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1990 Annual Report



ISNAR

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, the 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 nonprofit autonomous agency, international in its character, and nonpolitical in management, staffing, and operation.

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 research policy, organization, and management issues, thus complementing the activities of other assistance agencies.

ISNAR has active advisory service, research, and training programs.

ISNAR is supported by a number of the members of CGIAR, an informal group of donors that includes countries, development banks, international organizations, and foundations.

ISNAR DONORS 1990	
Core Funding	Funding for Special Projects
Australia	Australia
Belgium	Asian Development Bank
Canada	Canada
China	Denmark
European Economic Community	European Economic Community
France	France
Germany	Germany
Italy	IDRC
Japan	IICA
Netherlands	Netherlands
Philippines	Norway
Spain	United Kingdom
Sweden	Rockefeller Foundation
United Kingdom	UNDP
United States	United States
World Bank	World Bank

Cover photo. A common sight in West Africa: selling farm produce by the roadside. Developing countries need strong, well-managed agricultural research systems if they are to supply their farmers with relevant and useful technologies.

1990 Annual Report

March 1991



International Service for National Agricultural Research

CONTENTS

Preface	3
ISNAR Board of Trustees 1990	5
Acronyms	6
I. Advisory Service	8
Bangladesh	9
Botswana	12
Mali	15
Tanzania	16
Morocco	19
Bolivia	21
Advisory service around the world	24
II. Research	27
Analysis of NARS data will help inform policy	28
Structuring the guesswork: priority setting in Indonesia	29
Biotechnology books and case studies launched	31
Study of small countries: trends begin to emerge	33
Study of linkages moves into synthesis phase	36
Other research	37
III. Training and Conferences	42
Training the trainers	42
Kenya: building a cadre of managers	43
People's Republic of China: first steps for ISNAR	45
Management information systems for Asia	46
Malawi: managing change in the research system	48
International consultation with research leaders	49
Organizing for sustainable agriculture	50
Training events and conferences by region	53
IV. Information	55
Publications Unit	55
Library	56
Computing services	56
ISNAR Publications 1990	57
ISNAR Consultants 1990	61
ISNAR Staff 1990	64
ISNAR Financial Summary	66
Items on shaded pages	
Critical factors in strengthening NARS	10
The Technology Triangle	39

Preface

On behalf of ISNAR, its Board of Trustees, and its staff, I take pleasure in presenting the institute's Annual Report for 1990.

Last May we used the mid-term meeting of the CGIAR in The Hague for a get-together with colleagues and friends to briefly reflect on ISNAR's first decade of service to the national agricultural research systems — the NARS. The Kenyan Minister for Agriculture, the Honorable Maina Wanjigi, undertook a serious review of the overall agricultural research situation in Africa south of the Sahara. Professor Jan Tinbergen, Nobel laureate in economics in 1969, highlighted some of the important resource and development issues all of us will be facing in the coming decades.

In November, His Royal Highness Prince Claus of the Netherlands honored ISNAR with a working visit to our headquarters. During our roundtable, he stressed the importance of conserving natural resources, especially water, for future generations.

A common thread ran through all our discussions, meetings, workshops, and seminars in 1990. The consensus was that national agricultural research in developing countries, along with the institutions and mechanisms serving research and linking research with farmers, needs further strengthening. ISNAR is ready to play its role.

The 1990 Annual Report highlights some of the year's work by our advisory service and by our research and training programs. We are confident that our partners will find all our activities of significance to them. Of special note, and of wide-ranging interest, we expect, are two synthesis monographs published in 1990 — one on scientific and policy issues in

biotechnology, the other on linkages between researchers, technology transfer agents, and farmers.

ISNAR's work spans more than 10 years and 50 national systems. This experience, together with the development and provision of numerous tools to improve agricultural research management, is now generating strong demand for our services. Unfortunately, the financial and human resources at our disposal are not adequate to meet all requests. A growing number of proposals for diagnostic reviews, for assistance with planning and training, and for advice on various issues have had to be postponed or even refused. And, for a number of reasons, several of our institution-building activities have not yet resulted in the emergence of strong and effective NARS institutions fully able to serve technology users.

The mandate to strengthen NARS is being put to the test. Donors will have to agree on the varied and still-growing needs of NARS in developing countries and on the substantial resources to meet their requirements. In this context we look forward to the quinquennial external review of ISNAR's programs and management in 1991. We have been reflecting on some of the issues likely to be raised by the review team: on the one hand, past performance, impact, and management of resources at our disposal; on the other, our strategy, priorities, and the importance of new developments and global trends for the decade ahead of us.

Political, economic, scientific, and environmental changes are affecting all societies and all countries, but developing countries are suffering most. Natural resources and the environment are under increasing stress and future generations will query our action or lack of it. The



His Royal Highness Prince Claus of the Netherlands (right) visited ISNAR headquarters in November for a briefing on the institute's work. ISNAR Director General Christian Bonte-Friedheim hosted the discussion and tour.

CGIAR system is reviewing some of these developments. During Centers Week in 1990 it was decided to enlarge this important international research system to include research in support of forestry, agroforestry, fisheries, irrigation management and other technical fields. Issues surrounding future research within specific agro-ecological zones — such as coordinating efforts and setting priorities — were also raised and will be further discussed.

ISNAR and its mandate will be affected by various new developments. We look forward to the external review panel's assessment, to advice and assistance from our friends and donors, and to the guidance of our Board during these forthcoming months

The leadership of ISNAR's Board of Trustees changed in 1990. Our special thanks go to M. Henri Carsalade of

France for his long and distinguished service as a member of the Board and later as its chairperson. At this time we welcome Professor John Dillon of Australia as the new chairperson. Along with his colleagues on the Board of Trustees, he has assumed major responsibilities for guiding ISNAR in the years to come. Together we will build an even stronger and more effective International Service for National Agricultural Research.

Christian Bonte-Friedheim
Director General

ISNAR Board of Trustees — 1990

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* Completed service in 1990

Seated, left to right: Rakotovo, Dillon, Bonte-Friedheim, Carsalade, Al-Shayji. Standing: Junguito, Peters, Camus, Mwandemere, Berndt Müller-Hage (FAO observer), Deborah Merrill-Saunders (secretary), Hemmi, Thomas, Sadikin, Porceddu, López Saubidet, Wessels.



Selected acronyms used in this report

AARD	Agency for Agricultural Research and Development — Indonesia
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AgGDP	agricultural gross domestic product
ARC	Agricultural Research Corporation — Sudan
ARI	agricultural research intensity ratio
ARIS	Agricultural Researcher Information System — ISNAR
ARP	Agricultural Research Project — Bangladesh
ATMS	agricultural technology management systems
BARC	Bangladesh Agricultural Research Council
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit — Germany
CAAS	Chinese Academy of Agricultural Sciences
CARDI	Caribbean Agricultural Research and Development Institute
CARP	Center for Agricultural Research Planning — Indonesia
CARP	Council for Agricultural Research Policy — Sri Lanka
CASER	Center for Agro-Socioeconomic Research — Indonesia
CIAT	Centro de Investigación Agrícola Tropical — Bolivia
CIDA	Canadian International Development Agency
CIFAP	Center for International Food and Agricultural Policy — University of Minnesota, U.S.A.
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement — France
CTA	Technical Centre for Agricultural and Rural Co-operation — European Community and Lomé Convention countries
DAR	Department of Agricultural Research — Botswana
DAR	Department of Agricultural Research — Malawi
DRT	Department of Research and Training — Tanzania
FAO	Food and Agriculture Organization of the United Nations
FSR	farming systems research
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit — Germany
HBSTC	Science and Technology Commission of Hebei Province — China
IARMW	International Agricultural Research Management Workshop — ISNAR
IBTA	Instituto Boliviano de Tecnología Agropecuaria — Bolivia
ICIPE	International Centre of Insect Physiology and Ecology
ICRA	International Course for Development Oriented Research in Agriculture

IDRC	International Development Research Centre — Canada
IER	Institut d'Economie Rurale — Mali
INERA	Institut d'Etudes et de Recherches Agricoles — Burkina Faso
INERA	Institut National pour l'Etude et la Recherche Agronomiques au Zaïre
INFORM	Information System for Agricultural Research Managers — ISNAR
INIA	Instituto Nacional de Investigación Agropecuaria — Uruguay
INIAP	Instituto Nacional de Investigación Agropecuaria — Ecuador
INRA	Institut National de la Recherche Agronomique — Morocco
INRZFH	Institut National de Recherches Zootechniques, Forestières et Hydrobiologiques — Mali
IRA	Institut de la Recherche Agronomique — Cameroon
IRZ	Institut de Recherches Zootechniques — Cameroon
ISABU	Institut des Sciences Agronomiques du Burundi
KARI	Kenya Agricultural Research Institute
M&E	monitoring and evaluation
MIS	management information system
NAARM	National Academy of Agricultural Research Management — India
NALRP	National Agricultural and Livestock Research Project — Tanzania
NARC	National Agricultural Research Center — Laos
NARP	National Agricultural Research Program — Kenya
NARP	National Agricultural Research Project — Malawi
NARS	national agricultural research system
NCRTD	National Center for Rural Technology Development — China
OFCOR	on-farm client-oriented research
PBS	program budgeting system
PCARRD	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development
SACCAR	Southern African Centre for Cooperation in Agricultural Research
SADCC	Southern African Development Coordination Conference
SEARCA	Southeast Asian Regional Center for Graduate Study and Research in Agriculture — Philippines
SPAAR	Special Program for African Agricultural Research
SSTC	State Science and Technology Commission — China
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

Working to strengthen national agricultural research systems

I. Advisory Service

The International Service for National Agricultural Research is dedicated to assisting the national agricultural research systems — the NARS — of developing countries. Our three areas of concentration are agricultural research policy, organization, and management. At the heart of ISNAR's partnership with NARS is our advisory service. This is supported by research and training programs.

Our advisory work typically, but not always, follows a three-step pattern: diagnosis, planning, and implementation.

The first step is normally an ISNAR mission to the country. A small review team identifies the special characteristics of the NARS, and it becomes acquainted with the system's or institute's managers. The review addresses many critical institution-building factors (see page 10); its exact nature depends on the needs of the particular country and the terms of reference. In 1990 broad system reviews were conducted in Bangladesh and Botswana.

Increasingly, diagnostic reviews are carried out jointly with a national review team. Sometimes the national teams take the lead. Algeria and Yemen, for example, selected this approach and each began preparations during the year by organizing, with the participation of ISNAR staff, a workshop on the use of review procedures.

The second step in the sequence is to formulate a plan and strategy to strengthen the system. These take into account the recommendations made by the review team. Here the managers and staff of the NARS become heavily involved. Our work in Mali, Morocco, and Tanzania, as described below, are good examples of this.

The third phase is assistance with executing a plan or parts of a plan. This usually means helping a national research system or lead institute to formalize mechanisms or procedures to strengthen it in one or more critical areas. For example, ISNAR might assist with the creation of a management information system and provide training, as in the case of Bangladesh, Mali, and Morocco. Or it might introduce and help implement procedures for setting research priorities or evaluating research, as in Indonesia and Bolivia. In practice,

ISNAR's planning and implementation efforts overlap, and in a few cases we respond to requests for assistance without having first conducted a diagnostic review.

*The following pages in this section focus on six countries. They provide but a few examples of our partnerships with NARS in 1990, but they do illustrate the depth and breadth of our work and the mutual reinforcement of our advisory, research, and training programs. These descriptions are followed by a list of our advisory work in 22 other countries and one regional organization. For more information on our approach and operations, we invite the reader to write for a copy of our strategy document *Working to Strengthen National Agricultural Research Systems*.*

Bangladesh



population (1988): 109 million
main agricultural commodities: rice, wheat, potatoes, pulses, sugarcane, sweet potatoes, oilseed, tobacco, jute, tea, fish, cattle, ducks, chickens, sheep, goats

agricultural researchers (1986): 1152 in 10 institutes

ISNAR's work with the NARS of Bangladesh, which dates from 1987 and continued in 1990, is part of a comprehensive program of institution building. Its aim is to equip various levels of the research system with the management structures and tools needed to tackle the formidable obstacles to agricultural devel-

opment faced by this populous Asian country.

Production of principal food crops, especially wheat, has grown markedly in the last two decades, thanks in part to research. However, these increases have not kept up with the high annual population growth rate of 2.7 percent observed between 1980 and 1987. The net effect has been a decline in per capita food consumption over the past decade.

