries, fishery harbors, handling of the catch, and coast conservation. Research is carried out by the National Aquatic Resources Agency (NARA), within MF. It is a semi-autonomous unit established by an act of Parliament in 1981. The fisheries research branch and the Institute of Fish Technology form the nucleus of the organization.

NATIONAL AQUATIC RESOURCES AGENCY (NARA)

NARA is controlled by a board, of which the secretary of MF is the chairman. This board is responsible for general policy guidance and for provision and control of funds. Current research programs of NARA reflect the broad national policies:

- maintaining the present off-take, which represents about 60 to 70 percent of the estimated sustainable catch from inshore fisheries, and maximizing the proportion of the marine catch used directly for human consumption;
- developing the considerable areas of fresh and brackish water which are not fully exploited at present;

- exploring and responding to market opportunities, including some overseas, for other aquatic production; e.g., exotic fish for aquaria, and shrimp from brackish waters or produced in special cultures.

MINISTRY OF HIGHER EDUCATION (MHE)

There are five main units concerned directly with agriculture, and animal health and production, within the university system:

- Faculty of Agriculture, University of Peradeniya;
- Faculty of Veterinary Medicine and Animal Science, University of Peradeniya;
- Faculty of Agriculture, University of Ruhuna;
- Faculty of Agriculture, University of Batticaloa;
- Post-graduate Institute of Agriculture (PGIA), Peradeniya.

Funding for teaching in the universities comes from the University Grants Commission. MHE funding for research is quite inadequate; research, therefore, depends largely on external funding from either NARESA or abroad. Funding for training at PGIA comes from several sources, including DA, which sponsors members of its own staff.

THE OFFICE OF THE PRESIDENT

NARESA, which was constituted by an act of Parliament in 1981, is the only unit in the research complex in Sri Lanka that reports directly to the President.

The main objectives of NARESA are to advise the president on policies concerning science, national resource development, and energy; to initiate and sponsor research in these areas; to collect and disseminate information; and to study and report on matters of importance regarding science and technology, natural resources, and energy. NARESA has a governing board¹ comprising the director general, who is chairman, and ten members appointed by the President from a wide range of mainly scientific and socio-economic disciplines. There are ten working committees in the various areas of NARESA's responsibility.

The main activity of NARESA in agricultural research so far has been the channelling of funds to priority research areas, in response to specific requests from staff in public-sector institutions. These grants are made from local resources or from funds provided by donors for specific purposes.

WEAKNESSES OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM

The existing agricultural research system in Sri Lanka is recognized to be adversely affected by: weak linkages between policy makers, producers, and researchers; inadequate channels of communication within the line ministries between policy makers and research institutions; absence of a forum to develop national research priorities; inadequate level of operational funds and low ratio of support staff per scientist; low funding level for livestock, forestry, fisheries, and minor export crops; lack of a systematic manpower training program; restricted use of program budgeting among research institutions; insufficient emphasis on research areas that need participation of more than one ministry or research institution.

With a view to rectifying these weaknesses of the agricultural research system, a World Bank-funded agricultural research project is due to commence with the following major objectives:

- to improve the capacity of the national agricultural research system in facilities and trained manpower, and to develop systematic manpower planning in agricultural research;
- to procure realistic funding for research institutions to match the broad requirements of the national agricultural research efforts;
- to promote inter-institutional coordination of national agricultural research by improving linkages among

research organizations to establish national research priorities and a national agricultural research plan;

- to develop mechanisms for agricultural research to contribute to national planning and policy-making in a regular and purposeful way;
- to improve the process of formulation and articulation of research programs and to improve the administration and financial procedures in agricultural research management.

Under this project, a council for agricultural research policy (CARP) is to be established for research coordination and planning. CARP would be established by an act of Parliament.

The functions of CARP will be mainly advisory, but it will have executive authority for allocating funds for certain inter-ministerial research programs of national importance; post-graduate training for agricultural research staff; for conferences, workshops, and other activities on national, international, or inter-institutional agricultural research issues.

SUMMARY

The national agricultural research system in Sri Lanka is complex, with research functions dispersed over several line ministries and the Office of the President. Several modes of governance exist among the different organizations. Research-extension-producer linkages appear to be relatively more effective in the line ministries than in other institutions.

AGRICULTURAL RESEARCH IN TOGO: ACHIEVEMENTS AND PERSPECTIVES

T. Aithnard and Nguyen-Vu
(Excerpts)

BACKGROUND

Agricultural research in Togo started with French specialized research institutions: the Research Institute on Cotton and Textile Fibers (IRCT) at Kolokope in 1949, the French Institute for Coffee and Cocoa (IFCC) at Kpalimé in 1967, the Research Institute on Tropical Agriculture (IRAT) in 1972.

In 1979, national agricultural research in Togo was reorganized with the setting up of ten specific research institutes, one of which was the Directorate for Agricultural Research.

AGRICULTURAL RESEARCH POLICY

The fourth Plan for Social and Economic Development (1981-1985) sets the priority given to agricultural development, to reach self-sufficiency for food crops (cereals and roots) and for animal products (particularly animals with a short cycle).

Since 1985, the constant worry of the government has been to reach the set objectives. For this, a reorientation of activities and means has proved to be necessary. The New Strategy for Rural Development is targeted to produce, before the year 2000, an improvement of the farmers' quality of life, through increases in productivity and agricultural production. This includes agricultural research, which is in charge of the national seed program, the production of pre-selected seeds, and the control of selected seeds.

Better links must be established between research and development, and research programs more focused on production systems.

ORGANIZATION OF RESEARCH

In Togo, agricultural research is not controlled by a single ministry; it is shared between four ministries.

A distinction is established between institutions having conventional bilateral financing, semi-autonomous, and national institutions with full national financing, or benefitting from some special financing agreement for specific programs.

The only institution having entirely foreign financing is the French Institute for Scientific Research for Cooperation in Development (ORSTOM).

The Ministry of Rural Development (MDR) covers 60 percent of the research programs and has seven institutions, three of which deal with food crops.

The Ministry of Rural Installations (MAR) has two institutions.

The Ministry of National Education and Scientific Research (MENRS) has two institutions.

The Ministry of Trade and Transportation has one directorate (agro-meteorology).

To reduce such a dispersion, and to increase research efficiency, a project for restructuring agricultural research is currently under study.

FINANCIAL RESOURCES

An analysis of agricultural research budgets for 1980-1986 indicates a small rate of annual increase in the

fraction allocated to operations and salaries, compared to capital investment. This corresponds with the government's desire to promote agricultural research by creation or reinforcement of research installations.

However, qualified, experienced researchers are always in short supply, and operations need better financing.

The total 1984 budget was 1171.37 million francs CFA, of which 205.53 were for capital expenses, 261.13 for operations, and 704.69 for salaries. The sources of finance were: external 538.25; national 558.87. The total budget represents approximately 1.5 percent of the gross agricultural product. The yearly increase of budget exceeds nine percent. The main expense item is salaries, with about 60 percent of the total. Capital expenses represent 18 percent, and operation expenses approximately 22 percent of the budget.

PERSONNEL

In 1984, out of a total staff strength of 500 there were 58, administrative personnel, 58 researchers, 132 technicians, 252 support persons. Of the total, 20 were foreigners.

All researchers have a minimum qualification of "ingénieur agronome".

PLANNING AND COORDINATION OF RESEARCH

The National Council of Scientific Research (CNRS) has been reorganized in 1986, with a Program Committee, whose secretariat is provided by the Directorate of Scientific Research, in charge of coordinating and programming national research, including agricultural research. A coordinating interministerial committee is currently being organized.

MANAGEMENT INFORMATION SYSTEMS PLANNING IN NATIONAL AGRICULTURAL RESEARCH SYSTEMS

R. P. King

Advances in information technology are changing the economics of information processing and management in organizations of all kinds. In many public and private-sector organizations, the availability of powerful, inexpensive microcomputer hardware and software makes computer-based management information systems (MIS) a realistic possibility for the first time.

That same technology allows organizations with existing computer-based MIS to increase the level and quality of the support those systems provide.

National Agricultural Research Systems (NARS) in Africa, Asia, Latin America, and the Middle East are among the organizations responding to these opportunities. Growing size and complexity in organizational structure and operational activities, increased reporting requirements imposed by donors, and the need for timely processing of larger amounts of scientific data, are among the factors motivating NARS to improve computer-based support for a wide range of activities. With the benefits of increased computerization, however, come new needs that must be addressed by the managers of NARS. These include: the need to develop policies for access to and use of computer resources; the need to provide adequate resources for MIS maintenance, support, and security; and the need to train staff in the management skills required to make effective use of an MIS. Mistakes in dealing with these problems can cause major setbacks in the transition to increased computerization. Careful information systems planning can be instrumental in avoiding such mistakes.

In this paper I present a general introduction to issues related to MIS planning in NARS. My objective is not to formulate a comprehensive framework for MIS planning and implementation. Rather, it is to establish a starting point for discussion of MIS issues, needs, and problems that are shared by all NARS.

DEFINITIONS AND CONCEPTS

A management information system (MIS) is an interrelated set of components – people, processes, and information technology, that function together to provide information needed to support the activities of an organization. An MIS is a support system for storing, routing, and processing information needed by an organization to achieve its objectives. Computerization is not essential in an MIS, but it greatly increases the possibilities for effective support.

Every organization has an MIS, but often it has never been formally described. The components of an MIS may include:

- people, both users and support staff;
- manual procedures for recording, processing, and routing information;
- computer hardware and software;
- models and tools for planning, control, and evaluation;
- databases and written records;
- telecommunications systems.

Together, these components form the infrastructure for information processing in an organization. The functions they help support may include:

- routing and summarizing information within the organization;
- preparing documents and reports for external stakeholders;
- analysis for planning, control, and evaluation;
- maintenance of an "organizational memory".

The effectiveness of an organization's MIS is determined not by the complexity and sophistication of its components, but by the quality of the support it provides.

PLANNING FOR MIS NEEDS

The MIS planning process, as described by Davis and Olson (pp. 447-450), begins with the identification of organizational objectives and goals for information processing, as well as external opportunities and threats that may affect information processing needs. The process continues with an assessment of current capabilities, with the formulation and evaluation of strategic alternatives, and with the eventual selection and implementation of a course of action. The organization and its information processing needs must be the starting point for MIS planning. The planning process should not be driven by questions related to information technology, and it should involve general managers.

Four closely related strategic issues need to be addressed by the managers of NARS as they develop plans for their MIS. The first issue is that of establishing priorities for activities that will be targeted for increased information processing support through the design, development, and implementation of improved application systems. These activities should be important to the organization, and they should lend themselves well to improvements in efficiency and/or effectiveness through changes in computer-based or manual information processing support. A second strategic issue is that of identifying needs for staff training - training that may focus on developing managerial and analytical skills needed to make effective use of improved information processing support, or on familiarizing staff with new technology and procedures for information processing. A third strategic issue is that of determining the degree of computerization being sought for the organization, the type of computer hardware and systems software that will be purchased to achieve that degree of computerization, and the timetable for purchasing new equipment. In effect, these decisions define an equipment selection and acquisition strategy for the organization. The final strategic issue is that of designing policies for the management of the MIS. These should provide guidelines on access to computers and information processing services, and they should define the role, function, and career path for information support personnel.

An MIS planning process that addresses these issues is important because:

- the design and implementation of new procedures and support tools is expensive in both finances and personnel;
- initial investments for equipment and software may be high;

- policies about access to computers and information processing support, once established, may be difficult to change;
- failed attempts to improve an MIS may create almost insurmountable barriers to future changes.

Successful MIS planning is difficult, however, because:

- information needs are complex and technological possibilities are unfamiliar;
- people find it difficult to make formal statements of information needs;
- people are often threatened by the changes associated with new MIS components.

Because of these problems, a number of structured methods for MIS planning have been developed. Among these is the strategy set transformation approach, which is described and illustrated in the next section.

THE STRATEGY SET TRANSFORMATION APPROACH TO MIS PLANNING

The strategy set transformation approach to MIS planning was developed by the author as a method for matching MIS goals and strategies with organizational goals and strategies. Under this approach, the planning process begins with the development of organizational strategies for reaching those goals. Organizational attributes that may affect the MIS strategy are also identified. Attention then shifts to the MIS strategy, MIS goals, factors that may limit the range of strategic alternatives for the MIS, and a set of MIS design strategies, are identified. These are derived from and linked explicitly to the organizational strategy.

The organizational and MIS strategies for a hypothetical NARS that are outlined in Figures 1 and 2 help to illustrate this approach. The organizational goals for this NARS are listed in the left-hand column of Figure 1. Key elements of the strategy for achieving these goals are listed in the middle column of Figure 1. Note that each of these elements is linked to an organizational goal. For example, increased responsibility for program leaders is identified as a means for reducing the percentage of the budget spent for administration. Finally, four organizational attributes that are likely to have an impact on the MIS strategy are identified in the right-hand column of Figure 1. These attributes may be favorable, as is the fact that there is an effective manager in the accounting department, or they may identify potential problems, such as the fact that the organization has very little computer experience.