The Government of Bangladesh hopes to cut heavy dependence on traditional monsoon-based agriculture, which is vulnerable to destructive floods, in favor of more dependable crop production based on irrigation in the dry season. These policies will present research with new tasks and create demand for new technologies. Future efforts will need to address several issues, among them natural resource management and the sustainability of more intensive land- and water-use systems. There will also be a demand for more research on the quality, processing, marketing, and storage of produce for domestic use and export.

Critical Factors in Strengthening NARS

In Agricultural Research Policy

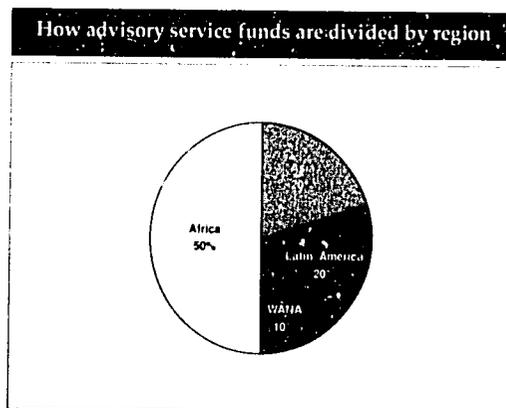
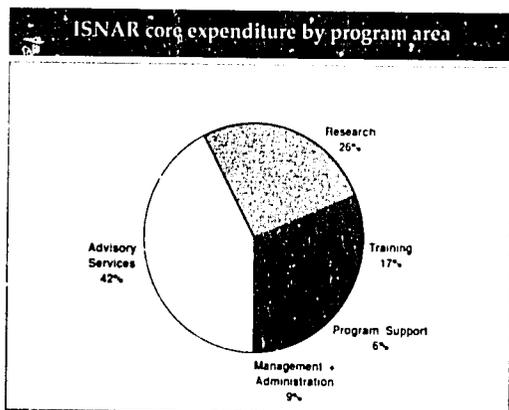
- Creating and maintaining positive interactions between agricultural research and national development policy.
- Formulating effective agricultural research policies: setting priorities, allocating resources, and developing long-range plans.

In Research Structure and Organization

- Building an effective NARS structure and organization.
- Developing linkages between the NARS and policymakers.
- Creating linkages between NARS, the technology transfer system, and users of technology.
- Developing and using linkages between the NARS and outside sources of knowledge.

In Agricultural Research Management

- Formulating programs and program budgeting.
- Monitoring and evaluating research programs.
- Managing information.
- Developing and managing human resources.
- Developing and utilizing physical resources.
- Acquiring and managing financial resources.



In 1990, ISNAR assisted Bangladesh in two ways. First, at the government's request, a team of two conducted a diagnostic review of the NARS during the first half of the year. It centered on the Bangladesh Agricultural Research Council (BARC) and its links with other institutes. Second, ISNAR continued to provide assistance with Phase II of the USAID-funded Agricultural Research Project (ARP). This is designed to assist BARC to set up mechanisms and procedures for effective management of research at the institute, program, and experiment station levels.

Reviewing the apex body and its links

Banagladesh's publicly funded agricultural research is carried out by the research institutes of five ministries: agriculture; fisheries and livestock; forests and environment; education; and industry and commerce. BARC is at the apex of this system. It plans programs, sets priorities, monitors and evaluates research, allocates resources, and builds human resource capacity. In effect, it serves as an umbrella for coordinating the work of the NARS.

During the 1990 ISNAR mission, the review team looked at several issues. First, it analyzed the structure of BARC to see whether it has the needed authority and capacity to fulfill its responsibilities. Second, it examined the lines of authority between BARC and the country's research institutes, as well as whether the current institute structure is suitable. Third, it looked at BARC's relationship with other public and private research bodies not under its jurisdiction. In particular, it examined the role of the universities and other schools of higher education in conducting research and in training new scientists.

The review identified key management issues at the national and institute levels and suggested options for strengthening the research system as a whole. While the government is still considering some of the needed reforms, it initiated others, along the lines recommended by ISNAR, immediately after the review.

The main action taken was to merge four research institutes into one autonomous body under BARC. This will go a long way to reinforcing links between agricultural research policy and its execution. It will also improve research coordination through closer dialogue between the Council, its Secretariat, and the institutes under the Ministry of Agriculture.

System-level leadership and support

In 1990 our Bangladesh-based staff member, supported by consultants and other ISNAR staff, continued work with BARC on the Agricultural Research Project, mentioned earlier. This second phase began in 1989 and focuses on management of the overall research system. It will bolster BARC's capacity to provide leadership in planning and management and to supply certain support services to the institutes under its jurisdiction.

First, an analysis of research priorities was carried out to provide a basis for future research planning and resource allocation. Done in close consultation with BARC and the research institutes, the analysis was based on estimates of production data and projected demand estimates for 57 agricultural commodities, collected in a field survey by BARC. Bangladeshi staff familiarized themselves with the overall procedure so they can conduct similar analyses in the future.

At BARC's request, ISNAR also helped to organize a survey of all staff and to establish a human resources data base for

the entire agricultural research system. The task was part of a wider objective of phase II of ARP, namely to review human resources management policies in the NARS and formulate a manpower development plan.

During 1990 the assessment of other management information needs continued. We are responding to these needs in three steps, in each case consulting with the institute director and staff.

The first step was to create a management information system (MIS) using data for the 1988-89 financial year. This was completed at several of the institutes during 1990 as they were progressively provided with computers by BARC.

The second step was to establish a planning procedure, use it to draw up each institute's research program, and then allocate resources to the programs using a program budgeting system (PBS).

Preparations for this step were completed in time for the annual planning cycle that began in September and October. They included training five institute staff members in the use of an ISNAR-developed PBS. (See page 46.)

The third step will be to formalize the use of the PBS within the NARS. Information in standard format from all the institutes will eventually help BARC to plan and coordinate research more effectively across the whole system.

Finally, at the request of the Ministry of Agriculture and of BARC, ISNAR assisted in the completion of the research section of the ministry's Fourth Five-Year Plan (1990-95). As part of the overall exercise, we also prepared guidelines to assist the institutes in formulating their master plans, which translate policies of the Five-Year Plan into operational programs.

Botswana



population (1988): 1.2 million
main agricultural commodities: beef, millet, maize, sorghum, wheat, cotton, groundnut, sunflower, goats, sheep, pigs
agricultural researchers (1990): 39 national researchers and 12 expatriate researchers in the Department of Agricultural Research, Ministry of Agriculture

Managing the physical and biotic environment and promoting sustainable agriculture are two cornerstones of Botswana's agricultural development policy. This is to be expected. On the one hand, this semiarid country's endowment of natural resources available to agriculture — like water, soils, and vegetation — is rather limited. On the other hand, the rural areas, including marginal lands, are under strong pressure from human settlement, animal husbandry, and wildlife, even though the overall human population of the country is relatively low.

To improve food security and promote rural employment over the long term, government policy calls for agriculture to be diversified, for land productivity to rise, and for natural resources to be consciously managed and conserved. To do

all this demands a variety of specialized knowledge and technologies for putting land, water, and plant and animal resources to the best use. Developing the technologies, in turn, requires a national capacity with a full spectrum of agricultural and related natural resources research — from strategic and applied, to adaptive and testing.

At the Ministry of Agriculture's request, ISNAR collaborated on a review of Botswana's agricultural research system in May and June of 1990. The review team was composed of two ISNAR staff, a consultant, and a national task force from the Department of Agricultural Research (DAR), the leading agricultural research agency in the country. The mission was ISNAR's first in-depth collaboration with the NARS of Botswana.

The review team's work linked closely with an ongoing examination of Botswana's national agricultural development policy and strategy. The entire research system was studied in detail. This included visits to most of the research facilities, stations, ranches, and experiment sites, and consultations with policymakers, government development agencies, donors, NGOs, educational and technical institutions, and other stakeholders and potential partners in research for development. This broad overview has helped DAR to define its strategic role in organizing, managing, and coordinating research to serve Botswana's agricultural industry.

The diagnosis and analysis focused on several strategic issues. The main ones were the research system's structure and organization, research planning and programming, development of human and physical resources for research, and links with other actors in national agricultural development.

The review team paid particular attention to DAR's research program structure. Previously, the department had several re-

search projects organized according to scientific disciplines. Under this system, research activities in a particular discipline did not necessarily add up to a coherent, productive program. In some cases, there were gaps in the research effort — that is, some priority topics or problems were not being investigated; in other cases, topics of limited relevance were being researched.

Realistic size and research portfolio

The review team's analysis suggested the need for DAR to set specific limits on its overall size and on the portfolio of research programs it conducts. Doing so will help ensure that DAR's efforts are fruitful and sustainable over the long term. The analysis indicated that, in the area of natural resource management, the emphasis should be on multidisciplinary strategic and applied research. As for priority crops, livestock commodities, and production systems, the agricultural system should concentrate on applied, adaptive, and technology-testing research.

The review team proposed a modest restructuring of the research department. One of two main features would be the creation of a deputy director position to strengthen policy, scientific, and technical leadership in DAR. The other would be the creation of two assistant directorships to provide leadership within each of the two divisions: crop production, and animal production and range.

Discussions with DAR managers and scientists led to a detailed proposal for reorganizing the research programs as follows:

- crops — cereals, oilseed, grain legumes, horticulture, soil/water management, production systems, including agroforestry;

- animals — beef, dairy, small ruminants (sheep and goats), feeds, range and pastures, production systems.

In this arrangement, each program would be made up of multidisciplinary teams of researchers led by a senior scientist who provides guidance in the initial planning, formulation, and review of programs.

In the area of staffing needs, the review team recommended that the NARS attempt to reach a complement of some 60-65 researchers and 200 technicians during the 1990s. This level of scientific manpower, a 20- to 30-percent increase over

the current level, is considered sustainable over the long term due to potential support from the nonagricultural sector.

The review team also identified a need to strengthen linkages between researchers and other key actors in agriculture, including policymakers, extensionists, and farmers. In particular, better links with policymakers would help to ensure that the setting of research priorities and the allocation of resources are closely harmonized with national development objectives for agriculture. To achieve this, the review team recommended, among other things, the creation of a "national research and technical committee". This would be

A researcher from Botswana's Department of Agricultural Research (left) and two assistants (seated men) share maize and conversation with farmers in the Okavango Delta region. Maize, sugarcane, and sorghum are three major crops in this area. In recent years drought has interfered with the annual flooding cycle that normally creates good farming conditions once waters recede. The reduction in most arable land may require local farmers to grow new crops, alter the timing of planting, and change their soil management techniques. Careful management of natural resources is a key goal of Botswana's agricultural research.



a priority-setting forum for DAR and other technical bodies with a direct stake in agricultural research. The committee would communicate upwards to the ministry's Agricultural Policy Committee and downwards to the program formulation committees (composed of researchers, extensionists, and government development departments).

ISNAR is pleased that the reaction of the Government of Botswana to the re-

view team's report has been positive and swift. The proposed national research and technical committee, for example, is expected to be inaugurated in mid-1991. Some of the other major recommendations have already been incorporated into Botswana's Seventh National Development Plan, and we expect to assist with some aspects of the implementation.

Mali



population (1988): 8.8 million
main agricultural commodities: cattle, millet, sorghum, cotton, rice, groundnuts, maize, sheep, goats
agricultural researchers (1990): 203 working in the new national research institute

Agriculture and agricultural research in the West African country of Mali face difficult challenges because of the threat of desertification, the fragility of the soils, and the pressure exerted on the natural environment by people and livestock.

The NARS of this Sahelian country is the largest in francophone Africa south of the Sahara and about 90 percent of the scientific staff are nationals. The expenditure of 0.9 percent of AgGDP on the NARS gives Mali one of the highest "agricultural

research intensity ratios" in Africa and, indeed, in the developing world. However, a little more than half of total annual funding for agricultural research comes from outside donors, mainly to cover operating and equipment costs. The rest is provided by the government, with most of it going for salaries.

With advice and support from ISNAR, the Malian government in 1990 merged its two main agricultural research institutes: the Institut d'Economie Rurale (IER) and the Institut National de Recherches Zootechniques, Forestières et Hydrobiologiques (INRZFH). The new entity, retaining the name IER, is a semi-autonomous national institute covering forestry, crops, and livestock. The law creating it was passed last October.

Covered too many commodities

Before 1990, agricultural research had been dispersed over some 35 commodities. In effect, the research community was trying to cover too much scientific territory, rather than setting priorities for maximum impact.