The MIS strategy for this hypothetical NARS is outlined in Figure 2. MIS goals are listed in the left-hand column of Figure 2. Each is linked back to an element of the organizational strategy or to an organizational attribute, emphasizing that MIS goals are determined by the needs of the organization. For example, the MIS goal of providing management support tools for program leaders is in direct support of the strategy that calls for increasing the responsibilities of program leaders.

Similarly, the MIS constraints listed in the middle column of Figure 2 are linked back to organizational goals, strategies, and attributes. Finally, the MIS design strategies listed in the right-hand column of Figure 2 identify specific actions that can be taken to achieve MIS goals. These include investment in computer equipment, the development of management support tools, the establish of organization structures for managing the MIS, and the training of support staff and users. Each element of the MIS strategy is linked back to an MIS objective or constraint or to an organizational attribute.

Of course, the most difficult challenge for general managers in implementing the strategy set transformation approach is in making the transition from an organizational strategy to an MIS strategy. This approach provides a framework for structuring ideas and for showing linkages between the two strategies, but it provides little direction on how to identify the most appropriate MIS strategy. General managers should have little difficulty specifying MIS goals and constraints, since these are best expressed in terms that are closely related to organizational goals, strategies, and attributes. They will often need the help of an MIS specialist, however, in formulating an MIS design strategy. The job of that specialist will be made much easier, though, with a clear organizational strategy statement and an initial set of MIS objectives and constraints.

IMPLEMENTING PLANNED CHANGES IN A MIS

Finally, even the most carefully formulated MIS plan is of little value if it is not implemented effectively. I will close, then, with three general rules for implementing MIS changes. These are taken from a paper by Calhoun, Drummond, and Whittington that describes their experiences in the design, development, and implementation of a computerized MIS in the Ministry of Finance and Economic Planning in Sudan.

"Equipment: keep it simple" is their first rule. They stress the importance of selecting computer hardware and software that can be installed and maintained under adverse operating conditions. Ease of use, reliability, and

the availability of service and support should be given as much attention during the hardware and software selection process as cost, computing power, and custom features.

"People: training and organization are key", is the second rule for effective transition to increased computerization. Human, rather than technical, constraints often pose the most difficult challenges in the implementation of planned changes in an MIS. In many developing country organizations, manual information processing procedures may not be well established, and clerical and managerial staff may not have the skills needed to make effective use of computer-based application systems. Therefore, well-designed training programs that develop both managerial and computer skills are a necessity. A failure to integrate MIS support personnel into the overall organizational structure—by carefully defining their roles and possible career paths—can also lead to implementation problems. Therefore, consideration also needs to be given to the organizational changes that may need to accompany a planned change in the MIS.

"Technique: developing the computing environment", is the third rule for the effective implementation of planned changes in an organization's MIS.

They note that, in the long term, successful adoption of computer-based management support tools depends on their consistency with the work flow and rewards structure of the organization. Equally important is the need to foster the continued development of an adequate computing support system, not only within the organization but also in the local market. Efforts directed toward integrating the MIS into the organization and toward the development of computing support systems help establish a computing environment that is conducive to continued improvements in the quality of the MIS.

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ORGANIZATIONAL GOALS	ORGANIZATIONAL STRATEGIES	STRATEGIC ORGANIZATIONAL ATTRIBUTES
01. Conduct research that helps improve the quality and stability of the nation's food supply.	S1. Emphasize adaptive research (01).	A1. Experiments are geographically dispersed.
	S2. Use on-farm research extensively (01).	A2. Effective manager of accounting department.
02. Increase real budget by 10% annually.	S3. Increase responsibilities of program leaders for program planning, budgeting, and management (03).	A3. Donor reporting requirements have varied formats.
03. Reduce percentage of budget spent on administration.	S4. Emphasize documentation of program quality and fiscal accountability when applying for external funds (02).	A4. Organization has very little computer experience except in research data analysis.

Figure 1. Organization Strategy for a Hypothetical NARS

MIS OBJECTIVES	MIS CONSTRAINTS	MIS DESIGN STRATEGIES
M01. Provide management support tools for program leaders (S3)	C1. Very limited budget for computers (03)	D1. Expand responsibilities of accounting department to include support for program planning and budgeting (A2)
M02. Improve director general's ability to monitor and coordinate activities across programs (S3, S4)	C2. Report to donors must conform to their specifications (S4, A3)	D2. Hire and train 2 new support staff (M01, M02, M03) – external reporting – PBS
	C3. Few people with computer skills available; private-sector salaries are higher (A4)	
M03. Improve timeliness, accuracy and appearance of reports to external funding sources (S1)	C4. Electrical power supply is unreliable outside capital city (A1)	D3. Purchase 2 personal computers (IBM compatible) for administrative support; locate in capital (C1, C4, M01, M02, M05) – PBS/external reporting for D.G. – budget preparation support for program leaders
M04. Provide support for literature searches by scientists.	C5. Computer maintenance and support services are limited (A4)	D4. Assign statistician to help design data coding forms and procedures for on-farm experiments (A1, M05)
M05. Improve flow of data from field experiments (S2, A1)		D5. Seek external assistance for management tool development, training, equipment purchase (C1, C3)
M06. Work toward greater computerization for management support but start slowly (S3, A4)		D6. Establish MIS planning committee – accounting dept. mgr. and 3 program leaders – to develop long-range plan (A2, A4, M01, M05).

Figure 2. MIS Strategy for a Hypothetical NARS

COMPUTERIZED PROGRAM BUDGETING SYSTEM

R. Devred

A Program Budgeting System (PBS) using a microcomputer is being developed by ISNAR in cooperation with the Institut National de la Recherche Agronomique (INRA) of Morocco. The PBS methodology has been developed through a test run utilizing data of the Saharan Agricultural Research Program of INRA. The test, based on newly designed computer software programs, was successful, and the PBS will be further developed and used by INRA for all of its research program, in cooperation with USAID.

The PBS program accomplishes a number of significant management objectives.

PBS is an essential tool for more efficient use of scarce resources. It is a cost-effective system for managing operational resources through a program of action or a work plan adjusted to available resources. It avoids overprogramming and underprogramming. PBS is a management information tool to better plan, organize, coordinate, and manage human, financial, and physical resources. It helps to better define operational limits in relation to means, concepts, and objectives. PBS makes programs more specific in regard to manpower and cost of expenditures by modules at various levels of implementation (Programs, Projects, Operations, and Experiments) and helps to maintain realistic operational costs, and salary costs. It facilitates making a case for realistic funding of program – elements, guides effective use and disbursement of funds by specific objectives, and makes programs and budgets intelligible to everyone.

PBS procedures forces the formulation of a provisional budget at the beginning of the programming process, helps to build a balanced program of action in line with objectives, targets, and goals given by policy makers, development services, and clients, and includes regular review and periodic adjustments.

PBS is not really new. It is an approach which ensures

intensive participation of all those concerned with research implementation, through a project-based management information system, to facilitate budgeting, to measure activities in quantifiable terms, to calculate time spent by researchers, and to cost all required operational and experimental inputs. It is mainly a tool for managers to quantify research objectives and to measure how effectively resources are used, to match resources with objectives, and to apply feedback in the planning and program formulation process.

A Project Data Sheet, an Operation Data Sheet, and other support for recording data were explained during the meeting, together with detailed methodological procedures for feeding the computer software data base through a coding manual.

The computer equipment used is the standard IBM PC, XT, or any similar compatible computer that can readily be purchased by any NARS today.

The basic software is a dBase III system (Ashton Tate) which is a market leader with a wide range of add-ons and upgrades available, and is capable of aggregating or disaggregating different types of data. User-friendly, it is designed so that any individual already familiar with the use of a microcomputer can work after a day of training.

Computer printouts are available for different breakdowns of research activities aggregated by activities, operations, projects, and programs. The use of a microcomputer allows any data (objectives, targets, manpower, costs, etc.) to be tracked and retrieved at different levels of aggregation or disaggregation.

Different cross-sections of data can be provided, depending on the combination of variables requested by users; in particular, policy makers, planners, managers, scientists, and farmers.

Breakdowns of manpower time or cost, as well as direct operational costs, given in real figures, relative percentages, or block-diagrams, can be provided by commodities, thematic or systemic programs, by field of specialization, by discipline, by development or research objectives, by client groups or by research workers.

Breakdowns can also be provided for regional stations, geographic or natural regions, by any sort of linkages with other research or development projects, as well as by specific budgetary items.

The PBS is only in its first phase of development. It will be refined by using it in different NARS. The PBS can be tailor-made to fit any specific NARS administrative system.

PBS is a powerful tool for improving planning, program formulation, program review, monitoring and evaluation, and for facilitating program implementation and program resource management. It allows managers and scientists to efficiently use resources and time, to monitor and control financial resources, to quantify research and development objectives, to argue with policy makers and planners, to justify funds and facilitate their disbursement, and to control as well as to use scarce resources in the most cost-effective way. However, PBS is only a method; it will never be a substitute for experienced and dedicated scientists.

PLANNING AND PROGRAMMING IN MOROCCO

H. Faraj

I would like to briefly comment on programming by objectives.

JUSTIFICATION OF PROGRAMMING BY OBJECTIVES

The reasons fall into two categories. Some reasons are of a structural order; other reasons are linked to our present situation.

Among the structural factors, we find the analysis and constant criticism that users of research – farmers, professional organizations, services of the Ministry of Agriculture – voice every time the role of agricultural research is discussed: “research is searching for itself”; “research results are not useful to farmers”; “research is done in theory”; etc. Overall, the significance of research is neither perceived nor felt.

The second structural factor results from observations that have been made concerning the internal operation of the institute, observations also mentioned in the ISNAR report. In particular:

1. Mechanical repetition of experimental protocols from one year to the next;
2. Lack of interpretation and analysis of experimental results. The field stations are required to accumulate observations, measurements, figures and, finally, a decision is made on the basis of a very summary statistical interpretation, whether the result is significant or not. Plant phenology, the stresses incurred during the vegetative cycle, the environmental parameters, are but rarely taken into account to obtain an exhaustive interpretation of experiments and to reorient work for the following year;

3. Priority objectives are not precisely defined, which leads to dispersion of manpower and finances, in short supply almost by definition;
4. Researchers and scientists regularly complain about the lack of resources; even if they have no tools to evaluate, and no facilities to manage;
5. An all-too-evident lack of communication appears between various complementary research operations.

Overall, these findings would indicate a need for controlling the situation by establishing, on one hand a double contract between scientists and research managers, whereby the research objectives would be balanced, and the resources allocated to researchers; on the other hand, a contract, defining the mission and authority of INRA, between INRA and political decision-makers.

Worthy of note is a series of events which have initiated the implementation of programming by objectives, and particularly the fact that Moroccan agricultural research changed its institutional type by becoming a public institute, endowed with legal status and financial autonomy.

A structural change is a unique occasion for accelerating evolution, an occasion which will not occur again for a long time, in view of the inertia inherent in any administration.

To this should be added the fact that the average age of researchers is comparatively rather low, and that many of them have been trained or are in the process of being trained in the USA, which predisposes them to accept the method of programming by objectives.

EFFECTS OF PROGRAMMING BY OBJECTIVES

The work on programming by objectives has begun. The end is not yet in sight. Nevertheless, several very positive results can already be mentioned.

The beneficial effects of this programming by objectives, associated with a computerized financial control, result from one fundamental fact: researchers are compelled, when developing their programs, to take into account two factors, the number of man-years and the financial resources necessary to complete their work.

Taking man-years into account has, by itself, the following five consequences:

1. Hierarchizing research operation within a discipline.
In this respect, it should be recalled that, in previous programming efforts, man-years were not limited, which resulted in researchers proposing an almost unlimited spread of research operations, covering all aspects of the problem at hand. But when the researcher knows that, during the year, he will have to spend time for bibliography, time for tests, time for missions, time for interpretation, and time for report writing, he is bound to choose, among the various research operations, those that should benefit from priority, and will allow him to reach his stated objective.

The researcher is, thus, led to consider himself as a factor in the technological creation process, which automatically results in a better grasp of realities;
2. Allocation and authority conflicts, which used to continuously crop up between researchers in the same discipline, or in adjacent disciplines, have been reduced when it has become known that no researcher could supervise more than two or three research operations;
3. The fact that work is conducted with a common development objective, in a limited time frame, results in that the input of complementary disciplines is not only tolerated, but rather solicited, which improves coordination between the various research operations;
4. The result of taking into account the time factor, not only for the research operation, but also for the research program, is that research evaluation is facilitated. A research operation or project begins on

one date and terminates at another date. Hence, every researcher knows that he cannot repeat the comment "Research in progress" year after year. On the contrary, that he is bound to respect a time limit at the end of which a precise report will be requested;

5. Time evaluation has shown that researchers are in short supply, and we have associated the contribution of researchers to the activities of other institutions, particularly schools and universities.

Generally speaking, programming by objectives has resulted in the elimination of walls between research units.

The second important factor, when programming by objectives, is the taking into account of financial evaluation. It has triggered and encouraged all previous initiatives to elaborate a budget based on norms, and hence to obtain a more realistic appreciation of the resources necessary for research.

It has also sensitized researchers by reason of their involvement in the analysis of necessary resources, and in the cost of operational inputs.

THE PATH TO PROGRAMMING BY OBJECTIVES

Two successive approaches have been followed. The first consists of a long-term master plan over ten years. It proved very difficult to implement because of bottlenecks which impeded the operation of the institution.