Because of the merger and the problem of dispersed efforts, ISNAR worked with the Malian NARS in 1990 to produce a strategic (12-year) plan. This effort fol-

lowed a brief diagnostic review of the research system by ISNAR in 1988 and an assessment of agricultural research needs in 1989.

Supported in part by USAID, our assistance in 1990 had three components. First, we gave guidance on the design of new research programs. Second, we helped to create a research resource data base. This is basically an inventory of physical, human, and financial resources, and it records both existing resources and those that will be required by the new programs. Third, we provided information to support decision-making on overall investment levels and to help set priorities for resource allocation.

ISNAR's overall aim in this collaboration is long-term — to introduce managers to the strategic planning process and formalize it within the research system.

Much of the planning exercise centered on the design and reorganization of research into a smaller number of programs. ISNAR staff members worked with 40 Malian managers and scientists grouped into four teams. Their job was to define a scientific portfolio of seven priority research programs, reflecting the total mandate of the new IER. These will be: cereals and legumes, livestock, forestry and

fisheries, industrial crops, horticultural crops, farming systems, and natural resource management.

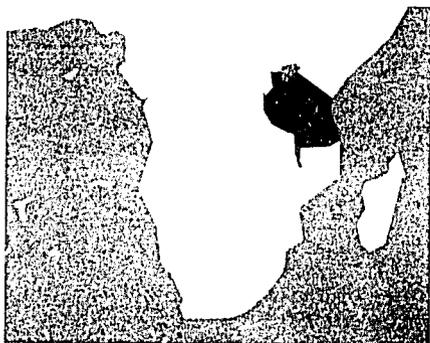
To define each program, the working groups went through a detailed planning process developed earlier by ISNAR. Steps include:

- reviewing national development goals and the potential of existing production systems for achieving those goals;
- determining the constraints on agricultural production;
- evaluating past research results;
- setting research objectives;
- determining human resource needs;
- defining research priorities.

(The section on ISNAR's work in Morocco, on page 19, describes the method in more detail.)

The strategic plan presents various research options open to the Malian government within the framework of the seven programs. Their final makeup will depend on the levels of financing and the number of researchers that the government believes the system can sustain in the long term.

Tanzania



population (1989): 23.8 million
main agricultural commodities: maize, rice, coffee, cotton
agricultural researchers: 350 in 50 institutes, stations, and substations

Agriculture is the backbone of Tanzania's economy, but in recent decades domestic and outside factors have led to a disturbing cycle of agricultural and economic decline. As economic prog-

ress faltered, the government faced severe fiscal constraints. Agricultural research, like other national development endeavors, suffered from underfunding. For this and other reasons, agricultural production stagnated, further adding to the momentum of economic decline.

The seriousness of the situation has become clear to the Tanzanian government and to the international donor community. Among the corrective actions taken by the government was the launch, in 1988, of the National Agricultural and Livestock Research Project (NALRP). Supported by the World Bank and other donors, this multimillion-dollar project, among other things, aims to reorganize and rehabilitate the country's agricultural research system.

An important component of the project has been the preparation of a research master plan by the Ministry of Agriculture and Livestock Development. This is basically a blueprint for agricultural research in mainland Tanzania for the next five years. Discussed under the aegis of the Special Program for African Agricultural Research (SPAAR), the preparation of the plan was financed by Germany and the United Kingdom (the main donors in this effort), as well as the Netherlands.

ISNAR began working with the ministry's Department of Research and Training (DRT) in 1988 to help establish the framework for the masterplanning exercise. Late in 1989 we posted a staff member to Dar es Salaam to assist the national coordinator of the master plan and the 30-odd Tanzanian scientists and managers working with him in four groups. Eleven foreign consultants provided by ISNAR worked with the team during 1990 to gather and analyze data and help write up the results.

During 1990 the team produced 58 papers in three volumes. These provided a detailed historical and current picture of

the national agricultural research system and its needs. Some papers were retrospective, describing the achievements of the national research system in recent years. Others looked at research priorities for the next five years. Several papers defined the resource needs of the research system: funding, numbers of scientists and support staff, equipment, buildings, and information. All together the papers formed the building blocks from which the master plan document was eventually drafted.

The picture that emerged from the exercise was one of an overextended, deteriorating, and dispersed NARS that is attempting to conduct 22 commodity programs, five livestock programs, and six special programs. In effect, the resources allocated to the research system are insufficient to support its nationwide network of 50 research institutes, stations, and substations, staffed by some 350 well-trained scientists, 550 technicians, and 760 assistants. Lack of transport to and from research sites is sometimes a problem, and in some cases research facilities do not have basic services such as water and electricity.

Another problem is research planning. It continues to be a bottom-up process in which projects are submitted by individual researchers and stations and then combined into national plans without clearly stated priorities.

Most of the funds allocated to DRT are used to pay staff salaries, which are low. Little is left for actual research. The network has become largely unproductive and staff morale has slumped.

Consolidation rather than growth

The overall strategy for agricultural research that has emerged from the masterplanning exercise can be summed up in a few words: consolidation rather

than growth. The strategy assumes that government and donor resources will be restricted in the future; the funding that is available will be needed to rehabilitate the country's infrastructure of roads, buildings, electrical power grid, etc. The research system must therefore be redesigned to get the most out of its current scientific manpower and to focus on the most important research questions.

After analyzing their data, the planning team proposed research priorities for the next five years. The resulting plan calls for program areas to be divided into three sets. The first, top-priority set comprises the following: coffee; cotton; tea; rice; animal health and livestock diseases; ruminant meat and milk production; soil and water management; agroforestry; farming systems research (FSR), and agricultural economics. A major reason for giving top priority to commodities such as tea, coffee, and cotton was that they are important sources of export earnings for financing national development, including agricultural research.

The second set of research areas comprises maize, roots and tubers, phaseolus beans, grain legumes, vegetables, and oil seeds. All other areas fall into the third set, with the lowest priority. This ranking of programs will need to be regularly reviewed and possibly adjusted.

The master plan calls for resources available under the NALRP to be concentrated on the first-priority research programs. Research on second-priority programs will continue at their current resource levels. The lowest-priority programs will receive much less emphasis, and some of their resources may be reallocated to the first-priority programs.

At the same time, the master plan sees the need for each program to have a critical mass of scientists to make sure research goals are achieved. As part of the masterplanning operation, a national

manpower plan was drawn up with assistance from an ISNAR human resources specialist. It estimates that 88 scientists, 102 technicians, and 41 assistants will need to be reassigned.

Following logically from the new research priorities is a resetting of priorities among research facilities. Under the master plan, eight major research institutes, all of which are designated to carry out priority research, would be considered the highest priority for rehabilitation. This includes construction of new laboratories and housing, as well as provision of water facilities, computers, transport, and laboratory and other equipment. Also identified for rehabilitation are a further 14 institutes and research stations (second priority) and 10 substations (third priority).

Apart from defining new program priorities, staff reassignments, and a rehabilitation scheme for physical facilities, the master plan spells out the need for the NARS to secure funding from alternative sources. The most promising option, it suggests, is to seek funding from the export commodity parastatals (marketing boards and agencies) which are important users of research results. At the same time, the plan notes that good links between the research system and other actors in the agricultural community are important if the research effort is to be effective. Its authors underline the need for the NARS to strengthen its currently limited links with other government services (such as extension), the universities, other countries, and outside organizations.

In a nutshell, the basic aim of the master plan is to have fewer but better endowed agricultural research programs that are more likely to lead to meaningful results. This alone, of course, will not be enough. The proposed overhaul of the research system, should the government decide to adopt it as policy, must be seen in

the larger context. It is but one important step in the country's overall efforts to rehabilitate its national infrastructure and economy.

For ISNAR, the experience has been greatly beneficial. From our role of pro-

viding the Tanzanian planning team with external coordination assistance, we have gained rich experience in the logistics of conducting a large-scale planning effort — an effort that has a potentially massive payoff to the host country's agriculture.

Morocco



population (1988): 23.5 million

main agricultural commodities: wheat, barley, maize, food legumes, sugar beet, sugarcane, oil seeds, olives, fruit trees, grapes, fodder and pasture crops, vegetables, cattle, sheep, goats

agricultural researchers (1986): 178 at the main research institute, plus others at teaching institutions

Since the mid-1970s, following a phase of expansion, Moroccan agriculture has faced formidable obstacles. In particular, population growth has been rapid and the European export market for Morocco's fruit and vegetables was constricted following the entry of Spain and Portugal into the European Community. Added to these is the fragile natural environment's continuing susceptibility to degradation.

Until recently, the government made irrigation a priority. The policy proved effective for boosting production of exports such as citrus fruits and vegetables, and

of some basic products, including sugar, milk, and vegetable oils. Rainfed agriculture has received much less attention. As a result, production has lagged and there is a severe and growing cereals deficit.

The potential for increasing rainfed production is there, but it will be difficult to harness. It requires mastering soil and water management techniques, and intensifying the use of natural resources while preserving the environment. This is a major challenge to Morocco's scientists. For a new agriculture, new research is required — research that responds better to national development objectives.

ISNAR has been working for several years with the NARS of Morocco in pursuit of this goal. Our partnership has been with the foremost organization responsible for agricultural research in the country, the semi-autonomous Institut National de la Recherche Agronomique (INRA). (The Institut agronomique et vétérinaire Hassan II and other parastatals also conduct agricultural research.)

What is particularly noteworthy about our collaboration with INRA is that it is a good example of how ISNAR, where feasible, integrates the three main components of its assistance to NARS: advisory service, research, and training. Our work began in 1984 with a review of the agricultural research system, followed by assistance with the implementation of the resulting recommendations. Collabora-

tion centered first on the development of a computer-based program management and budgeting system (PBS), for which the software was successfully completed during 1990.

In addition to this continuing work, we also put major emphasis on the redesign of long-term (10- to 12-year) research programs during the year. The effort began with joint development by INRA and ISNAR of a method for long-term program design. It includes procedures for setting priorities among "areas" of research (e.g., propagation, soil cultivation, irrigation) within a particular program (e.g., olives), as well as procedures for allocating human resources.

The method begins with a three-pronged analysis comprising: a review of national economic and agricultural development objectives; an assessment of the needs of farmers and other economic agents, their potential for achieving these objectives, and constraints on them; and a review of the results of earlier national and external research.

Armed with this analysis, program designers set research objectives, identify corresponding research activities that need to be carried out, and specify the numbers and types of scientists and other staff required. Finally, priorities are set among specific areas of research (for which specific research projects are later formulated by the program scientists).

This program-design method builds upon previous ISNAR research in the area of planning and priority setting. It also draws on techniques used for project planning by Germany's GTZ.

A salient feature of the method is that it is intended to be used by a working group or program steering committee. This brings together researchers, research managers, and research users. Group discussions are managed through visualiza-

tion techniques to ensure creativity and full participation.

In this social process, staff of the NARS planning unit (if one exists) take a backseat. They act as facilitators and leave the center stage to those who have a direct stake in the research program. The method is participatory rather than consultative because participation breeds the commitment needed for implementation at a later stage.

Participatory action-research

The program-design method was developed jointly during 1990 by ISNAR and INRA through INRA's programming division. The work began with a prototype method that we designed and tested in cooperation with the steering committee of INRA's olive research program. This experiment led to refinements and further testing on two other research programs (forage crops and small ruminants) with GTZ participation. This, in turn, allowed us to make more refinements. Such a hands-on cyclical approach, directly involving users, is often referred to as participatory action-research.

All these tests culminated in a joint publication by ISNAR and INRA staff, describing the program-design method step by step (ISNAR Working Paper No. 37). The two organizations also jointly conducted training workshops to introduce the method to other research programs at INRA, including the largest farming systems program, aridoculture.

Once the long-term program-design method had been developed, other tools were needed to help with shorter-term planning tasks — namely, the design of individual research projects and allocation of resources to them. These tasks require that activities and resources be defined for two different time frames: medium-term (about five years) and annual.

Methods for doing this were developed with INRA using the same participatory action-research approach.

INRA's annual programming exercise provided the occasion for applying these project-level tools in conjunction with the computer-based program budgeting system (PBS) mentioned earlier. The scientists furnished the PBS with information on the activities they would be undertaking the following year and the resources they would need.

With these programming procedures now being put in place, the use of the PBS can become a formal part of management at INRA and procedures for monitoring and evaluating research can begin to be established. These next two steps will be

undertaken in 1991, completing the set of program management techniques.