Nevertheless, this approach allowed a precise enough definition of the large research sectors and of the corresponding priorities.

Since the ISNAR mission, it has been decided to develop programming by objectives starting with the existing situation and the existing researchers. It should begin with an analysis of the costs of operational inputs and their introduction into software. Many sectors have been processed, but it has been decided to input into the computer the case of Saharan agriculture, chosen as a test.

I would like to add that a new organigram has been established, in which a specialized unit will be in charge of programming. New statutes are also introduced, conferring specific responsibilities and remuneration to program heads.

PLANNING AND PROGRAMMING AGRICULTURAL RESEARCH IN MADAGASCAR

V. Raharinosy and C.P. Ravohitrarivo

HISTORICAL PERSPECTIVE

Scientific and technological research in Madagascar went through two distinct periods. The first period covered the years preceding 1972. It was mainly characterized by dependence on foreign specialists. Many fields of research were entrusted to French independent organizations, which conducted research programs with government participation. For agricultural research, such was the case of the National Geographical Institute (IGN), Pasteur Institute, and National Laboratory for Public Works and Buildings (L.N.T.P.B.). Other totally independent institutions, such as the Office for Overseas Scientific and Technical Research (ORSTOM), and the Office of Mining and Geological Research (BRGM), were conducting research, with practically no control from the government.

The second period is characterized by the search for identity and for adequate structures, with the objective of exploiting national research potentialities. The practical implementation of this policy evolved through four stages:

- a. In 1974, agricultural research institutes were nationalized, as well as IGN and ORSTOM. Only the Pasteur Institute went without any modification. The system is ruled by Decrees 74-180 and 74-181 organizing an Interministerial Committee for Scientific and Technical Research, thus defining the role of the Directorate of Scientific and Technological Research (DRST);
- b. In 1976, the Ministry for Scientific and Technical Research (MRS) was created to coordinate research activities in these centers and in research organizations using public money;
- c. In 1977, in view of the particular importance of

university research, and the extent of research activities in centers and organizations, a single ministry, the Ministry of Higher Education and Scientific Research (MESUPRES) was placed in charge of general management of the system;

- d. In 1983, the status of scientific research was redefined. It should be associated with development. The implementation of this policy has been entrusted to the Ministry of Scientific and Technological Research for Development, created by Decree 83-353 of 21 October 1983.

That is how research came to occupy its present place, at the level of general development strategy and macroeconomic perspectives, in the following sectors:

Agricultural sector

- to rehabilitate large production units and agro-industrial complexes;
- to restore a physical and economic environment conducive to a resurgence of production;
- to reutilize the existing productive potential.

Industrial sector

- to reinforce existing priority industries through an adequate policy of rehabilitation, modernization, and extension;
- to conduct systematic research so as to maximize the value of available national resources, leading to food self-sufficiency and energy independence.

Social sector

- to improve quality of life in the population,

particularly as regards health, education, security, information, culture, leisure, housing, employment.

SCIENTIFIC AND TECHNICAL POLICY

1. Research strategy

This strategy is defined through integration of research into the main options of national development.

It is characterized by:

a. its objectives

- food self-sufficiency;
- development of export crops;
- utilization of natural resources;
- improving quality of life;
- developing adapted or appropriate technology;
- integrated regional development.

b. its ways and means

- creation of services for coordination, evaluation of results, utilization of acquired results;
- constitution of multidisciplinary research teams;
- institutionalization of linkages between research and development;
- optimal use of resources;
- improvement of scientific equipment.

2. Medium-term scientific policy

Taking into account the main options in scientific research and research strategy in Madagascar, a suitable scientific policy is a medium-term necessity. It will apply at three levels: ministry, institution, professional.

Ministry level

It embodies:

- an inventory of techniques and technologies transferred to each sector or channel, and problems met in applications;

- the centralization of programs;
- an inventory of personnel and of scientific equipment;
- the statutes for researchers and diploma equivalency;
- the rotation of foreign researchers;
- relations with foreign institutions;
- financing of research.

Institution level

A medium-term scientific policy requires:

- a re-examination and an actual reorientation of center activities, under the supervision of the Ministry for Scientific and Technological Research for Development (FOFIFA, CNRO, CNRP, Department of Geophysics, of Medical Entomology, of Hydrology), as regards scientific, management, and organization activities;
- a reinforcement of centers, characterized by:
 - training and recruitment of researchers and technicians according to programs defined by the General Directorate of Plan (DGP);
 - procurement of laboratories and scientific equipment;
- a coherence of research through creation of a documentation center to improve the flow of scientific information;
- an examination of options concerning fields of research not covered by existing national research centers (universities, development institutions);
- dynamic programming ensured by:
 - continuing active projects;
 - setting up new projects considered to be priority projects;
 - reinforcing the evaluation system and monitoring.

Professional level

The scientific policy aims to:

- protect results for researchers active in public

institutions, as well as for researchers of the private sector;

- communicate results through publication in scientific magazines, periodicals, etc., and even through direct demonstration;
- acquire financing (counterpart of large development projects).

Finally, the following must be emphasized:

- Important options are still to be decided concerning the creation of new centers or extending the scope of existing centers.
- Of fundamental importance are training and recruitment of high-level researchers and technicians, on the one hand, and rehabilitation of laboratories and scientific equipment, on the other hand.
- The main sources for financing research are in the national budget, which must be completed by the contribution of economic products and by an effort at self-financing on the part of the centers.

3. Progress made

At the institutional level

The following initiatives have been approved:

- restructuring of the principal center of agricultural research (CENRADERU/FOFIFA);
- creation of various consultative boards to improve the linkages between research and development.

At the research management level

- implementation of a system to recruit and train researchers;
- implementation of dynamic programming:
 - in 1983, selection of active research programs, not as a function of program objectives, but based on existing resources, particularly financial;
 - in 1984, priority-setting of programs based on six objectives previously fixed, emphasizing integration of research into development;
 - in 1985, centralization of all research programs

conducted by the various institutions under supervision of the Ministry for Technological and Scientific Research for Development; implementation of a system of evaluation and monitoring, both technical and financial;

- in 1985, setting up of a Research Master Plan concerning agricultural research in the first place.

At the external cooperation level

- establishment of conventions to define fields and modalities of cooperation with various foreign institutions (ORSTOM, CITAID, CNRS), the Memoranda of Understanding having been signed in June 1986;
- financing and implementation of research programs, either bilateral or multilateral, depending on research needs.

At the transfer-of-results level

- publication of periodicals (biological sciences series);
- involvement of research in extension. Pilot zones are Lake Alaotra and South East.

RESEARCH MASTER PLAN

Once research policy is defined, its implementation requires setting up a plan must not only consider immediate problems, but also trace new paths and open new horizons. This requires a judicious balance between short-term and long-term research.

1. Objectives

The Master Plan has set objectives which define the attributions of the Ministry for Technological and Scientific Research for Development on questions of research.

These objectives are:

- research orientation;
- research efficiency within the frame of available financial resources;
- credibility of researchers;
- accelerating implementation of necessary institutions;
- coordination of in-country activities and usage of the various external funding sources.

2. Means

These consist of:

- possession of social and economic basic documentation (statistics, various published studies, scientific information, etc.);
- creation of various boards:
 - consultative;
 - for monitoring;
 - for evaluation.

3. Master Plan for Agricultural Research (FOFIFA)

There is no need to stress the usefulness of a master plan for Agricultural Research, particularly in a country like Madagascar, which has chosen agriculture as the basis for development, and food self-sufficiency as one of its principal objectives. The existence of a suitable research structure, oriented to the main national options and adapted to the country's natural and human resources, will in great part contribute to the development of agricultural production and, consequently, to the attainment of food self-sufficiency.

The Master Plan for Agricultural Research will endeavor to implement the established principles of the technical and scientific policy, and will result from a realistic and systematic study of the constraints and potentials of the agricultural sector in Madagascar.

AIMS OF THE MASTER PLAN FOR AGRICULTURAL RESEARCH

- specify an agricultural research strategy based on a clear definition of research objectives and priorities;
- identify research themes and activities they generate, per product (vegetal, animal, or forestry);
- propose eventual structural modifications of agricultural research institutions, particularly FOFIFA, to allow implementing the research strategy;
- propose mechanisms for developing efficient linkages between research and extension services and other institutions (SOMALAC, FIFABE, etc.);

- propose a national information system to disseminate research results and extension themes, to reach the set objectives;
- prepare, for agricultural research institutions, a long-term plan for staff training, including satisfactory procedures for recruitment and promotion;
- define eventual mechanisms for coordinating research with other countries, to avoid duplication of efforts and to facilitate the exchange of information on research results.

In a word, the Master Plan will endeavor to:

- define an agricultural research long-term strategy;
- determine the policy of transfer.

INITIATIVES FOR IMPLEMENTING AND DEVELOPING THE MASTER PLAN

The Ministry for Technological and Scientific Research for Development is responsible for preparing the Master Plan for Agricultural Research. However, since programs will have to be adapted to national priorities and to the real needs of users, the main institutions interested in agricultural research will also participate in the development of the Plan. Besides, the methodology adopted should be adequate to identify agricultural development problems, at the national level, at the regional level, and per main lines of production.

Initiatives for Implementing

Initiatives for implementing will be considered in an overall planning option, linked with techniques of regional and sectoral planning. They concern:

Global planning

- study of the present place of the agricultural sector in Madagascar's economy;
- analysis of the long-term situation of agriculture:
 - determination of agricultural development objectives;
 - identification of agricultural development priority problems;
- identification of development problems solvable through research;

- analysis and proposal of the modes of intervention of foreign support sources;
- analysis and proposal of local financing sources:
 - * national budget;
 - * other funds;
 - * self-financing;
- proposal of projects for institutional reinforcement of research organizations:
 - * organization, management;
 - * linkage of research/extension;
 - * information system to disseminate results (national, international, etc.);
- determination of priority criteria to be taken into consideration when selecting research programs.

Regional and sectoral planning

- collection, synthesis, and exploitation of documents and data on agricultural statistics, per homogeneous regions and per main products;
- setting up the balance of research results;
- identification of main agricultural development priorities at the regional level;
- identification of the main farming systems, due account being taken of constraints, limiting factors, and potentials;
- identification of development problems in farming systems, solvable by research;
- identification of research solutions (research program).

IMPLEMENTATION BODIES

Two bodies are created to implement the Master Plan:

- an Interministerial Committee, composed of high-level decision makers, representing the various ministerial departments interested in research; its function is to supervise, arbitrate, and approve the Plan;

- an Interministerial Working Group; its members are chosen on the basis of their competence and experience; it deals with technical implementation of initiatives; its members are:

- * a specialist on financial and budgetary questions;
- * a specialist in agricultural and economic planning;
- * an economist or an agronomist specializing in farming systems, or a high-level representative of extension services;
- * an administrator, or a specialist in management;
- * an agronomist specializing in research.

The Working Group is supported by three consultative boards, composed of technicians specializing in the various areas concerned (rice, other food crops, industrial crops, animal health, forests). These boards will have to give their advice on evaluation, programming, and financing of research, among others.

The setting up of the Master Plan, initiated at the beginning of 1986 with an evaluation of research, is planned to be completed at the end of 1987. It will be followed by an international symposium on agricultural research, and by the implementation of the first quinquennial program.

AGRICULTURAL RESEARCH MANAGEMENT AT THE LEVEL OF FOFIFA/CENRADERU

As previously mentioned, before 1974 an important part of agricultural research was conducted with the participation of French research institutions each having its own objectives. The priority objectives were:

- satisfaction of the intellectual interests of researchers (publications, theses);
- research on export crops, in support of companies and large farmers.

In 1974, nationalization of research resulted in the creation of FOFIFA, a national organization regrouping and following on seven French institutions (IRAT, IRCT, IRHO, IMVT, CTFT, IFCC, IFAC). Except for some programs of immediate practical utility, requested through agreements by support beneficiaries, in view to study feasibility of various projects, research continued

on most of the themes initiated by the seven institutes. This was due to two main reasons:

- Many research activities were active at the time of nationalization. Besides, all were interesting from a scientific point of view;
- Nationalization of research has provoked, at the users (farmers and extension) level, the formulation of problems and needs until then not studied in their real aspect. The lack of programming, the insufficiency of financial resources, and the shortage of research staff, combined then to give agricultural research a low efficiency and a low level of recognition. This is why it was decided to restructure FOFIFA, as per Decree 83-123 of 5 December 1983.

PRESENTATION OF FOFIFA

FOFIFA, a unique institution in agricultural research, is a public establishment with industrial and commercial activities, managed by a board of trustees and a director general. Under the director general, there is a scientific directorate supervising eight departments, and an administrative and financial directorate supervising four departments. There is also an expert in programming. Also reporting directly to the director general, there is a documentation service, and a computer and biometrics service.

BASES FOR MANAGEMENT POLICY

The deficiencies previously observed in the center were inherent to the lack of programming and coordination:

- walls between the various research departments, and even between disciplines in one department;
- isolation between research and its environment;
- sectoral design of programs;
- pursuit of research without considering available means and possibilities.

The bases of a research management policy by FOFIFA rest on the implementation of an efficient programming system, to allow evaluation and monitoring of programs, as well as promoting of results.