Also a communications tool

The use of the program-design method has sparked the curiosity of non-INRA agricultural specialists — for example, staff of agricultural development agencies and university-based researchers. They are interested in the potential results of INRA's research programs and possible collaboration. The method, then, is serving not only as a planning and design tool but also as a vehicle for coordination and improving communications between the various actors in the NARS.

Bolivia



population (1988): 6.9 million

main agricultural commodities: in the altiplano, potato, oca, quinoa, sheep, llamas, alpacas; in the lowlands, sugarcane, rice, oilseed, citrus, soybean, wheat, barley, cotton, pastures, beef cattle, timber

agricultural researchers (1988):

172 in two main public institutes

ISNAR's work in Bolivia is a good example of our increasingly integrated approach to helping countries strengthen their agricultural research systems. More

and more, our advisory, research, and training services reinforce each other, and to some extent the boundaries between them are becoming blurred

The task of assisting Bolivia is complicated by the fact that this South American country has two distinct agricultures. The fertile lowlands, comprising some three-fifths of the country, has a varied climate ranging from tropical to semiarid. It is here that most of the high-value commodities such as cotton, sugarcane, and beef are produced by medium- and large-scale farmers. The Centro de Investigación Agrícola Tropical (CIAT) conducts research and extension for the eastern province of Santa Cruz, the largest in Bolivia. Its research serves both commercial farmers and the growing numbers of subsistence farmers.

The altiplano is the dry western plateau lying between the two main ridges of the Andes Mountains at an altitude of some 3700 meters. Occupying about one-

fifth of the country, it is a highly populated region in which subsistence farming is the predominant form of agriculture. This area, along with the high-altitude valleys, is served by the nationally mandated Instituto Boliviano de Tecnología Agropecuaria (IBTA). (Apart from CIAT and IBTA, numerous other smaller public and private organizations are involved in research and technology transfer in Bolivia.)

In 1990 we followed up on needs identified by our review mission of these two institutes in mid-1989. Following the rapid implementation of several major recommendations by CIAT, ISNAR was asked to provide assistance on six management themes. Available resources allowed us to help in two areas during the year: economic evaluation of CIAT's soybean research and a training workshop on the principles and practice of monitoring and evaluation.

The soybean study used "economic surplus" theory to estimate the gains from research and extension for this important commodity in Bolivia over the past 15 years. The findings of this "ex post" (after-the-fact) evaluation, conducted jointly by an ISNAR economist and CIAT's deputy director, indicated an average annual return on investment of about 70 percent. This compares very favorably with the 12 percent minimum rate expected of other development projects and with the 40 to 50 percent rates usually estimated for agricultural research as a whole.

This analytic work closely followed economic methods developed in the past 30 years and used by ISNAR in 1988 to calculate the rate of return on investment in rice research in Uruguay. The work in Bolivia and Uruguay is generating great interest among other NARS hoping to evaluate the payoff from their research. ISNAR is now beginning similar analyses

in Ecuador, Indonesia, and sub-Saharan Africa.

Economic evaluations of research are highly useful. As a planning tool they can help research managers to assess the costs and benefits of long-term programs and the allocations of resources to them, based on measured performance rather than on less empirical criteria. They also serve to keep government decision makers informed of the importance of agricultural research and its link with agricultural and economic policy.

ISNAR's goal in these studies is to develop the capacity of our NARS partners to evaluate the economic impact of their work.

In October ISNAR also collaborated with CIAT on a training workshop on monitoring and evaluation for about 10 research program leaders. This covered two main activities: monitoring of research during implementation, in case midstream adjustments are needed; and "ex ante" evaluation (review of research proposals at the planning stage). The workshop was the first time CIAT's program managers had ever had the opportunity to exchange experiences on how they monitor their research. Together they described various mechanisms used throughout the institute and its research stations to monitor inputs, expenditures, research results, and personnel performance. Some of these tools — for example, research report forms — were simplified or otherwise improved.

Long-term strategy for change

Progress in Bolivia's larger research institute, IBTA, has been slower than at CIAT. This is because IBTA's organizational and financial problems are more serious than CIAT's, and its task of servicing the technology needs of poor farmers in the altiplano and valleys is for-

midable. IBTA, therefore, requires a longer-term strategy for change.

ISNAR's 1989 review called for radical structural changes at IBTA to make the institute and its stations more effective. Apart from recommending a consolidation of IBTA research into a smaller number of focused programs, ISNAR also advised a major reorientation of IBTA's extension work. This was in part because of the institute's poor record of transferring new technologies to farmers.

Operating a traditional government extension service in the rugged and remote region of the altiplano is costly and logistically difficult. However, at least 50 large nongovernmental organizations (and hundreds of smaller ones) are already operating in this region. ISNAR therefore recommended that IBTA provide "pre-extension" services to these NGOs and other public and private development agencies as a better way to serve farmers.

The ISNAR review was a catalyst for donor action. At the end of 1989, the World Bank commissioned FAO to examine in more detail the state of IBTA, its research, and extension services. The FAO report largely concurred with ISNAR's findings but went further by recommending detailed changes. Bolivia is now nego-

tiating with the World Bank for a multi-million dollar eight-year loan to strengthen IBTA.

During the first half of 1990, the project proposal was finetuned by the Bolivian Government and the FAO and World Bank teams. Under this project IBTA will concentrate mainly in the highlands and valleys by conducting six commodity programs of special importance to poor farmers: potatoes, quinoa, cereals, legumes, maize, and pasture and livestock. The work will be conducted by four principal research stations. IBTA will also aim its technology dissemination efforts at the NGO community and other public and private technology-transfer organizations.

After the World Bank approves the loan, ISNAR expects to assist IBTA with the planning and implementation of various technical assistance components of the project. These include planning, priority setting, management information systems, monitoring and evaluation procedures, and linkages with technology-transfer agents such as NGOs. In anticipation of this and other challenging work in Bolivia, ISNAR formed a country task force of six staff members in November 1990. It is the first of what promises to become a useful innovation for integrating services to our NARS partners.

Advisory service around the world

The following list gives brief highlights of ISNAR's advisory work in those countries not covered in detail in the preceding section.

Africa

Benin

Examined proposals for reorganizing the Direction de la Recherche Agronomique, in preparation for a project of the World Bank and FAO to strengthen the NARS.

Burkina Faso

ISNAR visited by the Minister of Secondary and Higher Education and Scientific Research in June to discuss collaboration; later visited by the director of research and two deputies to prepare their plan of activities for the next several years.

Burundi

Monitored major progress on the implementation of recommendations of a 1988 ISNAR review of the Institut des Sciences Agronomiques du Burundi (ISABU); assisted with the design of a programming system and revisions to personnel regulations, and advised on criteria for evaluating staff.

On a visit to The Hague to review his country's collaboration with ISNAR, the Honorable Mouhassine Nacro (left), Burkina Faso's Minister of Secondary and Higher Education and Scientific Research, renews an old friendship with ISNAR's publications officer. Both were at the University of Georgia in the early 1980s, the former as a postdoctoral fellow, the latter as a faculty member.



Cameroon

Reviewed progress on the implementation of the action plans of the Institut de la Recherche Agronomique (IRA) and the Institut de Recherches Zootechniques (IRZ); outposted ISNAR adviser continued work on research programming at IRA.

Ghana

Followed up on the diagnostic review of 1989; worked with a team of Ghanaian scientists in developing a framework for producing a national agricultural research plan, to be completed in the first 18 to 20 months of a proposed five-year project to strengthen agricultural research; expected funding by the World Bank.

Guinea-Bissau

Followed up on a planning workshop in 1989; worked with Departamento de Estudos e Pesquisas Agricolas to set research priorities and to prepare their research programs.

Kenya

Participated in a donor-funded mid-term review of the National Agricultural Research Project; assisted the Kenya Agricultural Research Institute (KARI) in preparing its 1991-92 work plan and in designing procedures for reviewing research projects at the national level; advised the National Wheat and Oilseeds Research Centre and the National Agricultural Research Centre (Muguga) on program formulation.

Senegal

Completed two-year institution-building human resources management project funded by USAID; as a result of this work, ISNAR asked by the government and the donor to continue collaboration.

Somalia

Worked with Somali Government on a revision and updating of their Strategic Agricultural Research Plan, to be used as the basis for developing a National Agricultural Technology and Training Project, funded through an IDA loan.

Uganda

Following 1987/88 review of Uganda's NARS, request received for ISNAR assistance in preparing a national agricultural research strategy and plan; staff person outposted to Uganda in 1990; staff and consultants collaborated with a Ugandan working group on the production of a two-volume plan and implementation strategy.

Zaire

Assisted, in conjunction with CIRAD, in finalizing Zaire's national agricultural research master plan, as part of the final phase of a UNDP-funded project to restructure the Institut National pour l'Etude et la Recherche Agronomiques au Zaire (INERA).

Asia**Indonesia**

Agency for Agricultural Research and Development (AARD) assisted by outposted ISNAR staff in establishing a management information system (MIS); AARD also assisted by ISNAR consultant in reestablishing its center for research programming.

Laos

Supported the management of the National Agricultural Research Center (NARC) and an Asian Development Bank team in the design of a long-term research plan, as part of the final phase of a UNDP-funded project.

Philippines

Pilot tested (in two research institutes) ISNAR-developed tools for research managers — the Agricultural Researcher Information System (ARIS) and a program budgeting system (PBS); collaborated on documenting the experience of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) in monitoring and evaluating its programs.

Sri Lanka

Worked with the Council for Agricultural Research Policy (CARP) in developing and testing a management information system and in training staff in its use, at all 19 research institutes for which CARP has responsibility.

Latin America and the Caribbean

Costa Rica

Worked with senior officials on the role of the National Commission of Agricultural Research and Technology Transfer, which was established earlier on the basis of ISNAR recommendations; prepared a plan for ISNAR-Commission collaboration following acceptance of the Commission's role by the new government.

Ecuador

Advised on the legal and institutional framework needed to obtain autonomy for the Instituto Nacional de Investigación Agropecuaria (INIAP); included efforts to define structural and organizational changes, to reshape and strengthen planning and programming, and to improve research and technology transfer.

Uruguay

Continued work on planning phase of the new Instituto Nacional de Investigación Agropecuaria (INIA), including advice on institutional policy and strategy, priority setting, structure and organization, human resource planning and development.

Caribbean countries

ISNAR asked by the Caribbean Agricultural Research and Development Institute (CARDI) to work with it on a new 10-year plan; exchange of visits by CARDI's executive director and ISNAR staff to lay the groundwork for the review which will cover all Caribbean Community (CARICOM) countries.

West Asia and North Africa

Algeria

Assisted a local study team to carry out a diagnostic review of the national research system; included a workshop on ISNAR-developed methodology for reviewing Agricultural Technology Management Systems (ATMS).

Sudan

Participated in the mid-term review of the Agricultural Research, Extension and Training Project; prepared a paper on improving the organization and management of Sudan's Agricultural Research Corporation (ARC).

Syria

Assisted the national strategic-planning team in preparing and finalizing a strategy for agricultural research.

Yemen

Assisted a local study team to carry out a diagnostic review of the national research system; included a workshop on ISNAR-developed methodology for reviewing Agricultural Technology Management Systems (ATMS).

In addition to the countries listed above, ISNAR also worked or had contact with the NARS of many other countries, often combining advisory work with research and training. These countries include: Angola, Brazil, Colombia, China, Côte d'Ivoire, Ethiopia, Fiji, Guinea-Conakry, Jamaica, Lesotho, Mexico, Mozambique, Niger, Rwanda, Sierra Leone, Togo, Tonga, Zambia, Zimbabwe.

II. Research

To maintain a relevant and high-caliber advisory service to the national agricultural research systems (NARS), ISNAR must blend two kinds of expertise. One is personal know-how and long experience, especially of our senior staff. The other is the new knowledge, tools, and methods generated by ISNAR's own research program. Both types of expertise are reinforced by collaboration with our NARS partners and by the selective use of consultants.

Underpinning the need for research is the fact that the NARS environment is dynamic. Needs change; new problems arise. From Bamako to Bujumbura, microcomputers are being bought by national institutes, for example. Like so many rusty, derelict tractors, these could end up on the junk heap unless new tools and methods are formulated to ensure that the right data are collected for managers, kept up to date, and put into a useable format. Otherwise, computers will not end up contributing to management and decision-making. This is just one of several areas where ISNAR is helping.

Apart from developing tools, ISNAR's research program also serves to continuously update our global knowledge base on the state of NARS.