Programming covers three main fields:

- research subjects;

- recruitment and training of research staff;
- necessary technical and financial procure.

Besides, it will aim at:

- coherence between objectives of research subjects, and the objectives of the national development plan;
- compatibility between human and material possibilities, and the needs of research;
- coordination, now a necessity, between the various research themes studied in the departments and the regional centers.

Finally, keypoints of this programming are:

- a clear definition of objectives and expected results;
- an objective estimate of implementation schedules;
- an optimal use of available means.

CONSTRAINTS AND MEANS

This programming imposes taking into account two major constraints:

- the necessity to consider interdisciplinarity, for an integrated approach to research subjects, in view of a real economic development, and the aspirations of the various regions of intervention;
- the availability of means (which can hamper the good development of research work) to ensure that different means can be used, essentially belonging to one of two groups. The first group includes recruitment and training, so as to reinforce scientific potential. The second group includes equipment, so as to provide the center with appropriate physical means.

PRIORITY CRITERIA

This programming leads to the establishment of program priorities.

Selection and priority-setting of programs is based on criteria, which for the time being can be:

- relations between project and development priorities;
- level of competency, and level of motivation, of researchers;

- degree of rationalization in attaining objectives;
- time needed for obtaining results;
- scientific and practical interest of work;
- importance of potential users of research results;
- degree of technology transfer;
- chances of successful program completion.

The weightings applied to these various criteria will have to be refined through practical usage.

IMPLEMENTATION OF PROGRAMMING

Operation of Institutional Structures

The Board of Trustees and the Scientific Committee have had five meetings since restructuring.

The Board of Trustees has examined management for the years prior to 1984 and has approved, in June 1986, the financial report for 1985.

The Scientific Committee has examined research results and programs to be implemented. The working methodology of the Scientific Committee should be better defined and more rational, as research programming is set up. The Administrative and Financial Directorate should, by the end of 1986, define its management system application mechanisms. With the help of a consultant firm, this directorate has produced a statute for FOFIFA, and for technical and scientific staff.

The Scientific Directorate, assisted by a programming expert (ISNAR), should also develop a management system for research programs. This directorate has recently set up a Programming and Coordination Service, as well as a Service for Monitoring-Evaluation-Promotion.

These two directorates are supported by a documentation service, also in process of rehabilitation, and by a computer and biometrics service, in process of installation.

Progress Made

Account being taken of deficiencies mentioned above, under "Bases for Management Policy", the sequence followed and the steps completed are:

1. *Definition of program structures.* The following concepts have been adopted by the Scientific Committee in 1985.

a. Program. A program is a coherent set of research operations combining to produce results defined by objectives normally tied to national priorities.

A given program is defined by:

- ★ its motivation;
- ★ its objectives;
- ★ the means to mobilize;
- ★ its scientific and technical description.

b. Operation. An operation corresponds to a scientific and technical field in which research will take place to attain the objectives of the program. A set of operations constitutes a program.

c. Activity. An activity corresponds to a work in the field, or in the laboratory, specific and defined by a clear experimental protocol. A set of activities constitutes an operation. For example:

- ★ varietal testing;
- ★ insecticide or herbicide testing;
- ★ vaccine efficiency testing;
- ★ propagation testing.

The set of results successively obtained at the activity level allows attaining objectives defined at the level of a given operation.

d. Action. An action is a set of activities conducted in a region or station.

This structure established, it has been followed by codification of all program elements, taking into account relationships with the development plan (PIRD), as well as implementing scientific departments.

2. *Homogenizing of structure and content of the various documents.* These documents are:

- ★ activity reports;
- ★ half-yearly reports;

- mission reports;
- program projects.

These documents should clearly evidence the dynamic and development aspect of activities.

3. *Data collection.* Cards should be used to collect two categories of data:

- program-operation cards
- resources cards.

We are implementing computer processing of the cards. Exploitation of these cards should allow, on the one hand, the implementation of programming work properly; on the other hand, monitoring and evaluation of programs and research results. The concept of progress indicators has been introduced, and has to be defined according to the case.

4. *Promotion of results.* Some options have been adopted for a better promotion of research results. It is mainly based on improving communication between developers and users, for a better monitoring of results utilization, and for evaluating their impact on development.

Results are presented in various forms:

- technical cards;
- accompanied organized visits;
- activity reports;
- scientific reports (archives);
- pilot unit;

- yearly meeting (workshop);
- participation in extension, through the Research and Development Department (Lake Alaotra, South-East, Middle-West, Highlands).

Despite these present accrued results of programming, the pursuit of the setting up of the system still has a number of problems, of which the most important are:

- a change in researchers' mentality, for a better assimilation of the concept of system management; actually, a sensibilization, by means of a seminars, is necessary in the short term;
- a search for stable and sustained financing;
- reinforcement of human potential;
- renewal of equipment;
- rehabilitation of existing infrastructures.

CONCLUSION

At the level of the Ministry of Scientific and Technological Research for Development, the Directorate for Planning and Coordination bears responsibility to produce a Research Master Plan, particularly agricultural, in liaison with the General Directorate for the Plan. At the level of FOFIFA, we are responsible for designing and setting up a management system for agricultural research. These two tasks should be completed in 1987, and the system should then become operational to allow FOFIFA to fulfill its role in the attainment of development objectives, as specified in the interim plan for 1986-1990, constituting a first phase of the six objectives planned for the year 2000.

Evolution of Scientific Staff at FOFIFA

Year	Nationals			Expatriates	Total
	Doctorate Ph.D. DEA	Master Engineer Licence	Total	Doctorate Ph.D. Engineer	
1973	-	12	12	60	72
1982	13	56	69	6	75
1985	43	48	91	12	103
1986 (July)	51	47	98	19	117

Distribution of Expatriates by Institution or Country of Origin in 1986

Institute	IRAT	CTFT	GTZ	IRRI	Switzerland	Total
Number	9	2	2	2	4	19

List of Acronyms

BRGM:	Office of Mining and Geological Research
CNRO:	National Center for Oceanographic Research
CNRP:	National Center for Pharmaceutical Research
CTFT:	Tropical Forestry Technical Center
DRST:	Directorate of Scientific and Technological Research
TEFABE:	Fikambanana momba ny Fampandrosoana ny lema'i Betsiboka
IFAC:	French Institute for Overseas Fruit Research
IFCC:	French Institute for Coffee, Cocoa, and

IGN:	Other Stimulating Crops National Geographical Institute
IRAT:	Institute for Tropical Agricultural Research and Food Crops
IRCT:	Research Institute for Cotton and Exotic Textiles
IRTTO:	Research Institute for Oil and Oleaginous Crops
LNTPB:	National Laboratory for Public Works and Buildings
ORSTOM:	Office for Overseas Scientific and Technical Research
SOMALAC:	Madagascar Company for Development of Lake Alaotra

PLANNING AND PROGRAMMING IN INDONESIA

A. Syarifuddin Karama

Within the last 15 years, several changes have been occurring in the Indonesian research and development systems. Before 1975, some changes were due to political reasons rather than technical and management reasons. The changes within the last 10-15 years have been more for technical and management reasons. However, further changes may still occur as the research and development systems and country development progresses.

ORGANIZATION CHANGES

In 1974, a presidential decree organized the research and development institutes of various ministries into one agency. Within the Ministry of Agriculture, the Agency for Agricultural Research and Development (AARD) was established in 1975. Prior to the AARD establishment, different research institutes were organized under different directorates general within the Ministry of Agriculture. For example, the Directorate General of Agriculture (food crops) had the Central Research Institute for Agriculture (CRIA), the Horticultural Research Institute (HRI), and the Soil Research Institute (SRI); the Directorate General of Fishery had the Research Institute for Inland Fishery (RIIF) and the Research Institute for Marine Fishery (RIME); the Directorate General of Animal Husbandry had the Research Institute for Animal Husbandry (RIAH) and the Research Institute for Animal Diseases (RIAD). Some research institutes had representative or branch offices and experimental farms in different areas of Indonesia, while others had experimental farms only. Few of the representative or branch offices or experimental farms were autonomous. Almost all research activities and experiments were planned by the centers. After the establishment of AARD, all research institutes were put under the agency. However, until 1981, almost all research activities were planned by the centers. During this period, the research institutes under respective centers were in the stage of establishment and

development. The centers supposed to function for coordination were more active in research directly, except for Animal Husbandry and Estate Crops. Branch or representative offices still existed.

A ministerial decree in 1979, which was implemented in 1980, gave the centers more of a coordinating function, and research institutes under the respective centers were to be autonomous. During this period the concept of research institute mandates was evolved. Research institutes developed more rapidly than before, and were more autonomous in their own mandates. During this period, the branch and representative offices were changed or merged into research institutes.

A ministerial decree of 1984, which was implemented in 1985, changed the AARD structure slightly. After one year, the research institutes became more autonomous, while the centers' function as coordinator became clearer. No longer was research planned and conducted by centers, except for the centers without research institutes, such as the Center for Soil Research (CSR) and the Center for Agro-Economic Research (CAER).

CHANGES IN PLANNING, PROGRAMMING AND EVALUATION

The above changes in organization were the recommendations of evaluations related to the development of research systems and of the country. The change in 1974, from several research institutes under different directorates generals into one agency, occurred in all ministries. Therefore, this change was based on high-level evaluations, at the Ministry of National Equipment. However, the information for the evaluations was drawn from the lower levels, such as at the research institute level.

After the establishment of AARD in 1975, all agriculture

research planning, programming, and evaluation were coordinated through the AARD planning office. However, during the early stages of AARD establishment, the planning office was largely occupied with administrative matters rather than research matters. Research planning, programming, and evaluation were handled by the centers. Therefore, coordination was weak. Beginning in 1978, AARD became more involved in directing research planning, programming, and evaluation. Several symposiums, workshops, and consultations were held with directorates general, extension, universities, national/provincial development planning agencies, the private sector, other ministries, international research centers, and the agricultural agencies of other countries.

In 1980, research institutes were active and centers began to function as coordinators. In 1981, the concept of research mandate was evolved and mandates were determined. Each research institute was given its own mandate. It took as much as two years for the research institutes to adjust to their mandates. Adjustment rates were influenced by the degree of development of each research institute, particularly in manpower.

During this period, AARD conducted several evaluations, using internal and/or external agencies or personnel. As an example, ISNAR was invited to evaluate AARD. This activity has been going on since 1981. The evaluations were conducted for either partial or total systems. The results of evaluations were discussed during internal AARD meetings. Some recommendations were incorporated into the following plans and programs.

To evaluate the effectiveness of plans or programs, AARD requested research institutes to present their progress, results, plans, and programs. Five areas were presented: 1) research results and programs; 2) facility development; 3) manpower development; 4) impact on agricultural development/technology transfer; 5) administration.

Within the last four years, AARD has adopted the idea of individual research programs. Each program is supposed to be developed by a research team. The programs must be in agreement with the research institute's plans and mandate. One senior scientist leads several junior researchers to develop the program and to carry out the research on a certain problem. Therefore, the research institute's plans consist of several individual research programs.

Until now, most of the evaluations were initiated and

performed by AARD. However, recently AARD has included centers and research institutes to develop their capability in evaluation. The evaluation team may include external agencies or personnel.

FACTORS MOTIVATING CHANGE

Before 1965, some changes in research organization were more due to political considerations, but management considerations were also important.

The change in 1974, from separate directorates to one agency, was for the following reasons:

- better coordination among centers and research institutes, particularly in planning, programming, and evaluation;
- equalization of development among different research institutes, at least within a ministry;
- more efficient and effective use of the limited number of scientists, researchers, facilities, and budget;
- numerous development and scientific problems urgently needed to be solved.

Until 1980, most research planning, programming, and to some extent implementation, was carried out by centers. From 1981 research institutes took over those activities, for several reasons:

- AARD had grown too large to be planned, programmed, and evaluated only by AARD or centers;
- Manpower and facility development had grown to the point where research institutes had the capability to carry out those activities;
- Agricultural development had grown too large and too diverse to be served by center offices.

Beginning in 1981, research institute mandates came to the systems. These mandates were for:

- giving identity to respective research institutes for more effective and clearer plans, programs, and evaluations;
- reducing or, if possible, eliminating duplication in research activities;

- synchronizing of research activities with research institutes conditions and facilities;
- directing other plans, such as manpower and facility development.

Soon after the mandates developed, the Individual Research Program System was adopted. The factors motivating adoption were:

- Numerous agricultural development problems needed to be solved and could not be solved by sporadic research plans. Therefore, to sharpen the focus of research plans and programs, individual research programs were adopted. This system is similar to management by objectives (MBO). Each program has clear objectives;
- The number of scientists was increasing and needed to be organized into more effective research programs;
- The need for more efficient and effective use of finances and facilities;
- The need for increased ease of evaluation and impact assessment.

EXISTING PLANNING PROCEDURES

AARD holds meetings with all directors of centers and research institutes, senior scientists, representatives from directorates general and other agencies involved in agricultural development. The meetings discuss and decide the overall research program (short-term and long-term) based on the national and regional development program.

Research institute directors and scientists take part in the programs in accordance with the institute mandates.

Each individual research program is developed by a team led by the most senior scientist in the team. The team consists of the different research disciplines needed in the program. The team develops detailed plans which include kind, number, and location of experiments, time, personnel, and budgets. One individual research program usually is of 3-5 years duration. However, it should also be clear on yearly objectives. The progress report, or even a partial scientific report, can be written without waiting for the termination of the program.