The external panel that reviewed ISNAR's program in 1985 recommended an increase in the share of resources devoted to research. Our medium-term plan saw this rising to 25 percent in 1990. With 26 percent of staff time devoted to research last year, we are on track with our plan.

We have two principal mechanisms for carrying out research. We initiate formal projects of fixed duration, for which we seek special funding from donors. And we have ongoing investigations, supported by core funds and carried out by in-house "working groups".

ISNAR's research continues to contribute to our other work, as was originally intended. For example, some of the results of our global special project on on-farm research were applied in our advisory work in Tanzania in 1990. Likewise, concepts used in our major study of agricultural research in 50 small countries proved useful in

our advisory work in Botswana and in a training workshop in the Caribbean. ISNAR staff members who conduct training and advise NARS, then, are also important clients of our research program.

The following section describes some of ISNAR's research work in 1990, with special emphasis on five research projects that made good headway. Other research efforts are mentioned only briefly here, especially those that are discussed elsewhere in this report in the context of training or advisory service.

Analysis of NARS data will help inform policy

ISNAR's *Indicator Series* data base, consisting of financial and personnel statistics on the NARS of 154 countries, was published in October 1989 by Cambridge University Press. In 1990 we took a major step by completing the first stage of analysis and interpretation of this huge pool of raw data, aimed at contributing to the international dialogue on agricultural R&D policy.

The result is a companion volume, *Agricultural Research Policy: International Quantitative Perspectives*, soon to be printed by the same publisher. It is described by one of its editors as an effort to address "as many of the key policy issues as we could usefully inform with empirical evidence."

Drawing not only on the *Indicator Series* but also on data from the World Bank, IMF, and FAO, the new policy volume examines a number of important issues for donors, governments, and NARS. The 12 chapters, by five ISNAR staff and eight outside experts, are clustered around five themes: research in a policy context (including issues of sustainable agriculture); measuring research and economic development; public-sector research (from national, regional, and international perspectives); private-sector research; and emerging policy issues for the 21st century.

Threat to development assistance

The stated purpose of the researcher-editors is to "underpin policy dialogue with data." And policy dialogue there will be. The geopolitical landscape of the world is in the midst of a dust storm that will continue to stir policy debates but undoubtedly will not have settled fully by the end of the century. As the editors say in their introduction, "The old clichés of first, second and third worlds may soon lose much of their descriptive value as new alliances and priorities emerge." One thing appears certain to the editors: "The flow of development assistance to what have been recognized as less-developed countries seems destined to be seriously compromised."

Support to national agricultural research is a small component of overall development assistance from donor countries. Nevertheless, it seems to be a crucial component in agricultural growth. How it fares in future will depend on shifts in the policy wind — on donors' perceptions and priorities in a world of heavily competing demands.

Perhaps the most significant and worrying large-scale trend to emerge from the ISNAR analysis is the erosion of NARS funding that is already under way. In particular, the debt-ridden countries of sub-

Saharan Africa, Latin America, and the Caribbean have been forced to make painful cuts in government expenditures. Agricultural research funding has not been exempt; on the contrary, it seems to have fared worse than overall government expenditures. Development assistance is also a worry. Throughout the 1980s the volume of total donor contributions to less-developed countries did not rise. Neither has there been any indication that agricultural research has been able to get a larger slice of the donor pie.

Thus, between the two periods 1976-80 and 1981-85, 37 percent of the less-developed countries in the ISNAR sample had declining "agricultural research intensity ratios" (ARIs). In other words, the percentage of AgGDP they spent on agricultural research went down. About half of these, or 16 countries, are in sub-Saharan Africa. By contrast, only three more-developed countries saw reductions in their ratios over the same period.

Analysis of *Indicator Series* data shows that for the period 1981-85 the low-income countries annually spent an average of 0.6 percent of AgGDP on agricultural research. For the low-income countries to reach the high-income countries' average of 2.13 percent, however, would be unreasonably costly. It would mean boosting research's share of agriculture-related government expenses from its 1981-85 level of 7 percent to 25 percent. To do so would be, in effect, to take away scarce resources from non-research investments — in rural roads, irrigation, extension, and subsidies for production and marketing.

An obvious policy implication is that

donors and developing-country governments must be very wary of using "global" rules of thumb in calculating desirable levels of funding for NARS.

In the concluding chapter of the policy book, economist Vernon Ruttan looks ahead to the first decades of the next century. Among other things, he predicts that crop and animal production in most developing countries will remain well below their potential. Efforts to institutionalize research capacity in less-developed countries, he asserts, will have to be intensified.

The ISNAR policy volume is expected to be available by mid-1991.

Finally, a note about the original *Indicator Series*. The publication of this data base was an institutional milestone for ISNAR. Compiled over four years and based on over 1000 references, it is now permitting policymakers, NARS managers, and donors to make cross-country comparisons of agricultural research funding and scientist strength for the years 1960-1986. Although information for certain years was not available for a number of countries, the *Indicator Series* remains the most comprehensive statistical picture to date of the world of agricultural research at the national level.

In 1990 we continued to monitor NARS and collect information for the data base. We also drafted a proposal for a global, long-term project which would launch a second round of data collection and analysis. Special funding to begin work on the sub-Saharan Africa portion of the project has been secured and that will be the focus for 1991.

Structuring the guesswork: priority setting in Indonesia

An important task of top-level agricultural research leaders is to set priorities

among proposed programs; that is, among sets of interrelated research pro-

jects. In practice, this means accepting and funding some programs, and rejecting or postponing others. In 1990, ISNAR and several collaborating institutions made encouraging progress in their efforts to design a set of procedures to help managers perform this task.

Before managers set priorities, they need to address a number of policy-related, technical, and economic issues. On the policy side, they should clarify the research systems' goals and objectives. On the technical and economic side, they must ask themselves: What are the chances of the proposed research program producing usable results? How long will it take before concrete results are seen in the field? How much will application of the results boost commodity production or lower farmers' costs?

In most countries this exercise amounts to educated guesswork. It relies on a mix of available data on commodity prices, production and consumption statistics, personal experience of seasoned research managers, and professional hunches. ISNAR and its partners in the priority-setting study are not aiming to replace the human element in decision-making; rather, they are trying to "structure the guesswork". They refer to their computer-simulation method as a "decision-support structure".

The main sponsor of this multicountry project, which began in 1988 and whose first phase was nearing completion at the end of 1990, is Australia's ACIAR. Collaborating research organizations in Indonesia, the Philippines, and Thailand are currently serving as test cases to develop and apply the method. Funding from Germany's BMZ covers ISNAR's collaboration with the Center for Agro-Socioeconomic Research (CASER) within Indonesia's Agency for Agricultural Research and Development (AARD), which will be among the first organizations to

apply the priority-setting method.

Calculating the benefits of research 'spillovers'

An attractive feature of the method is its analytical flexibility. It allows a user to calculate the potential payoff of applying the results of a research program in agroecological zones beyond the original target zone.

For example, a research program may call for the development of a potato variety that yields well under the specific soil conditions, moisture, temperature, and daylength of a particular area. Using the computer-simulation priority-setting method, an analyst can estimate the expected benefits if the research "spills over" into other non-target agroecological zones. It may turn out that the potential production increase is only half as great for these secondary areas. However, that may be enough to justify choosing the potato research program over, for example, a soybean program that promises big production boosts in one zone but little or no spillover to other zones. This kind of information is very useful to the senior research manager having to make and justify hard programming decisions.

As with any computer tool, priority-setting methods are only as good as the data used in evaluating the expected impact of research. In 1990, much of the CASER-ISNAR development work concentrated on the exacting and time-consuming task of collecting, interpreting, and assembling four types of information.

The first type is soil and climatic data for Indonesia which enabled the researchers to refine the definitions of the country's numerous agro-ecological zones. Once collected for a country, such information is good for all future priority-setting exercises. The second type is information on the suitability of various

commodities for these zones. The third is production, consumption, and price statistics for each commodity at the provincial level. These three types of information were collected from FAO and Indonesian sources, mainly the soils institute and local statistical and agricultural bureaus. The fourth type is the subjective estimates from scientists and extensionists: the expected impact of, or cost saving from, their research programs; the probability of success of the research; and the time lag before the new technologies are developed and adopted. Clearly, expert judgment is a key part of the process.

Running this information through the PC-based simulation model enables analysts to estimate the economic benefits of existing or alternative research programs, including the spillover potential. Repackaging this information into a form suitable for busy decision makers is the key to providing useful input into strategic planning and priority setting.

Now that the main development work is nearly completed, efforts are turning to

packaging the decision-support procedures and training analysts in the participating countries. During 1990, ISNAR continued to train three staff members of CASER. In October, they met with 21 of their counterparts from Thailand and the Philippines at a regional seminar in Punta Baluarte, the Philippines, sponsored by AICIAR. They shared their experiences in applying the priority-setting method and discussed ways to ensure its sustained use over the long term.

Work is now under way at ISNAR to design outreach materials aimed at helping other national research systems to adapt and adopt the procedures. These will include a volume on the theory and practice of research evaluation and priority setting, along with supporting computer aids. As for our work with Indonesia, the next task is to encourage the building of links between CASER and the ultimate users and setters of priorities: AARD's Secretariat and its Center for Agricultural Research Planning (CARP).

Biotechnology books and case studies launched

The results of a major international study on biotechnology, sponsored by the World Bank, ISNAR, and the Australian government, were published in 1990 in both technical and popular forms. The two-year project was led by an Australian plant scientist who spent a significant proportion of 1988-89 based at ISNAR headquarters. She joined ISNAR's staff in March 1990 to continue work on biotechnology issues as they relate to the national systems.

The first output of the project was a World Bank paper intended primarily for internal use by Bank staff and their clients.

The second publication is a short, highly readable book titled *Beyond Mendel's Garden: Biotechnology in the Service of World Agriculture*. It is aimed at research managers and policymakers who may not have a background in molecular biology but are responsible for investing resources in agricultural research. The book, which was published by CAB International on behalf of the study's sponsors, begins with a brief review of the most important techniques in biotechnology and their application. It then lays out some of the major policy issues, such as biosafety, access to new knowledge, intellectual property management, and socioeco-

conomic impact on developing countries.

The third publication, also published by CAB International, is a longer, more technical book titled *Agricultural Biotechnology: Opportunities for International Development*. It contains the 31 papers commissioned for the international study, covering scientific, policy, and management issues in biotechnology. The intended readership is scientists, economists, and managers actively working in biotechnology, especially in developing countries.

Study of four countries

In 1990, the Government of the Netherlands commissioned ISNAR to carry out complementary studies on biotechnology and its application in NARS. The four countries proposed — Colombia, Indonesia, Kenya, and Zimbabwe — all have active agricultural biotechnology programs and can provide special lessons for other countries.

During the year, two of the case studies were begun, in Indonesia and Kenya. ISNAR prepared a draft overview paper on biotechnology in Indonesia; it will be used in 1991 as background for the study in that country. The University of Nairobi has been commissioned to prepare a similar overview paper as part of the study of the Kenyan biotechnology scene.

In each country the study teams will work with scientists and policymakers to record their experience and identify future opportunities for building biotechnology into the national research systems. The studies will collate information about current priorities in research, public- and private-sector investments, regulatory procedures, intellectual property management, and international technology transfer.

Research proposal for eight Asian nations

Apart from the two research projects mentioned above, ISNAR has also been playing an active advisory role in biotechnology research. During 1990 our biotechnology specialist worked closely with FAO and UNDP on the design of a large Asian research program on plant biotechnology. The proposed five-year, US\$5 million effort will involve eight countries: China, India, Indonesia, Iran, Korea, Malaysia, Philippines, and Thailand. Research will concentrate on pest and disease resistance in oilseed crops, insect resistance in cotton, rapid propagation of date palm, and post-harvest quality of tropical fruits.

During the year, ISNAR wrote a synopsis of biotechnology in each of the eight countries and took the lead role in drafting the project document. In December, specialists from the participating countries and agencies met at an FAO-sponsored planning meeting in Bangkok and revised the document. Discussions centered on the logistics of collaboration, research priorities, and mechanisms for gaining access to continuing advice on biotechnology policy issues. FAO has submitted the project for possible funding by UNDP.

Finally, ISNAR contributed significantly to the inter-institutional work of BIOTASK in 1990. This international committee of the CGIAR, whose secretary is an ISNAR staff member, is charged with stimulating an international dialogue on biotechnology among donors, NARS, and international research centers. During the year, BIOTASK organized two biotechnology seminars — one in March in Amsterdam on cassava, the other in June in Canberra on rice genetic mapping and plant breeding. Reports of the meetings were widely distributed.

Study of small countries: trends begin to emerge

ISNAR's study of agricultural research in 50 small countries made substantial progress in 1990. The methodology — for identifying and analyzing the capacity, problems, and comparative advantages of research organizations in a range of small countries — was refined and written up. National research leaders working with us completed drafts of four of the seven case studies — on Fiji, Honduras, Sierra Leone, and Togo. Final texts of the case studies of Jamaica, Lesotho, and Mauritius are expected by mid-1991.

During the year team members also completed regional study papers on selected NARS of two areas: francophone West Africa and southern Africa. Research for a third paper, on technology flows between countries of the South Pacific, was also completed.

The main goal of the small-country project is to identify organizational models and management strategies suitable for the research systems of small countries. To do this requires a wide, comparative knowledge of the current research situation in as many small countries as possible. A data base on 50 small countries is therefore being compiled by ISNAR as part of the project. It contains four types of country information:

- crops, production systems, and agro-ecological zones;
- type of research system and its capacity (e.g., extent of financial support, number of researchers, and their level of training);
- links between component parts of the system;
- links with outside sources of knowledge.

In 1990, progress was made collecting

and entering information of the first two types. Agricultural information compiled from FAO and other global sources is now available for nearly all 50 countries. As for institutional information on the NARS themselves, about one-third has been collected from national sources. The most complete entries are those for the seven case-study countries, as well as countries in which ISNAR has previously conducted review missions.

The research methodology relies on several concepts to permit analysis and comparison of small NARS. Among them are **scale** and **scope**.

Scale is the inherent or planned research capacity of a national system. Briefly, this means the total resources at the NARS's disposal: people, finances, information, and physical resources such as laboratory equipment, buildings, and experimental fields.

Scope is the scientific agenda of a NARS — the set of research topics and goals to which it is committed. This has two dimensions. The first is the range of research programs undertaken, usually based on a commodity, discipline, or agro-ecological zone. The second is the level or kind of research: basic (strategic), applied, adaptive, and testing. Basic research is normally the most costly and complex and is rarely conducted by small NARS.

Refining the methodology

The initial design of the project and its methodology were drafted in 1989. In February 1990, at an international workshop in The Hague, the ISNAR research team discussed the methodology with 22 contributors to the project: researchers, ISNAR advisors, and external advisors. Participants offered several concrete ideas

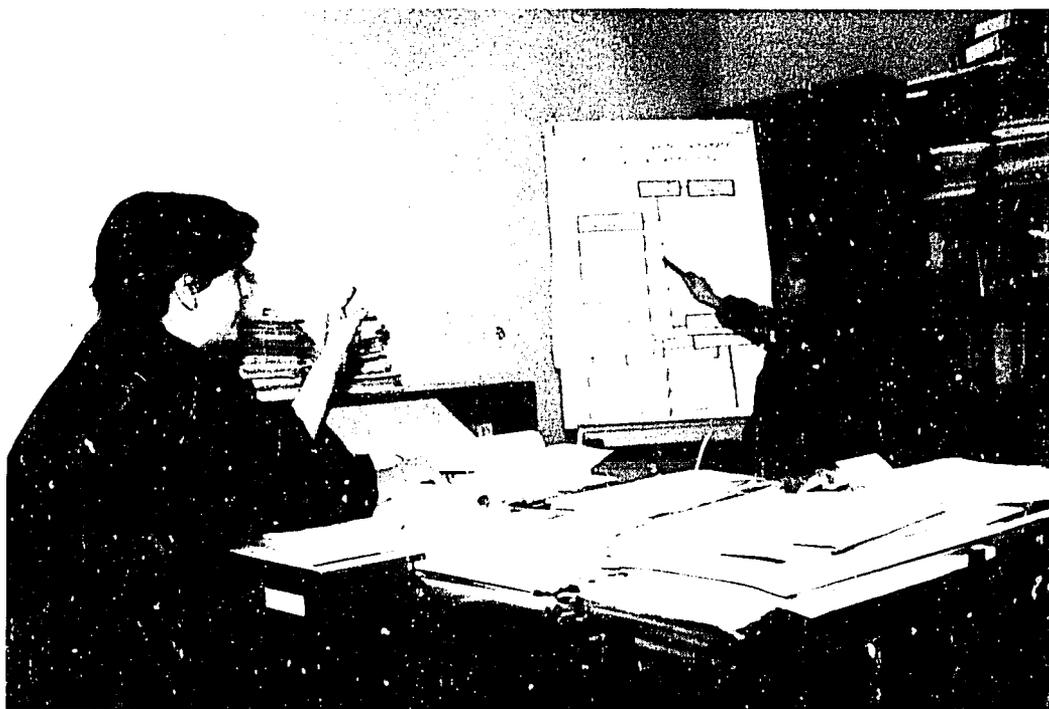
for improving it. They recommended, for example, that in measuring the scale of a NARS, the researchers should consider the research system's fiscal stability over time. Small-country NARS, they noted, are particularly susceptible to the vagaries of national funding and to boom/bust cycles. In effect, they may shrink or expand dramatically in a short period.

The point of departure for the ISNAR study has been the assumption that small developing countries of modest means need to ensure that the scope and scale of their NARS match. ISNAR has often observed that small systems tend to allow their research scope to become too wide;

that is, they take on an increasingly heavy and varied load of programs. Lacking the critical mass of resources needed to generate useful results, individual programs become barren. Mummified by bureaucratic inertia, some programs continue from year to year, long after they have outlived their usefulness.

One way to avoid this pitfall is to become adept at adapting and testing technologies borrowed from outside. This seems to be an attractive option for most small countries. Because of this, the ISNAR study is paying special attention to technology flows between small NARS and outside sources of technology and re-

Two ISNAR consultants work on the design of a data base covering 50 small countries. The system will eventually include information on each country's agriculture and NARS, including links with domestic and foreign organizations.



search, such as other NARS, private firms, universities, and research networks.

Borrowing technologies, however, may not be as easy as it sounds. Preliminary findings from the 1990 sub-study of technology flows in the South Pacific indicate that technologies from outside sources may have limited application in small countries. A corollary is that many small NARS will need to build up in-country capacity to identify and adapt those technologies that are appropriate.

Tonga provides a useful example. The tiny island nation has a need for improved agronomic practices suitable for small-scale coconut production. But private firms in the region, as well as an agricultural research center in nearby Vanuatu, are geared more toward intensive production on large plantations. Information and technology from such sources, then, may not be relevant or will require considerable adaptation.

Many sources of research

A premise of the study is that because of the limited fiscal capacity of governments to invest in public research, small countries must rely heavily on a variety of agents to conduct agricultural research. In addition to government institutes, these include private companies, universities, NGOs, and donor development projects. This reliance on outside actors means that a small-country NARS must place greater emphasis on its coordination function. Even in those areas where it does not actually conduct research, it may have a key role to play in advising governments.

This trend is particularly evident in the Lesotho and Honduras case studies. A significant amount of agricultural research takes place outside official ministerial departments or institutes. Major sources are universities, private companies, and short-duration development

projects. Furthermore, these nongovernmental research initiatives often cover subjects considered by the NARS to be core areas of research — agroforestry and soil conservation, for example. These observations suggest that small-country NARS might contribute to national research capacity by exercising leadership among these disparate groups and channeling their results into the national agricultural knowledge pool.

Initial findings from the case study in Sierra Leone are also interesting. Unlike other small countries, this West African nation has insisted on maintaining a highly trained (though small) complement of agricultural researchers, geared toward on-farm work. It has followed this policy despite severe economic problems in recent years. The national research system relies heavily on agricultural technology borrowed from other countries, but it uses its own research expertise quite effectively. Intensive, frequent contacts between researchers and farmers yield the feedback needed to adapt technology so farmers can use it. The Sierra Leone case study continues to document the use of this strategy in root crop and rice research. The hope is that there will be important lessons here for other small countries.

Elements of ISNAR's small-country research have already proved useful outside the project itself. During 1990, the concepts and method were applied in our advisory work with several small countries and in a regional training workshop on strategic planning for small NARS. Outside ISNAR, the Caribbean research organization CARDI has been using the concepts of scope and scale, as defined in the ISNAR methodology, to assess NARS in the region. This work is part of CARDI's strategic planning process.

Study of linkages moves into synthesis phase

The second phase of ISNAR's four-year study of the links between agricultural research and technology transfer was completed in 1990. The work centered on the analysis of specific issues emanating from case studies in six countries — Costa Rica, Côte d'Ivoire, the Dominican Republic, Nigeria, the Philippines, and Tanzania. (Pilot work in Colombia was completed earlier.)

Following the departure of the project leader early in the year, one of the researchers on the Côte d'Ivoire case study assumed the leadership of the study and joined ISNAR's staff.

Seven analytic "discussion" papers were published during the year (see page 57). Two others are expected to be available by mid-1991, for a total of 12 in the series. The project also moved into its third and final phase — synthesis of the results.

The issue of linkages, according to a 1985 World Bank report, is "the most serious problem in developing an effective research and extension system." One specialist working on the ISNAR project went so far as to say that weak links between extension agencies and research institutes "almost guarantee that scientific results will not reach farmers, or if they do, farmers will not be able to use them." Unfortunately for many developing countries, attempts to improve links have been disappointing.

Responding to a need

ISNAR launched its linkages project in 1987 in response to requests from agricultural research managers for advice in this troubling area of agricultural development. Funding for the study comes from the governments of Italy and Germany and from the Rockefeller Foundation.

We found the literature on research and technology transfer contained many stories about the pitfalls of poor links. But much of this information was either anecdotal or very general. It was clear that a systematic study was needed to provide NARS managers with a set of concrete, valid guidelines for analyzing and improving links. By offering such guidance, ISNAR hopes to help managers to make research more relevant to the needs of farmers and other users and to ensure technology is widely disseminated and adopted by them.

The research began with a comprehensive review of the literature and the writing of a series of theme papers analyzing research-extension linkage problems from the vantage point of different disciplines. These covered topics such as the role of private-sector research in technology transfer and the effects of government policy shifts and organizational changes on links.

The second phase consisted of the seven country-case studies in which 17 subsystems of the national agricultural technology systems were examined by some 20 national researchers and ISNAR staff.

Policy context must be clear

The project moved into phase three in 1990 with the formulation of a strategy for synthesizing the study findings. A major lesson emerging from the case studies is that to understand research-technology transfer problems one must also understand the policy context. At the same time, the research team became increasingly aware of the fact that other conditions specific to countries and their NARS make it difficult to generalize about linkages.

As part of the synthesis process, we commissioned seven papers, four by ISNAR staff and three by outside experts. The following topics are covered:

- the effects of external pressure (e.g., from governments, donors, or farmers' associations) on the performance of linkages;
- resource requirements and management of linkages;
- the relation between NARS structure (e.g., the number of institutions) and effectiveness of linkages with technology transfer;
- the relation between the research system's organization (e.g., whether it is based on disciplines, commodities, or region) and the effectiveness of linkages with technology transfer;
- group dynamics, including the effects of differences in status between the various actors;
- the need for linkages according to the type of technology being disseminated;
- the effectiveness of specific linkage mechanisms.

The authors will draw on some 70 reports and papers so far produced by the project, as well as two books — one published in December 1989, the other (*The Technology Triangle*, see page 39) in September 1990.

The synthesis papers, which will be published in one volume, are not intended to be prescriptive by suggesting universal answers for managing linkages. The highly specific nature of national research and technology transfer systems precludes this approach. Rather, they will present issues in a way that arms NARS managers with the necessary concepts and questions for analyzing the situation in their own systems. These "hints" will also help us with the design of a linkage-analysis method for use in the future, both by ISNAR and by NARS staff.

The final component of the third phase will be to produce and disseminate training materials based on the synthesis documents and analytical method. If funding is available, further case studies will be conducted, the method refined, and training workshops organized for managers.

Other research

The following section briefly discusses some other research at ISNAR, mainly the continuing efforts of our working groups.

Monitoring and evaluation of research

During 1990 we laid the foundation for improved service to NARS in monitoring and evaluation (M&E) of research — an area of NARS management considered a priority by ISNAR. First, we began a

global literature review of M&E concepts, methods, and experiences, covering some 1500 documents.