Individual research programs are submitted to program leaders. Program leaders coordinate all research programs within a problem area. For example, in 1986,

SARIF has three program areas: 1) rice; 2) secondary crops; 3) farming systems. These programs are within the SARIF mandate: "Highland and high-altitude food crop farming systems". Program leaders review the programs and if necessary call for discussions with scientists in the programs.

These programs are then submitted to the research coordinator of the institute for review and may be adjusted to the budget in accordance with national guidance and the institute mandate. During this review, all program leaders, senior research scientists, and directors of the institutes are involved. The final programs are then submitted to centers and then to AARD.

AARD holds meetings to review the programs. The members of the meetings are the AARD director general, the AARD secretary and his planning staff, directors of centers, directors of research institutes, program leaders and senior scientists. Some adjustments in accordance with budgets and national agricultural development plans usually occur in this review. If modifications are needed, the respective institutes will discuss them with scientists in the institute. The final plans are then submitted back to AARD through the centers.

Research institutes have the authority to develop cooperative or collaborative research programs with other agencies, centers, or institutes, in-country as well as abroad. Cooperative or collaborative programs which involve the national budget or the external budget must be reported to AARD through centers and are subject to auditing.

Inputs for planning and programming are collected from different sources:

- the annual ministerial meeting;
- the directorates general meeting, once or twice a year;
- the extension meeting, once or twice a year;
- professional scientific society meetings, such as the Agronomy Society, the Plant Pathology Society, and the Biology Society;
- provincial and regional agricultural development meetings;
- farmer visits;
- reports on agricultural socio-economic surveys, conducted by different institutes and agencies;

- policy papers developed by different ministries or other;
- reports of different agricultural research institutes, universities, and centers, national as well as international.

DISCUSSION

Some weaknesses still can be observed in the present system. First, some research institutes still do not have experienced and prominent scientists. This condition may continue for another five or ten years. Second, cooperative and collaborative programs among research institutes are very weak. In the long run, this may be improved by improvements in planning.

EVALUATION OF AGRICULTURAL RESEARCH

M. Dagg

In order to design how best to build on strengths and correct weaknesses in agricultural research systems, ISNAR has had to develop capacity and methodologies to evaluate the status of existing research systems, and a "Guidelines for ISNAR Reviews and Evaluations" has been published.

Monitoring and evaluation are essential components in the management of agricultural research, and principles and procedures must be included in any comprehensive training course for research managers. Management must have feedback information on the progress and accomplishments of the research program so that plans and programs, and also management mechanisms, can be modified accordingly. Monitoring basically provides information on whether the program is proceeding as planned. Evaluation examines how the program may be departing from the plan (and how it can be corrected, if necessary); and also whether the plan and organization are the best ways to achieve the overall objectives and goals.

There are several levels in the management of agricultural research systems. Evaluation is an essential component at all levels, from the researcher evaluating proposals and progress in an experiment, through an institution checking its effectiveness, right up to the top level of government assessing returns to its investment in research in support of agriculture (see Table 1).

Much of the existing literature on monitoring and evaluation has concentrated on the production and sales aspects of agricultural development (extension, infrastructure, credit, marketing) rather than on research. There are important differences between research planning and output and planning in the production phases. For instance:

- Research creates only a potential for development.

The realization of potential depends on many subsequent development agencies, and final impact on production takes time, often 10 years or more from the research advance. For guidance of current research management of institutions, indicators with a shorter response time than impact on production are necessary.

- Efficiency of research depends more critically on the correct choice of program than on physical and financial efficiency of implementation.
- Future research must be guided by current results: it is intrinsically difficult to plan years ahead in detail as a basis for monitoring progress. Moreover, a lot of good research work must yield essentially negative results, which are difficult to rationalize within a framework expecting positive progress.

GENERAL PRINCIPLES AND METHODOLOGIES OF EVALUATION

All monitoring and evaluation depends on comparison with planned performance, specified or perceived. Frequently, agricultural research has not been well planned in advance, and evaluation has had to be carried out against a norm of expected performance from resources allocated or against general targets or a reconstructed "project intervention model". The types of evaluation, based on objectives, are concerned with *efficiency*, *effectiveness*, and *impact*. They can be carried out at different times, giving categories of *ex-ante*, *monitoring*, and *ex-post*. The indicators of progress to be used with these kinds of evaluations must have response times that allow for timely adjustments in management operations at the appropriate level of management.

Methodologies have been developed for different kinds and purposes of evaluation. Monitoring of physical and

Fig. 1: Expectations from evaluations of agricultural research at different levels of management in the system

Level of management	Expectation from information from evaluation	Type	Category	Response time	Methodology	Criteria (Type of indicator)	Frequency	Use
1. Cabinet	Use of investment in agric research	Impact	Ex-post	10 yrs +	Socio-economic survey	Macro-economic, political	5-10 yrs?	Guide investment level
2. National agricultural ministries	Use of investment in agric research	Impact	Ex-post	10 yrs +	Socio-economic survey	Macro-economic, political	2-5 yrs	Guide balance of investment in research/ development institutions
		Effectiveness	Ex-post	5 yrs	Technical Review	Technical contribution/ Development relevance		
3. National agricultural research (Council)	Effectiveness of research institutions,	Effectiveness	Ex-post	5 yrs	Technical review, Diagnostic studies	Technical contribution/ Development relevance, Costs, Management mechanics	1-5 yrs	Guide allocations to research institutions;
	Output to development institutions	Efficiency	Monitoring	2-3 yrs	Physical/ financial/ organizational; Beneficiary; monitoring			Improve efficiency of management of research institutions;
		Potential impact	Ex-ante		Technical and socio-economic analysis			Help review schemes of service

Fig. 1 continued

Level of management	Expectation from information from evaluation	Type	Category	Response time	Methodology	Criteria (Type of indicator)	Frequency	Use
4. Research institutions	Effectiveness of management components in operation of inst.	Effectiveness	Ex-ante Monitoring Ex-post	2-5 yrs	As in 3 above plus Annual research plans and reports;	Technical contribution Development relevance, Costs,	1-5 yrs	Guide allocations to divisions; Balance of disciplines;
		Efficiency		0.3-3 yrs	Personnel review	Management mechanics,		Long term research program;
	Research performance in relation to program; Output to development inst., planners and producers	Impact, Potential Impact	Ex-post Ex-ante	5 yrs		Requirements of people, Linkages		Assessment of personnel; Argument for resources; Improvement of management mechanisms
5. Research station	Research performance in relation to budget, facilities and program;	Efficiency	Monitoring	0.1-1 yr	Physical/ financial/ organizational;	Efficiency of experiments, Costs,	Annual	Guide allocations to stations; Short term (annual) program;
					Beneficiary monitoring;	Use of personnel and facilities		Personnel management
	Relevance of research experiments, Identification of constraints				Annual review and reports; Personnel review			

financial progress is the basis for much evaluation. Socio-economic survey techniques are valuable for evaluation of impact on a macro scale. Beneficiary contact monitoring and diagnostic studies are useful for checking relevance of research at the institutional level. Annual reports are valuable at the research station level. Technical and organizational reviews are helpful at the institutional level.

APPLICATION TO NATIONAL AGRICULTURAL RESEARCH SYSTEMS

There is a wide range of expectation of the uses of conclusions from evaluations at different management levels. A general scenario for the national agricultural research management system is given in Table 1. A

salient feature is the need for indicators with shorter response times as concern moves from macro to micro situations. Macro impact evaluations are important in convincing governments to invest more in research, but are not much help in planning current allocations to current management systems. Impact on decisions of development institutions is a useful medium-response-time evaluation. Beneficiary contact monitoring is valuable in evaluating relevance of ongoing research at the station level. The process of program budgeting is extremely valuable for any efficient monitoring and evaluation of physical, financial, and program progress.

There is a great need for future work on identification of appropriate and sensitive indicators at different levels of operation and management.

Fig. 1 continued

Level of management	Expectation from information from evaluation	Type	Category	Response time	Methodology	Criteria (Type of indicator)	Frequency	Use
6. Researcher	Quality and output of research;	Effectiveness	Monitoring	1-3 yrs	Personnel performance review;	Quality and quantity of experiments and studies;	1-5 yrs	Guide to short term program;
	Management of resources;	Efficiency	(and ex-post?)		Annual review and reports;	Perception of task and role;		Staff development
	Assessment for promotion				Program proposal review.	Responsible performance;		
						Linkages and communication		
7. Project	Progress in relation to project plan and objectives	Effectiveness	Ex-ante	2-3 yrs	All (except personnel review, and macro socio economic survey (2)) plus benefit-cost analysis	(Depends on project)	Mid term, Terminal, Ex-post	Guide to modify project;
		Efficiency	Monitoring (terminal)	0.2-1 yr		Costs;		Assessment of value, impact;
		Impact	Ex-post	10 yrs +		Use of funds		Guide for future projects

INFORMATION SYSTEMS FOR HUMAN RESOURCES MANAGEMENT

B. T. Mook

People are the most important resource of a national research program. Empirical confirmation of this statement comes from the fact that most NARS spend between 50% and 60% of their recurrent budgets on the salaries and benefits of their scientists, technicians, and managers. But who are these people? How many of them are there, what are their educational and career backgrounds, what are their aspirations, and what are their training needs?

In its first five years of work with NARS, ISNAR has been continually struck by how little is often known about the basic characteristics of research personnel. It is actually the exceptional NARS which is able to say quickly and accurately how many people it has on the payroll. Even more important are issues of future recruitment, career planning, and training management. What will the human resources in research organization look like in five years, or ten, or twenty?

In many NARS, human resources management is carried out today much as it has been since the research organizations were founded. Personal files are maintained for each employee. Each file contains information on the individual; educational background, his/her career, and perhaps even on his/her research activities. The problem is that most NARS have no means of aggregating these data. If an organization wants to know something about a particular class of persons - such as those with doctorates, or those with doctorates in entomology - the only way of doing so is to laboriously go through each and every file, one-by-one.

In other words, the structures available for human resources management have lagged behind the functions which the contemporary manager must perform. One response to this problem is the creation of national data bases on agricultural research personnel. ISNAR has begun to work with several NARS on the creation and

maintenance of such data bases using microcomputers. Four decisions are important in this process:

1. On what information should be included. The best strategy seems to be to start small. All data should be of direct use either to the central research organization or to the institutes/stations which provide the data. Obvious categories include education, career, current position, and current research/administrative work;
2. On appropriate software for the microcomputer. Once again, the best strategy is to start small and simple. Many people who will be involved in establishing and using the data base will be first-time computer users;
3. On how data is to be collected at the beginning. There are really only two alternatives here. The first is to approach individual scientists themselves, either in person (a very labor-intensive process) or by questionnaire. The second is to depend on personal files;
4. On how information is to be updated - probably the most difficult management challenge. Any data base must be kept current. If the information in it gets outdated, then clearly its usefulness will decrease.

CONDITIONS OF SERVICE

When we talk of "conditions of service", we usually refer to at least four issues:

1. *Careers*. After an individual is recruited into a research organization, what kind of career can he/she look forward to? How rapidly will he/she be promoted, and on the basis of what criteria?

2. *Salaries.* What level of salary is an individual likely to be earning three, five, or ten years from now? Just as important, what other monetary benefits is he/she likely to be eligible for?
3. *Professional Development.* What kind of in-career training should be planned for each individual? How often should such training occur, where, and at what cost?
4. *Non-Salary Benefits.* What kinds of non-monetary incentives are most important for agricultural research personnel? Can the research organization provide them – and, if so, how much are they likely to cost?

Issues 1 and 4 are discussed in this brief presentation.

Careers. One of the main uses of a data base on human resources can be to give senior research managers a tool for career planning. Such a data base can assist in answering three inter-related questions:

- What is the present distribution of personnel between different position/salary grades? That is, what is the current shape of the human resources pyramid?
- How are people being promoted? The formal rules are usually well known: evaluations of performance, seniority, passing tests. But how automatic or un-automatic are promotions really? When an individual on one salary scale reaches the low point of the next salary scale, what are his/her chances of crossing over to the next higher grade?
- What is the distribution of personnel between different position/salary grades likely to be in 5 or 10

years? That is, again, what might the future shape of the human resources pyramid be?

Non-Salary Benefits. The issue here is really one of incentives and motivation for agricultural researchers. NARS face an almost unique difficulty with regard to rewards for their personnel. By definition, agricultural scientists must be well educated. But – also by definition – the acquisition of post-graduate qualifications makes the holder a member of the elite in many countries. As such, he/she usually prefers to live in the capital city or at least in a good-sized town. But further – and still by definition – much of agricultural research requires residence in rural areas.

How can senior research managers deal with this problem? What kinds of incentives can personnel be given so that they will be happy and, therefore, motivated? The creative and imaginative manager will probably try to manipulate one or more of the following “environments”:

- The Physical Environment. Issues such as housing, transport, schooling for children, and medical facilities;
- The Career Environment. Issues such as access to merit promotions and training opportunities;
- The Professional Environment. Issues such as scientific isolation, responsibility for programs, and the relationship between field people and headquarters people;
- The Social Environment. Issues such as dual career families, social life for single persons, etc.