Second, we carried out a preliminary assessment of the M&E needs of the national systems. We did this by surveying research managers attending our International Agricultural Research Management Workshop in November and through a three-day consultation with selected research leaders directly following the

workshop.

Attending the consultation were 10 NARS leaders, along with a research evaluation specialist from Canada's IDRC and a senior manager from the R&D division of Shell International. Together with ISNAR staff they examined the current state of monitoring and evaluation in the national systems, identified needs, and suggested ways for ISNAR to help. If there was one recurring theme during the meeting, it was that M&E should start with a clear statement of the objectives of research and a clear set of evaluation criteria. The participants also stressed the need for easy-to-use M&E procedures, analytical tools, and training. A report of the consultation will be published in 1991.

Finally, our 1990 M&E activities included an economic evaluation in Bolivia. We worked with the Centro de Investigación Agrícola Tropical (CIAT) to determine the rate of return on the institute's soybean research and technology transfer work over the past 15 years. This is reported in more detail on page 22.

Study of China's NARS

In early 1990, ISNAR launched a 2½-year study of the world's largest NARS — that of the People's Republic of China. The project is being conducted in collaboration with the Institute of Agricultural Economics of the Chinese Academy of Agricultural Sciences (CAAS) and the Center for International Food and Agricultural Policy (CIFAP) of the University of Minnesota, U.S.A. Funded by the Rockefeller Foundation, the research builds on previous work by the main investigator, a Chinese agricultural economist now based at ISNAR.

The project's main aims are:

- to describe the Chinese system, including its institutional development and the growth of research capacity;

- to estimate the impact of agricultural research on production growth;
- to conduct a preliminary analysis of key policy issues affecting resource allocations to research.

During 1990 the project centered on two tasks. The first was to collect institutional information, mainly through field work in China. The second was the drafting of a monograph on the development and resources of the Chinese NARS from 1949 on. It will be published in 1991.

Management information systems

ISNAR completed the first phase of development of its Information System for Agricultural Research Managers (INFORM). This brings together information on research activities, personnel, and finances in a user-friendly system.

INFORM is designed to help managers use such information in planning, policy making, and monitoring and evaluation. Our work on the system advanced far enough in 1990 to permit us to conduct two training workshops for Asian managers during the year — in India and in the Philippines. A report of these begins on page 46.

INFORM is described in a series of guidelines supported by a set of training materials, to be published by ISNAR in 1991.

Study of on-farm research

ISNAR continued to synthesize the results of our ongoing study on the organization and management of on-farm client-oriented research (OFCOR). The project, which began in 1986, is supported by the Government of Italy and the Rockefeller Foundation.

During the year we published three documents related to the project. The

The Technology Triangle

The Technology Triangle: Linking Farmers, Technology Transfer Agents, and Agricultural Researchers. Summary Report of an International Workshop held at ISNAR, The Hague, 20th to 25th November 1989. By Deborah Merrill-Sands and David Kaimowitz, with Kay Sayce and Simon Chater. 1990. Pages: xiv and 118. The Hague: ISNAR.

Links between agricultural research institutes and their clients — farmers and technology transfer agencies — are vital for successful development and delivery of technology. Direct links between scientists and farmers, through on-farm research, ensure relevance and rapid feedback. Links with technology transfer agencies ensure wide dissemination of technologies, making it more likely they will be used by farmers.

Among the more commonly used links are liaison positions, coordinating committees, secondments, joint field trips, joint problem diagnosis, informal consultations, publications, and guidelines for allocating time and funds for collaborative work.

The Technology Triangle, published by ISNAR in 1990, summarizes more than 25 reports and presentations made at an international workshop organized by ISNAR in November 1989. The meeting, titled "Making the Link", was convened to review the findings of two ongoing ISNAR research projects on ways to strengthen researchers' links with users — farmers and technology transfer agencies. The projects include in-depth studies of linkages in 16 countries.

The workshop in The Hague was attended by some 50 participants: agricultural researchers and managers from all regions of the developing world, ISNAR staff, case study leaders, and other specialists in the field.

Much of *The Technology Triangle* is devoted to a discussion of how and why different kinds of links work or do not work. For this reason it is of particular interest to agricultural research managers from developing countries. A total of 31 boxes interspersed throughout the text give concrete examples of national experiences with research-user links, as well as trends distilled from numerous case studies.

The ISNAR study material described in the report focuses on five key areas of research management: the policy context within which links operate; organization of links; types of linkage mechanisms and their management; staff management issues; and leadership.

most important was a summary report of a major 1989 workshop. The other two were a comparative study on staffing issues in farming systems research and a discussion paper on the role of research-extension liaison officers in Zambia.

The first of these publications, *The Technology Triangle*, examines links between research, technology transfer, and farmers (see page 39). ISNAR is pleased that the Technical Centre for Agricultural and Rural Cooperation (CTA) has agreed to fund the translation of this important book into French to ensure wider distribution.

The OFCOR project also had a noteworthy spinoff in 1990. ISNAR was called on by the Tanzanian government to assist in the design of a six-year, Dutch-funded project to strengthen national capacity for farming systems research. ISNAR responded by drawing on its in-house expertise and results of the OFCOR project to help define the contents of the institution-building component of the project, including training.

Organization and structure of NARS

The ISNAR working group investigating this critical factor in research management continued with its study of the "anatomy" of NARS from a regional perspective. The work is supported by a grant from the Canadian International Development Agency.

As part of the project, two regional overviews (covering Asia and Arab-speaking countries) were published in ISNAR's Working Paper series in 1990. Drafts of three others were prepared and will be published in 1991. The working group also produced two papers on the issue of centralization-versus-decentralization of research management. All eight documents were used as catalysts for discussion at our International Agricultural

Research Management Workshop (see page 49).

Strategic planning

Our development of an approach to strategic planning has been based on collaboration with the NARS of several countries, particularly Morocco and Mali. During the year we drafted a working paper on an important component of strategic planning: the design or readjustment of long-term research programs. The document is essentially a "how to" guide for research managers. It describes a seven-step method, as well as a social process whereby key players in agricultural research (mainly scientists, managers, and technology users) participate in the design of research programs, rather than filling a merely consultative role. This approach is described in more detail in the context of our advisory work in Morocco beginning on page 19.

Public- and private-sector research

The worldwide trend toward privatization, coupled with government budget cuts in many developing countries, is redefining the boundaries between public and private agricultural research. Private-sector research — conducted or funded by multinational and domestic agricultural-input companies, plantations, commodity institutes, foundations, and farmers' organizations — grew substantially in the 1980s.

ISNAR launched a project in 1990 to examine interactions between the public and private sectors. It will focus on areas where they might complement each other and on alternative sources of funding for research. In the first phase, in 1991, the researchers will set out a conceptual framework and create a global data base on private-sector R&D. In the second phase,

several country case studies will be conducted.

The project will be a joint effort by ISNAR, and several NARS and development organizations. Ultimately, the results will provide guidance to policymakers on the roles of public and

private sectors in agricultural research and identify alternative institutional arrangements. The project also seeks to help NARS managers to see how these changing roles affect the organization, priorities, and programs of national institutes.

III. Training and Conferences

Agricultural research leaders are called on to perform complex, highly responsible tasks related to policy, organization, and management. These include strategic planning, setting research priorities, program budgeting, and the management of people, money, land, buildings, and equipment, to name a few. Doing these jobs competently demands expertise — specialized skills for which few scientist-managers have ever received formal training during their career ascent from laboratory bench to director's office.

Forging these skills requires, in turn, specialized, context-sensitive training. ISNAR is in a particularly good position to help fill this need. First, its research program has designed a variety of management tools and methods specifically for NARS managers. Second, we are able to draw on both in-house training expertise and conventional sources such as universities and management training institutes. Third, as a member center of the CGIAR, ISNAR is able to build on the training experience of the international commodity research institutes.

In 1990, ISNAR either organized or contributed significantly to 27 major training events and conferences in 18 countries. Most of these were of one to three weeks' duration. Five were global in scope, five were regional, and 16 were national (country-specific), and one involved two countries. Participants totaled 693 men and women, excluding ISNAR staff.

The next section highlights several of the main training activities and meetings organized by ISNAR either alone or in cooperation with other organizations. This is followed by a more complete listing of the year's events. ISNAR staff also contributed individually, as resource or support personnel, to a number of training events organized by other agencies, but these are not listed.

Supporting the trainers

The hub of ISNAR's training effort is the Training Unit. This three-person team provides overall coordination of training activities and conferences, and

supports those senior ISNAR staff members called on to serve as trainers in their areas of expertise. The unit gives advice and assistance in the planning of these

events and provides expertise in monitoring and evaluating them. It also helps the trainers prepare their audiovisual presentations and other training materials.

A major initiative by the unit in 1990 was the creation of four data bases. These contain profiles of trainees; event descriptions listing the objectives and content of each workshop, course, or seminar; an inventory of available training materials; and evaluations of training based on data from questionnaires completed by trainees at the end of each event. These data bases have already proven useful in determining whether the individuals chosen to attend events are indeed those in need of the training being offered. Recorded feedback from participants also helps ISNAR trainers to decide on whether or how to modify the design of training materials.

New publication series

The unit also launched a "Training Series" of publications in 1990. The first two documents were two training-the-trainer manuals for ISNAR staff, as well as NARS trainers, on key aspects of the design and execution of a training event. These documents cover topics ranging from the initial assessment of training needs, to the design and testing of pedagogic materials, to the execution and final evaluation of an event.

A second component of the Training Series produced in 1990 was a set of 16 documents on human resources manage-

ment — one of the critical factors on which ISNAR focuses. The documents are brief summary papers that lay out for trainers and NARS managers the theoretical basis of human resource management. They are listed in the publications section on page 58.

The set, which aims specifically at research managers in southern Africa, was produced as part of the SADCC/ISNAR In-Service Agricultural Research Management Training Project. Executed by ISNAR, the project draws heavily on in-house expertise and its core staff works closely with the Training Unit.

In 1990 the Training Unit also began production of practical teaching modules on human resource management to be used by ISNAR and other trainers in conjunction with the theoretical papers. These "storyboard" modules combine the trainer's text with the visual materials to be shown.

Similar sets of theoretical and practical training documents are also being planned for other critical management factors such as links between research and technology transfer, the organization and structure of research systems, strategic planning, and information systems for managers.

The next section focuses on major 1990 training events in five countries — Kenya, the People's Republic of China, Malawi, India, and the Philippines — plus two conferences held at ISNAR headquarters.

Kenya: building a cadre of managers

In 1990, ISNAR and the Kenya Agricultural Research Institute (KARI) saw the first fruits of an innovative long-term training project designed in 1989. Three workshops for research managers and scientists, plus a national scientific confer-

ence, were organized under the KARI/ISNAR Management Linkage Training Project.

These were the first of 25 training events planned for the project. Supported by a \$1.12 million grant from the Com-

mission of the European Communities, the project is designed to improve research management in the Kenyan NARS and will run until 1994.

The first workshop examined management issues related to the reorganization of KARI and the execution of the National Agricultural Research Program (NARP). ISNAR later published a proceedings of the discussions, for distribution among KARI staff. The director of KARI declared that the workshop's "working groups came out with very useful action plans which will guide KARI in improving its management."

The second workshop was designed to help research managers to write and present scientific papers. With KARI's national scientific conference (also a component of the KARI/ISNAR project) scheduled for the following month, the participants did not have to wait long for a real-life test of their skills. Several graduates of the science-writing workshop won awards for their presentations at the conference. Again, the director of KARI was impressed with the results. "The paper presentations from those officers who had had the training were obviously better than those who had not had it. The demand for these skills by most of our staff requires a repeat of this workshop every year."

The third workshop was a review of Kenya's national maize research program. It brought together KARI staff, the private sector, university researchers, and representatives from CIMMYT, ICIPE, and other international centers. "The workshop has aroused fresh thinking on what should be of future priority in the maize programme," wrote the director of KARI.

This partnership between ISNAR and the Kenyan agricultural research system is nothing new. Indeed, the training project should be seen in the context of ISNAR's long-standing cooperative rela-

tionship with Kenya. Our links go back to 1981, when we conducted a review of the agricultural research system. They continued in 1984-85 with our contribution to the drafting of the national strategic plan for agricultural research.

Scientists before managers

The strategic plan noted, among other things, a strong pattern in the management of the Kenyan NARS: most agricultural research managers have risen through the ranks and are first and foremost scientists, not managers. This trend is also found in other countries. The strategic plan therefore recommended a long-term management training and improvement effort. Its goal would be to upgrade the national pool of research managers by tapping training resources at both the regional and international levels and by building in-country training expertise.