HUMAN RESOURCES PLANNING AND MANAGEMENT FOR AGRICULTURAL RESEARCH

P. Bennell

Successful agricultural research depends on the effective planning and management of professional researchers and their support personnel. It is essential, therefore, that agricultural research managers develop the knowledge and skills that will enable them to maximize the productivity and output of these scarce human resources.

The overriding objective of human resources planning and management (HRPM) is to ensure that the organization has the personnel skills, attitudes, and motivations which will allow major organizational objectives to be attained as efficiently as possible. In general terms, HRPM can be subdivided into five main areas of activity.

- Human resources planning is concerned with assessing and providing the types and levels of skill required for attaining predetermined objectives over a specified time period in the most cost-effective manner;
- Staffing and development concerns the formulation and implementation of policies and practices that relate to (1) the recruitment, selection, promotion, and transfer of personnel and (2) the subsequent development of these personnel through formal and on-the-job training, and performance planning, appraisal, and counselling;
- Human resources utilization focuses on the major performance determinants of employees. Of central concern is the large number of organizational and individual factors which shape attitudes and influence motivation;
- The monitoring and evaluation of HRPM is required in order to appraise and analyze outcomes in each of

the three main areas of planning, staffing and development, and utilization;

- A human resources information system is a prerequisite for effective HRPM.

HUMAN RESOURCES PLANNING

The human resources planning process can be divided into two parts, each concerned with answering a question: What human resources will be required? What human resources will be available?

In actual practice, little formal human resources planning is undertaken by agricultural research organizations in most developing countries. The plans that are produced are typically poorly integrated into the overall planning and programming processes and are often little more than lists of additional personnel requirements. There is also usually an excessive preoccupation with professional research personnel, with inadequate attention given to technical and administrative support personnel.

Much of the explanation for the absence of human resource planning can be directly attributed to the major uncertainties in funding and resource provision in general, which research managers continually contend with. Faced with such inhospitable planning environments, many managers see little point in committing time and resources to the development of detailed human resource plans. However, there is almost always some room for maneuver that would allow important improvements in the human resources planning process to be achieved. Well-formulated human resource plans can play a vital role in securing needed resources from government, and can provide the operational framework within which recruitment, deployment, and training objectives can be realized.

INDIVIDUAL PERFORMANCE PLANNING AND APPRAISAL

Effective personnel development and utilization in an organization require the establishment of appropriately designed performance planning and appraisal systems. Because systems must serve the needs of both the organization and individual employees, they have multiple objectives which should fulfill different aspects of HRPM.

Numerous studies have demonstrated the complexities involved in establishing viable performance planning and appraisal systems, and the high levels of employee dissatisfaction and conflict which typically arise when things go wrong. In general terms, appraisal systems should have the following objectives:

- ★ specificity, relevance, and objectivity;
- ★ reliability and consistency;
- ★ practicality and simplicity;

- ★ regularity and routine;
- ★ participation, consensus, and openness;
- ★ management commitment and competence;
- ★ integration with the reward system.

In practice, these objectives are rarely fulfilled by performance planning and appraisal systems in agricultural research organizations. Some of the most common deficiencies include:

- ★ scepticism and wariness by managers and/or excessive leniency;
- ★ vague performance criteria and targets;
- ★ excessively top-down and confidential, with limited participation by employees;
- ★ often not regarded as objective and impartial;
- ★ limited role of peers, clients, and external evaluators;
- ★ poorly integrated with the promotion and reward systems due mainly to the prevalence of non-performance based criteria (most notably seniority) in determining career advancement.

HUMAN RESOURCE PLANNING AND MANAGEMENT IN THAILAND

T. Wongsiri

The Department of Agriculture (DOA) began in 1972 as a department within the Ministry of Agriculture and Cooperatives. Its responsibilities include all aspects of research on crop production. Research disciplines cover the normal spectrum ranging from plant genetics through agronomy, to farm machinery technology. The DOA also regulates plant quarantine, agricultural chemical quality, toxic substances, and certain other activities.

In 1981, the National Agricultural Research Project (NARP) was initiated with funding from the World Bank, IFAD, and Australia, with the aim of overcoming a number of agricultural research-related problems at the national level. The main problems which led to the formulation and implementation of NARP were:

- Centralization of staff. Most of the DOA's postgraduate scientific staff were located in Bangkok and were out of touch with farm problems;
- Duplication of research between institutions within the Ministry of Agriculture and the universities. Agricultural research was carried out by several government agencies because the DOA had inadequate resources for conducting needed research;
- Lack of research facilities at the regional level. Junior staff at sparsely equipped field stations observed field trials for senior staff who made periodic visits from Bangkok. Most scientific equipment was accordingly kept centrally, within easy access of senior scientists;
- Lack of a clear career structure for staff who wish to remain research scientists and not become administrators;
- Inadequately developed administrative services to support the changing role of the DOA;

Administrative skills were assumed as necessarily flowing from good scientific skills, resulting in senior administrative posts being filled by staff whose demonstrated skills lay in science. Simultaneously, pure administrators with no scientific credentials were accorded low status;

- Inadequate training of scientists and technicians who are responsible for implementing the new research policy. Within the educational institutions, the teaching of agricultural science research techniques in Thailand suffers from the low priorities placed on lecturers undertaking regular research and subsequently publishing in international journals. Thus research methods are often sadly out of date. Little emphasis is placed on students developing literature review skills and scientific, critical evaluation skills. Little is done to encourage the young professional researcher to develop these skills. In the past, opportunities for training and fellowships have been open only to those scientists stationed in Bangkok.

In order to alleviate these problems, the NARP was established, comprising:

Reorganization of the DOA, consolidating related activities under three deputy directors general rather than two. These DDGs were to have direct line responsibility for research, administrative service, and technical services.

Restructuring of the DOA, around six commodity-based research institutes with 23 regional research centers. These institutes are supported by seven technical divisions which provide technical staff for the institute regional research centers.

Regionalization of the staff. Thirteen hundred scientists will eventually be stationed at regional research centers.

Most of these postings are in place, being in effect gazetted transfers or new positions tied by location. Mechanisms to motivate staff to move out of Bangkok have included large numbers of training fellowships which are tied to specific disciplines at specific centers. The researcher is committed to working for a specified number of years at that location.

Transfer of the bulk of *scientific activity* out of Bangkok as planned will offer greater opportunity for achievement, and hence promotion, at regional centers. Plans for equipping the centers are targeted to complement these opportunities.

New staff housing has been constructed at each center. This is a strong motivator for young researchers, given the high price of housing in Bangkok. However, senior researchers are often freed from the problem of maintaining two houses until retirement.

Nor surprisingly, there has been a small rush to established centers close to Bangkok, producing a situation of virtual excess, while more isolated new centers remain undermanned.

Staff Development has been centered on technical assistance provided by the Australian government in the form of fellowships to study overseas and domestically. So far, 153 researchers have received fellowships to study to bachelor's, master's, and Ph.D. levels; 82 fellowships have been awarded to technical staff for diploma studies. Eleven administrative division staff have received fellowships.

Corporate Plan. The DOA's official budget is in excess of US\$30 million. Its activities are spread over a network of 2,000 km diameter, which includes some research centers whose effective budgets are in excess of three quarters of a million dollars, yet they only can be contacted by radio. The need for a research corporate plan is critical. This is networked down through the organization via institutes and discipline divisions to regional research centers and their client research stations, so that all decision makers have a clear idea of the departmental policy and goals. Advice from Australian technical advisers is being utilized in the development of the corporate plan.

Computerization of finance, personnel and capital infrastructure. A specific condition included in the loan agreement between the Royal Thai Government and the World Bank was that the DOA would introduce a form of program budgeting which would permit the DOA to manage and control its research programs and staff by program and location.

Although the Thai Government is committed to administrative reforms in the fifth Five-Year Social and Economic Plan, which included a changeover from the traditional form of incremental budgeting to a program-based system, difficulties were being experienced in implementing a common system which satisfies all government departments.

The approach adopted by the DOA with very generous technical and financial assistance from the Australian Government has been to take the existing manual system, computerize it, and in doing so improve the procedures and working system of the DOA in the process.

A similar approach has been adopted with *personnel management*. All of the data contained in the personal history files of each government official, and permanent wages official of the DOA, has been computerized, and programs written which allow regular reports to be produced by the computer for the DOA executive. These reports, as well as incorporating details of the employees' history, include location and will, in the near future, include such details as individual research program activity.

The *computerized management system* of the DOA, as well as providing regular printed reports on personnel budgets, expenditure, and capital resource inventories to management, also provides the executive of the DOA with a good "inquiry" feature. At any time the DOA can access all financial data to compare budgets and expenditures by research and administration program, research and administration project, and location. In addition, an instant readout can be given of staff numbers by sex, age, location, educational qualifications, P.C. level, and work location. This program will also include statistics regarding position vacancies and pending retirements. As soon as the DOA completes its current index of research projects, this feature will also be built into the financial and personnel computerized management systems.

All of these computerized systems which are currently available to the DOA at its head office in Bangkok are also being duplicated for each of the 19 newly planned research centers in the country. In addition, the research centers associated with rubber and sericulture, which are not part of the NARP redevelopment, will also receive the benefits of this program.

A decentralized system of *research planning* has been set up. The procedures place the responsibility for initial regional research plans with the resident research center

director. The new research plan is reviewed by the Research Center Committee before final approval by the Departmental Committee. The aim is for the regional researchers to develop research programs which address the type of farm problems given priority in the current policy of the DOA, which was derived from directives issued from the government's current Five-Year Plan.

Research Program Budgeting. The aim of this will be to program all research proposals to budgeted inputs in terms of costs of labor, consumables, equipment, scientists' time, and maintenance costs. This is done on an individual project basis and then on a research program basis.

Improvements in *research reporting* are required to address three factors: output, language, and currency.

Unfortunately, local researchers are often reluctant to write up reports in any detail. Publication of collected data is popular, but analysis of data and discussion within the report is not common. The reward for reporting in English is meagre. Even abstracts in English or another international scientific language are not required.

With regards *currency*, a serious need exists to reduce the long time-lag between initial farm problem identification and subsequent publication of research results developed to solve the problem.

The result has been reliance on personal contact between users and the research scientist. These communications unfortunately have no reliable written documentation summarizing what was communicated and what was understood.

Agricultural research and *extension* are divided into two separate departments in Thailand. With this division comes the tendency towards inherent rivalries and non-communication, a situation which is displayed by related and similar government departments in any nation. Progress has been slow, but a network of committees is being developed to remedy the problem.

In conclusion, it is suggested that the following points might be considered when strengthening an agricultural research system.

1. The importance of the need to make definite decisions at the beginning about structure and organization of a department, even at the risk of "hurting" people, followed by definition of policy, regional development, etc., cannot be over-emphasized;
2. Appropriate career structure must be established within the public service system. These are not yet clear in Thailand. Also, there are as yet no standards for analyzing the quality of research work;
3. There is a need to have the correct time perspective for developing research and for measuring the benefits;
4. How to handle the problem of people not wanting to move out of a city to a regional base, needs to be dealt with;
5. Finally, there is a need to ensure that the organization as a whole fully understands the objectives of the program from the start. This will help overcome the problem of short-term dissent in the interests of long-term national objectives.

HUMAN RESOURCE DEVELOPMENT IN THE AGRICULTURAL RESEARCH SYSTEM OF ZIMBABWE

P. R. N. Chigaru

INTRODUCTION

Agricultural research in Zimbabwe is carried out by a number of organizations, both in the public and private sectors. These include:

- Department of Research and Specialist Services;
- Department of Veterinary Services;
- Department of Agricultural Technical and Extension Services (Agritex);
- Faculty of Agriculture, University of Zimbabwe;
- Tobacco Research Board;
- Pig Industry Board;
- Agricultural Research Trust;
- Zimbabwe Sugar Association;
- Seed Co-operative Company of Zimbabwe.

Of these organizations, the Department of Research and Specialist Services (DR&SS) is the biggest and most predominant, with a much wider mandate and a larger country-wide infrastructure. The other organizations have narrower mandates and fewer staff. The Department of Veterinary Services carries out research only on animal health problems, and the Department of Agritex is essentially involved with extension and irrigation development, but also carries out some research in agricultural engineering through its Agricultural Engineering Institute.

All research, therefore, except that pertaining to animal health, agricultural engineering, pigs, tobacco and sugar, is carried out by DR&SS. Forestry and fisheries fall under a different ministry, but agroforestry research is beginning in various institutions. DR&SS has four operational divisions:

- Crop Research Division;
- Livestock & Pastures Research Division;
- Research Services Division;
- Executive Branch.

The total staff establishment of the department is 2150 persons, of whom 160 are professional officers with a minimum qualification of a B.Sc. degree in agriculture or other relevant disciplines in biological sciences, chemistry, etc. The rest of the staff provide support for the professional officers and range from research technicians with diploma qualifications to workers. All categories of staff are regarded as being important to the organization, with salary scales, promotion and advancement procedures meant to encourage them to stay with the organization and develop with it. Thus, although the professional scientists form the backbone of the department, it is recognized that a successful research effort requires support staff who are not only adequate in numbers but are also stable.

STAFF SITUATION PRE- AND POST-INDEPENDENCE

Zimbabwe is only six years old. Before 1980, white Rhodesians dominated all sectors of the economy, including the public service sector. At independence in 1980, therefore, the DR&SS had a predominantly white scientist cadre. During the first two years of independence, the majority of these scientists left the department, either to join the private sector or to leave the country. These scientists were replaced by indigenous Zimbabweans, most of whom had come back to the country following independence, or were straight out of university with their first degree. By 1984, therefore, the qualification and experience profile of the department scientists was as follows:

Qualification	Number	Percentage
B.Sc.	88	62
M.Sc.	42	30
Ph.D.	11	8
<hr/>		
Total	141*	100
<hr/>		
Experience (years)		
0-2	54	38
2-5	45	32
5+	42	30
<hr/>		
Total	141	100

* There were 19 vacant posts at the time.

These figures reveal that the research effort of the department was now entrusted to a scientist cadre with mainly a first degree and less than five years of experience. It is in the light of this unsatisfactory situation that a request was made to ISNAR for assistance in designing a manpower training plan in early 1984.

RECRUITMENT PRACTICES AND ADVANCEMENT PROCEDURES

As stated before, the minimum qualification for an aspiring research scientist is a B.Sc. degree, with at least second class honours from the local university or similar institutions outside Zimbabwe. Generally, posts which fall vacant in the department are advertised in the local press. The posts are filled after interviews have been conducted by senior research managers. Depending on qualifications and experience, a new scientist is graded as follows:

- Assistant Research Officer (B.Sc. degree holders);
- Research Officer;
- Senior Research Officer;
- Principal Research Officer;
- Chief Research Officer.

All new recruit, serve a probationary period of two years, during which time they can either voluntarily withdraw or be requested to leave the department at one month's notice. This probation period is important because it enables the department's management to assess the potential of the recruit as a research worker and also to determine, in the case of officers with a first degree, the type of further training that would benefit both the individual and the institution. Successful completion of the probation period depends on the Annual Confidential Reports and Merit Assessments, completed

by the recruits' head of station or institute, and ratified by the Department's Suitability Board and the Public Service Commission. At the end of the probation period, the officer is usually awarded additional salary increments over and above his annual increment.

Officers who join the department with master's or doctoral degrees are notched in accordingly, depending mainly on post-qualification experience. It is therefore possible for one to be appointed at the senior, principal, or chief research officer level. Similarly, during the course of their service and the acquisition of additional qualifications, an officer can be advanced to these senior grades. Such advancement is dependent on a Merit Assessment and Narrative Report which must satisfy the Suitability Board and the Public Service Commission. Any officer due for advancement who is not successful must be informed, so that he is aware of his shortcomings and the need for him to improve his performance.

Apart from advancement on the ladder from assistant research officer to chief research officer, promotion opportunities to section, station, or institute head also exist. These positions carry administrative responsibilities and better remuneration. This type of promotion obviously depends on qualifications, experience, and the possession of leadership qualities, and must be approved by the Public Service Commission and the Ministry.

For all new recruits, an induction course is now conducted on an annual basis, in order to explain to them about the department and their future within the system.

DEPLOYMENT OF SCIENTISTS

The deployment of scientists within the organization is largely based on qualifications. Individual scientists usually express their own interests and desires, and these are taken into account as much as is feasible. A scientist may also be transferred from one part of the department to another, either at his/her request or on the initiative of the department.

Generally speaking, and because government does not provide accommodation and transportation in the urban areas, most scientists these days prefer to work in the rural stations and institutes. At these rural research establishments, they are provided with non-subsidized housing, transport in the form of cars or motorcycles, and the cost of living is lower, particularly with respect to food items.

The disadvantages of living in a government station

include the lack of opportunity to purchase your own home, and difficulties associated with employment for your spouse, and in some cases lack of adequate school facilities for children.

TRAINING OPPORTUNITIES

As mentioned earlier, the qualification and experience profiles of the department's scientists, following independence, prompted us to seek the assistance of ISNAR in drawing up a training plan in 1984. The essential features of this plan are as follows:

- Using World Bank TEAD loan funds and through donor assistance, we have recruited 28 expatriates to carry out on-the-job training of junior scientists. These expatriates are also supposed to assist the department in evaluating existing research programs, and in providing ideas about the direction the department might take in their areas of specialization, in accordance with our research strategy and national development plans;

Research officers working with expatriate scientists are being assisted and supervised in devising projects suitable for part-time masters and doctoral degrees at the University of Zimbabwe. Such officers are also given the opportunity to attend course work at institutions outside Zimbabwe when it is felt that this is necessary. The emphasis, however, is that all training should as much as possible be carried out in-country;

- Where appropriate training is not available in the country, officers are sent for full-time study at universities outside Zimbabwe to obtain either M.Sc. or Ph.D. degrees. In most cases expatriates are appointed during their absence, to carry on with the research work in a given area and to assist the officer to take over the program on his return from study;
- The IARCs are playing an increasing role in scientist training in Zimbabwe. At present the centers that have some presence in the country are ICRISAT, CIMMYT, and IITA. Our scientists are benefiting from interaction with their scientists. In addition, we try to take advantage of the short courses, seminars, and workshops conducted by centers outside Zimbabwe;
- Starting in April 1986, ISNAR is now assisting us with an in-country training workshop for senior research managers in the planning and programming of research. Our senior research managers have found this workshop extremely useful because it sensitizes

them to the weaknesses of our organization in the areas of:

- priority setting and resource allocation;
- programming of the research effort in line with identified priorities;
- monitoring and evaluation of the agreed programs.

As a result of this first workshop, a task force of senior research managers has been formed which is analyzing these issues – including a review of the institutional organization and structure. A request has been made for assistance from ISNAR in this task. It is hoped that a joint report will be ready by the time of the next training workshop on research management in March/April 1987, at which ISNAR's participation will again be sought.

The training programs described above have had a motivating effect on our scientists at all levels. Most have developed a stronger sense of commitment to the organization and are keen to develop with it. Much still remains to be done in order to ensure that the organization continues its good reputation, both within and outside the country. In particular, the current review of the department's activities should help sharpen its strategy and focus, and enable all scientists to have a clear perception of their roles within the organization, including the manner in which they can contribute to solving the country's agricultural development problems.

TOOLS FOR THE JOB

A discussion of human resource development would not be complete without the mention of the need for reasonably adequate resources for the staff to carry out their mandated tasks. To ensure motivation and job satisfaction, staff must be provided with the tools for the job. In Zimbabwe, at present, salary creep in the department's budget is beginning to rear its ugly head.

Salaries and wages account for just over 70 percent of the budget, compared to about 65 percent at independence six years ago. These figures relate only to funds available from national sources and do not include any resources made available from outside sources. This percentage is beginning to be of concern for us. To ensure sustainability of our system and to avoid the frustration of our scientists, we need to do a better job of convincing our policymakers and the treasury to stem the tide of this salary creep. I accept, however, that this must be done within the framework of a more judicious system of priority setting, allocation of available resources, and the programming and evaluation of the research effort as a whole.

SUMMARY OF THE WORKSHOP

D. McLean

Day One

THEME: STRENGTHENING NARS – AN EMERGING ISNAR STRATEGY

Five ISNAR staff presented papers which discussed the following points: the new strategy of ISNAR, its research activities, the training program, considerations for strengthening national agricultural research systems (NARS), and the ISNAR data base. Discussion was solicited after each presentation. The day concluded with a slide presentation on ISNAR.

In the opening session, Director General Alexander von der Osten presented an overview of ISNAR and the new strategy. The discussion on strategy was developed in three areas: the profile of the institution, the ISNAR program, and ISNAR's management structure. The goal of ISNAR is to assist developing countries to improve the effectiveness and efficiency of their agricultural research systems through enhanced capacity in the areas of research policy, organization, and management. ISNAR has identified eleven management themes; internal working groups have been established that are charged with the development of the knowledge base on these themes. The five priority areas of ISNAR collaboration with NARS are:

- 1) formulating research; in particular, priority setting and resource allocation;
- 2) structure and organization of NARS;
- 3) program formulation and program budgeting;
- 4) monitoring and evaluation as a tool for management;
- 5) development and management of human resources.

Deputy Director General Howard Elliott described the objective of the ISNAR research program, which is to develop improved concepts, tools, and analytical methodologies in the areas of research policy,

organization, and management for NARS. The primary activities and responsibilities of the research program are:

- 1) development of a knowledge base on NARS;
- 2) identification of common constraints or problems shared by NARS, as well as opportunities for high impact in strengthening NARS;
- 3) development or adaptation of analytical methods;
- 4) generation of improved management concepts and tools for NARS;
- 5) maintenance of up-to-date information on developments in related fields.

He then gave details of ISNAR's research program. Dennis Wood described the training objectives of ISNAR. He emphasized that training was aimed at all levels of government – policymakers, senior-level research managers, and middle-level managers – and that training for middle-level managers will generally be in-country. Special-project funding will be sought for most of the in-country programs.

Ajibola Taylor presented a paper on considerations for strengthening NARS. He developed these topics in the three areas of ISNAR concentration: the policy environment of NARS, the basic processes of research, and organizational structure.

Philip Pardey presented a paper on the ISNAR Data Base. He discussed trends in the funding and staffing of NARS in a time series. He emphasized that in the past twenty years, while in many NARS the number of research staff has increased substantially, operational funds have not kept pace.

Discussion of Issues

Nine main issues were raised and discussed by

conference participants. They are not necessarily presented in order of importance.

Issue 1:

It is crucial to develop support for NARS among politicians and policy-makers. Some countries expressed that this was difficult to obtain and asked for ISNAR assistance. It was suggested that ISNAR consider publishing materials on the impact and value of research for use by NARS administrators in dialogue with policy-makers. General guidelines were not considered sufficient, but rather country-specific analyses and recommendations (e.g., strategies, manpower plans, etc.) are needed. Delegates also saw a role for ISNAR in presenting this material with NARS representatives - either in a dialogue with policy-makers or in seminar format. Delegates expressed that ISNAR should not approach policy-makers without full participation of NARS, and that ISNAR would, preferably, develop this capacity for policy dialogue within the NARS.

Types of publications requested were either country-specific, wherein ISNAR responds to NARS requests, or more generally applicable case studies of research program impact from countries within the same region or territory. It was mentioned, for example, that cost/benefit studies on agricultural research have not been conducted to date in Africa and are, therefore, less convincing than information on neighboring research programs.

Issue 2:

The role of private research organizations was perceived as both collaborative and competitive by different conference delegates. The relative importance of private sector involvement was also noted, with the sector more involved in Latin America and Asia than in Africa. It was suggested that ISNAR write a position paper on the role of the private sector in national agricultural research programs, perhaps drawing conclusions from countries at different stages of development and in different regions of the world. One delegate expressed that ISNAR's primary task was to strengthen the public sector research systems and that concentration on the private sector was not part of ISNAR's strategy. Other delegates, particularly those from Latin America, where the private research structure is important in the transfer and adaptation of technology, saw an ISNAR role in the interaction of private and public research organizations.

The potential for collaboration with private research organizations was stressed, especially as a means of

sharing the financial and administrative burden of research which was not imperatively public sector. The NARS must, therefore, first determine which research should be a public responsibility before specific private initiatives are encouraged. One delegate felt that collaboration was better between NARS and non-multinational private sector organizations.

In the history of agricultural research, the role of private research organizations has increased as the country develops. The primary role of the private sector has been in adaptive research and in the provision of farmer support services. By developing private sector capacity in these areas, the public sector NARS can function more efficiently. Developing countries must be aware of the extent to which the private sector controls patented technologies which may not be made widely available.

ISNAR could help define the respective roles of the private and public sectors in agricultural research and make country-specific recommendations to improve complementarity.

Issue 3:

ISNAR was asked to look at the research needs of some very small countries and to recommend how research could best be organized in these countries. Delegates put forward the problem of defining "small" countries but concentrated more on the minimum NARS necessary to accomplish needed research. Several points were raised: 1) that all countries need some research capacity; 2) that NARS must have the capability to interpret world knowledge and to adapt technology for local conditions, which may be the extent of NARS activities in very small countries; 3) that a considerable level of training is necessary for interpretive and adaptive research activities, and 4) that very small countries might share research capabilities by contributing to a regional R&D institute which would have outreach activities in participating countries (e.g., the Caribbean group). An important emphasis was also placed on the interdependence of smaller NARS on larger NARS in neighboring countries.

Issue 4:

The delegates raised the question of ISNAR's role in funding NARS. Some asked whether ISNAR could identify and inform the NARS of probable funding agencies. Some asked for direct ISNAR intervention in negotiating for funds.

ISNAR has a role as a facilitator and a funding broker.

By assisting a country to develop a sound national research plan, ISNAR increases the likelihood that a donor will take interest. The development of a coherent national research strategy and plan should be concurrent with a sensitizing effort on the importance of research at all levels—policy, research administration, and management. This would serve to better equip national leaders in their discussions with sources of external funding. The donor community is looking for wise investments and, in general, there is a global underinvestment in agricultural research as indicated by the high rates of return associated with it. ISNAR can facilitate contacts between donors and governments for funding specific projects jointly prepared by ISNAR and NARS.

Issue 5:

The linkage between research and extension and the transfer of technology were considered extremely important areas which are currently underemphasized in ISNAR's program. There was considerable discussion on to what extent NARS or ISNAR could get involved in the problems of extension services, the primary concern being the relevance of the research themes. This question of integration was addressed as being primarily a national decision, with linkages between the two services being of primary concern. Two issues of importance are: 1) defining the responsibility of the NARS in this linkage (e.g., is research to train extension workers, is publication for extension agents and farmers a part of the research program?), and 2) defining the necessary institutional framework.

It was suggested that ISNAR offer on a country-by-country basis recommendations for institutional linkages and responsibilities. One delegate suggested that ISNAR take a role in upgrading the quality of extension agents.

Issue 6:

Many NARS need assistance in establishing long-term goals and in priority setting.

Issue 7:

The role of ISNAR in networking and the strengthening of linkages between NARS and IARCs was discussed. The broad use of the term "network" evoked widely divergent opinions—from a discounting of networking as a buzzword to the very satisfactory appraisal of networks in the Mediterranean and Brazil. The effectiveness of networks was largely associated with the effectiveness of the NARS involved and their apolitical nature.

Regardless of the jargon used, the delegation agreed that coordination of research efforts is important. Some voiced a sense of dissatisfaction with the CGIAR centers for their lack of inter-institutional coordination and the excessive and sometimes competitive demands which IARCs make on NARS. The suggestion was made that ISNAR and the other IARCs coordinate their work through the NARS. This coordination of IARCs in national systems is the responsibility of the NARS involved. ISNAR can play a role by helping the NARS make better use of IARC services through improved system management.

Several roles for ISNAR were proposed. The suggestion was made that ISNAR develop tighter linkages between NARS and NARS, and between NARS and IARCs, and that ISNAR serve a coordinating role for IARCs working in a national system. ISNAR can play a key role in the formation and evaluation of networks between NARS. ISNAR is not able to assume the coordinating role between NARS and IARCs. A voluntary coordinating effort is currently taking place in Africa among IARCs in which ISNAR plays a part.

The donor community is in favor of developing and strengthening research networks as a means of improving NARS and could be looked to for external funding. ISNAR supports the premise that well-conceived networks are important parts of the NARS. It was proposed that ISNAR analyze different types of networks and assist in the development and management of networks in national systems.

Issue 8:

ISNAR was requested to provide more and different training to various levels of policy and research personnel. ISNAR was asked to provide international and regional training for areas which have similar levels of system sophistication. More in-country training was also requested. Funding constraints should not be allowed to hamper ISNAR's all-important training efforts. Training is needed in very specific areas according to country needs; the suggestion was made that broad-based training is of lesser utility. Involving national staff in the testing of ISNAR methods and models could also be a form of training-by-doing.

ISNAR has already begun to conduct regional training, and plans to organize more future training activities by grouping similar countries.

In those NARS where specific training is required, ISNAR is attempting to develop relevant courses. The

delegates also requested that ISNAR train people in each region who could become a career corps of agricultural research managers and who could possibly train others. Research management is only now becoming a recognized discipline, and the delegates held that ISNAR has a comparative advantage in being one of the few institutions in the world with this mandate.

Issue 9:

ISNAR was requested to be more explicit in its strategy as to the geographic focus of its work. In particular, participants felt that increased attention to the urgent problems of Africa should not be at the expense of programs in other regions, but rather call for an increase of donor funds.

Day Two

THEME: ORGANIZATION AND STRUCTURE

ISNAR presented two formal papers on research organization and structure. The first, "Organization and Structure", delivered by Deputy Director General Krishan Jain, focused upon organizational structures in the public sector. The second, by Hunt Hobbs, "Efficiency and Effectiveness: A Managerial Perspective", brought the discussion to a more managerial level. Three case studies were then presented of Kenya, The Gambia, and Sri Lanka, by W. Wapakata, M. Sompoo-Ceesay, and S. Gunawardena, respectively. Subsequent discussion was led by D. Gapasin, E. Madrid, and M. Touré.

Dr. Jain described several models of research organizations which are currently operational and their relative strengths and weaknesses. He concluded that autonomous national systems were generally the most favorable, but that no single model was ideal. He further described the types of research programs conducted as discipline-based, commodity-based, or of matrix form. In determining the most appropriate type of program to undertake, one delegate suggested the need for internal evaluation; others wanted some guidelines based on country size and population. Dr. Jain also discussed the linkage between research and extension and the lack of an absolute and ideal model.

Some conclusions reached were: While management for efficient utilization of resources is crucial, the system will be more effective if this is conducted within a well-organized structure.

- There is no one ideal system.

- Farmers of all sizes must be accommodated in whatever model is chosen.
- The research/extension interface must be studied carefully.
- Linkages between NARS and private and university research organizations are important.

In Hunt Hobbs's presentation he defined the terms efficiency and effectiveness. One makes efficient use of resources within an organization, but the results produced and their impact are indicators of effectiveness. He described the stages of a product life cycle. He stressed the importance of information management, program budgeting, human resource planning and management, and the management of physical resources in effective NARS. Effectiveness is ultimately more important than efficiency. Delegates asked ISNAR to consider methods of measuring the impact and effectiveness of NARS.

Discussion of Issues

Discussions following the case examples can be summarized as follows:

- There is a dynamic element to agricultural research which requires change and evolution of the organization; this is often difficult in a civil service structure.
- The linkages between research and extension are vital; however, this does not imply that the two organizations must be administered jointly.
- Extension personnel often seem more amenable to these linkages than researchers.
- Extension can play a greater role in adaptive research.
- Decentralized research institutes with specific mandates have achieved good coordination of researchers, extension agents, and farmers.
- NARS should consider expanding from primary crops to industrial crops, etc.
- ISNAR's concept of NARS in its reviews seems unduly restrictive; all organizations conducting national agricultural research should be included in the functional definition - this is particularly so for university research organizations which play a major research role in some countries.
- ISNAR as a service organization can help in the following areas:
 - 1) developing increased political support for research;
 - 2) assisting small countries in developing appropriate models for research and technology transfer;
 - 3) determining the relevance of R&D programs in developing countries;
 - 4) contributing to the measurement of impact;
 - 5) expanding the ISNAR Data Base to emphasize

university and private research organizations, and extension services;

- 6) developing a capacity in research management which is similar to that in commerce.

Day Three

THEME: PLANNING AND PROGRAMMING, INFORMATION SYSTEMS AND PROCESSES

Three formal papers were presented: Robert King of the University of Minnesota presented "Management Information Systems for Planning and Programming", wherein he discussed the need to develop this capacity in NARS. Rene Devred introduced methods for program budgeting and Matthew Dagg discussed evaluation and monitoring. Three country experiences on planning and programming were presented on Morocco, Madagascar, and Indonesia, by H. Faraj, V. Rahainosy, and S. Karama, respectively. Discussion of the topics was led by C. Seighion, C. Moran, and M. Coulibaly.

Three different stages of planning and programming were presented, including:

- 1) *The establishment of national research priorities* in accordance with the national development plan;
- 2) *Programming and budgeting*: through programming by objective, the research manager can allocate human and financial resources to priority activities. Program budgeting helps the research manager at several levels: in daily management, in the allocation of the annual budget, and in the justification of the program to policy-makers;
- 3) *Evaluation and monitoring*: both monitoring for efficiency and evaluating impact are necessary exercises. Program budgeting is valuable for monitoring and evaluation as is the identification of indicators of progress by which one measures achievement. Defining these indicators can be difficult. Evaluation and monitoring can look at the system, program, projects, operations, activities, and scientists.

It is extremely important to involve farmers and extension agents in the process of program determination. Government officials speaking on the behalf of farmers frequently is inadequate. Researchers must provide this link, all the more so since it is the orientation of their research which is at stake. Farmers' needs must be translated into research themes by the

researchers themselves. Questions were also raised on the extent to which the research system is responsible for extension and technology transfer.

The effects of macro-economic policies and national infrastructure on research program results were also pointed out. These critical factors must be stated when considering the evaluation of a program. It was pointed out that few ideal political and economic environments exist in developing countries. Consequently, one must continue to conduct research and do so in the hope that results may influence the political and economic environment. This is particularly true when talking of radically different technologies which have the potential for great impact.

Discussion of Issues

ISNAR was identified as being able to contribute in the following ways:

- 1) Regarding the development of information systems which require microcomputers, some delegates discussed the problems which they have in adequate facilities and servicing, and in lack of trained personnel. They suggested that training in information systems is one service which ISNAR could offer to improve the situation.
- 2) Delegates requested that ISNAR concentrate on simplifying information management systems and tailoring them to specific national systems.
- 3) There was a keen interest by many delegates in general assistance in programming and in intensive training in the Program Budgeting System (PBS). ISNAR should continue to simplify the data sheets in PBS and to adapt them to specific country situations.
- 4) The importance and use of publications as part of a NARS information system was discussed as a possible avenue of ISNAR involvement – publications for securing political support, for extension agents, and for farmers.
- 5) Much more work is needed on evaluation and monitoring, specifically in the identification of indicators which can be used to measure success in research systems at different levels. These indicators or benchmarks should be part of the planning process of a research organization. While many general evaluation methods can be taken from non-research sectors, three aspects of evaluating research systems need specific attention: 1) methods are needed to measure the efficiency and productivity of researchers, particularly for research systems with varying levels of sophistication; 2) the "noise" from other factors in the agricultural production system (e.g., improved pricing policies) make evaluation of

research system impact more ambiguous; and 3) the length of time necessary for measuring performance and impact makes ongoing modifications difficult.

- 6) The importance of involving farmers and extension workers in the process of research formulation resulted in the request that ISNAR focus attention on this vital aspect of research. ISNAR has recently begun a series of case studies on on-farm research which will look at this interface.
- 7) More emphasis will be placed by ISNAR on technology transfer and the research-extension interface, including the structural links necessary for successful collaboration.

Day Four

THEME: HUMAN RESOURCE DEVELOPMENT AND MANAGEMENT

The topic "Key Issues in Human Resource Planning and Management" was jointly presented by Byron Mook and Paul Bennell. Human resource development in Thailand and Zimbabwe were described by T. Wongtiri and P. Chigama, respectively. Subsequent discussion on the topic was led by C. Saubidet, E. Febong, and O. Leiva.

The staff presentation concentrated on four areas: the need for an information system/data base on human resources, the need for recruitment by program, conditions of service, and the role of training and appraisal in professional staff development.

Discussion of Issues

Many delegates expressed the need for improvements in human resource management in the NARS. NARS need to establish short-term strategies for management, development, and appraisal of human resources. Delegates expressed the need for greater personnel incentives in the NARS and discussed possible benefits, such as selection for conference participation, bonuses for exceptional work, better working conditions, and recognition, which did not necessarily include increases in salaries. In some systems there are structural and functional professional ladders, so that a scientist can earn an equivalent and sometimes greater salary than an administrator. To implement better conditions of service, political support must be obtained; it was suggested that ISNAR might be able to help.

The additional considerations of good human resource management, e.g., recruitment of qualified staff, the provision of a suitable system in which to work, and the ability to reward or discharge employees based on

performance, assumes a certain autonomy in the organization which does not always exist in civil service systems. Techniques of improved human resource management must be sought within the constraints of the existing system.

Delegates were also interested in the transformation which has taken place in many NARS since independence. In some cases NARS have become far less efficient, due, in part, to insufficient operating funds. NARS operational budgets have often decreased due to: 1) the increased percentage of the overall budget (often static or reduced) which goes to personnel, 2) the broadening of research mandates in national systems which require increases in personnel without concomitant increases in operating funds, and 3) enlarged personnel ranks resulting from automatic employment rights of agricultural school graduates, which often ends up swelling the ranks of the NARS. Operational funds per researcher are often inadequate for performing reasonable work. In developing countries the proportion of operating funds to personnel funds should be higher than in the developed world, since actual salaries and staff benefits are much lower and equipment and commodities are usually much more costly.

Delegates widely appreciated training opportunities for staff, scientific and technical. More financial support for training was requested. To reduce training costs, more emphasis was suggested on training in those national or regional institutions where the quality of education could be assured. Staff trained overseas often have a difficult time adapting themselves to local working conditions when they return. Training in the same region might lessen this problem. It was also emphasized that NARS should not depend on training funds from external sources only, but should push for support from their national budgets as well.

Delegates stressed that this discussion of NARS human resource development and management must also include the university research sector.

Because ISNAR's staff in human resource management is small, delegates urged ISNAR to develop methodologies and guidelines which could be useful in the NARS. The criticism was lodged that ISNAR country reports contain only results and not the methods of analysis used.

Day Five

THEME: GENERAL CLOSING REMARKS AND SUGGESTIONS

Delegates acknowledged ISNAR's good will and role in the strengthening of NARS. ISNAR assured delegates that NARS priorities are ISNAR priorities and that the suggestions made during this forum would be taken into account in formulating ISNAR's workplan. ISNAR is seeking ways of increasing its impact. One approach will

be the development of methodologies in the management themes which can be assimilated by NARS so that more can be done independently. Another way to accomplish this spread effect is through special projects with donors. This entails having a good, well-thought-out proposal and NARS participation in approaching donors.

For the near term, ISNAR will continue to work on a country-by-country basis, bringing a more systematic approach of methodologies to bear in the medium term. Full NARS participation is encouraged at all levels.