The current ISNAR/KARI training project is the result of those recommendations, as they were spelled out in the 1986 NARP. The component events during the training project's five-year span fall into five categories:

- awareness and overview workshops (e.g., to build system-wide understanding and consensus on Kenya's agricultural research strategy and organization);
- research management theme workshops (e.g., training in specific themes, such as priority setting, program formulation, and human resource development);
- skill development workshops (e.g., on scientific writing and on the use of computers for performing management tasks);
- review workshops (progress reviews of

research programs on specific commodities, production factors or systems);

- technical workshops (acquisition of specific technical skills by young scientists).

For ISNAR, this project is a rare opportunity to build on our experience with a national system over several years. In 1990 we improved our understanding of KARI's training needs and worked closely with its in-house training program. Two members of KARI's training

staff also came to ISNAR headquarters for two weeks to learn more about planning and organizing training events.

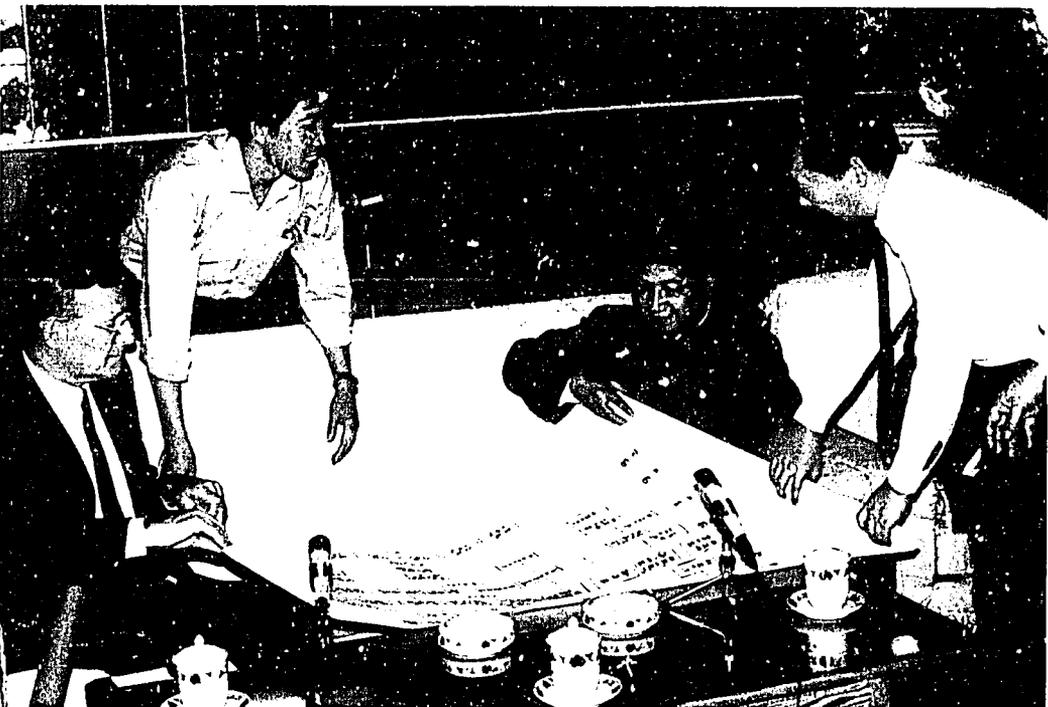
For Kenya, the project's first year marks a sound beginning to the crucial task of building a national cadre of highly trained and motivated research managers. With their hands guiding the research enterprise, Kenya will be in a good position to meet the double-barrelled sustainability challenge of the 1990s — increased agricultural production and rational management of scarce natural resources.

People's Republic of China: first steps for ISNAR

In late 1988, ISNAR signed a memorandum of understanding with the Na-

tional Center for Rural Technology Development (NCRTD), of China's State Sci-

During a publicly televised meeting last September, the vice-governor of China's Hebei Province (seated right) looks over organizational charts of the province's agricultural research, extension, and higher education systems. Helping him is the head of the Agriculture Department of the Hebei Science and Technology Commission (standing right). An ISNAR staff member (seated left) and interpreter (standing left) presented the charts earlier in a management seminar, ISNAR's first training event in China.



ence and Technology Commission (SSTC). The agreement specified several areas of potential cooperation. Among them was the need to improve national capacity in agricultural research management. As with the ISNAR/KARI training project in Kenya, 1990 saw the first tangible results of this initiative.

In the spring of 1990 a senior ISNAR staff member travelled to China to work out details of the first joint activity — a research management workshop in Hebei Province, in the northeast. Aimed at the provincial research system, it was conceived as a kind of pedagogic experiment in which ISNAR had as much to gain as the Chinese. It was the first test of the relevance and usefulness to China of research management approaches in ISNAR's "tool kit".

The week-long workshop was held in Zhengding in September, in association with the Science and Technology Commission of Hebei Province (HBSTC). A total of 33 senior and middle-level managers participated. The ISNAR workshop leader covered a spectrum of management topics — from research planning and priority setting to human resource management and linkages with universities, extension, and farmers. With the aid of an interpreter, presentations were made using visuals in Chinese.

The workshop proved to be a solid first step. The presentations were well re-

ceived by the participants and the provincial political leadership was pleased with the outcome. The vice-governor of Hebei Province, in a publicly televised meeting, expressed his government's concern over long-term agricultural and environmental problems and its desire to work with ISNAR in future on strategic planning of research.

Examples from industrial nations

For ISNAR, the workshop "experiment" was productive. First, it was an opportunity to present, and get feedback on, a number of management concepts adapted from ISNAR work in various regions of the world. It was clear from participant feedback that the Chinese are seeking more examples of industrial nations' experience in agricultural research management. This will be taken into account in future training events.

Second, the experience gave ISNAR a good sense of the logistics of organizing a training event in a new cultural and linguistic setting; the system of using an interpreter and translated materials proved to be feasible. Finally, the workshop provided ISNAR with some concrete, up-to-date information on the agricultural research system of Hebei Province and its organization, for eventual sharing with ISNAR's other client countries.

Management information systems for Asia

Lack of good information can be a major impediment to effective management of research. Managers need to know exactly what experiments scientists are carrying out, with which facilities, and at what cost. Without this information, managers cannot perform or improve essen-

tial functions such as planning, programming, monitoring, and evaluation.

To help NARS address this challenge, ISNAR has pioneered a management information system called INFORM — **INFORMATION for Agricultural Research Managers**.

In 1989, the Asian Development Bank (ADB) granted ISNAR funds to develop and publicize this system. ISNAR had actually begun preliminary R&D work in Indonesia and Sri Lanka in 1986. A major part of the ADB project was two regional training workshops in 1990 on INFORM.

The workshops had two objectives: first, to introduce Asian agricultural research managers to the use of INFORM for research program budgeting; second, to have these managers participate in the refinement of the INFORM guidelines and training materials developed by ISNAR.

The first workshop, from Sept. 17 to 29 in Hyderabad, India, was conducted jointly by ISNAR and the National Academy of Agricultural Research Manage-

ment (NAARM). Thirty-three participants and resource people attended from Bangladesh, the People's Republic of China, India, Nepal, Pakistan, and Sri Lanka. An important by-product of the workshop was a commitment by NAARM to introduce training in management information systems (MIS) into its own curricula. NAARM will hold its first MIS course in early 1991, using both its own and INFORM materials.

The second workshop, from Nov. 12 to 23 in Los Baños, Philippines, was sponsored by ISNAR, the SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA), and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD). Thirty-six participants

Participants at the two Asian workshops on management information spent more than half their time using microcomputers and INFORM to solve research management problems. These information and data processing specialists are from the Planning and Technical Division of Thailand's Department of Agriculture. During the Los Baños workshop, they receive advice from one of the resource people, a Filipina program budgeting specialist (second from right) from PCARRD.



and resource people attended from Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, the Philippines, and Thailand.

Hands-on spirit

In keeping with the hands-on spirit of the workshops, ISNAR trainers tried to move as much of the activity as possible out of the classroom and into the computer lab. Computer sessions were interspersed with group discussions and classroom work on the INFORM guidelines. Daily panels critiqued the guide-

lines and suggested changes.

In 1991, ISNAR will publish the INFORM guidelines, a series of INFORM training materials, and the proceedings of the two workshops.

Participants came to regard themselves as the nucleus of an Asian network of management information professionals in agricultural research. ISNAR plans to encourage development and growth of this network, and we will assist the workshop participants with the establishment of INFORM in their own countries.

Malawi: managing change in the research system

In the last few years agricultural research in the southern African country of Malawi has undergone a major reorientation. The main government research body, the Department of Agricultural Research (DAR), has shifted its attention to the country's 1.2 million smallholder farm families and their technological needs. These farmers operate 70 percent of Malawi's cultivated area.

To help the country's research managers adapt to the changing situation, ISNAR and DAR organized a two-week training workshop in Mzuzu, Malawi, from May 21-30. It was one of four African training events organized in 1990 by the SADCC-ISNAR training project.

The workshop covered several management themes: program formulation and budgeting, priority setting for commodities, resource allocation, preparation of reports and project proposals, human resource management, and experiment station management. DAR participation was strong, with 27 managers. Representatives of the University of Malawi, the Tea Research Foundation, the Forestry Research Institute, and the National Re-

search Council also attended, for a total of 32 participants (six of them women).

The shift in research emphasis in Malawi has been part of a long-term National Agricultural Research Project (NARP), designed by Malawi's Ministry of Agriculture and financed by the World Bank. In large measure, the workshop was a follow-up to recommendations contained in a review of NARP progress, completed in April 1989. The review team had suggested changes in the Department of Agricultural Research's operations, particularly improvements in planning and methods of setting research priorities, communication of research results, and the reward system and career structure for scientific staff.

'Translating' the master plan

A major portion of the Mzuzu workshop was devoted to a discussion of Malawi's agricultural "master plan", which had been formulated by the Ministry of Agriculture as part of the NARP. This focus was important because it ensured that the trainees were not learning

new management skills in a vacuum. As one resource person put it, the workshop was an exercise in “translating the master plan into implementable programs and projects.”

The workshop also provided the impetus for some intensive follow-up training

at ISNAR headquarters. Three members of DAR’s staff came to The Hague for two weeks of training in July. They studied the use of tools (developed or adapted by ISNAR) for setting priorities, program budgeting, and managing human resource information.

An international consultation with research leaders

Each year the Training Unit takes on the organization of a global meeting at ISNAR headquarters in The Hague. This International Agricultural Research Management Workshop, or IARMW, focuses on a major topic of interest to the national systems of the developing world.

The theme of the November 1990 workshop, which brought together 32 senior NARS managers, was the Organization and Structure of National Agricultural Research Systems. Financial support from UNDP and the European Community’s Technical Centre for Agricultural and Rural Co-operation (CTA) supplemented ISNAR core funds for this event.

The NARS in 2000

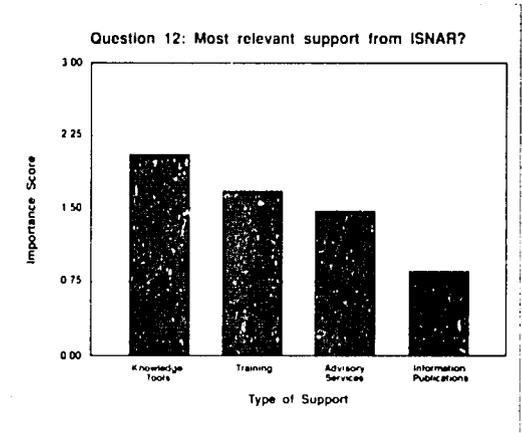
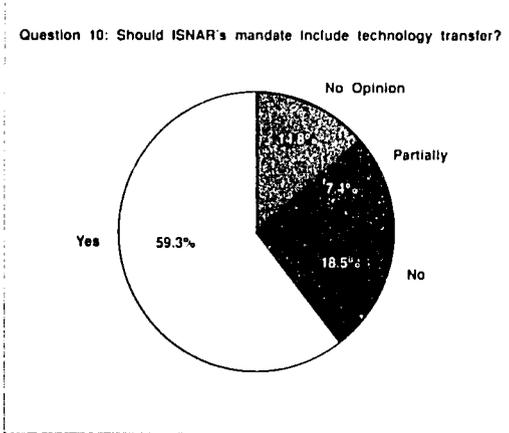
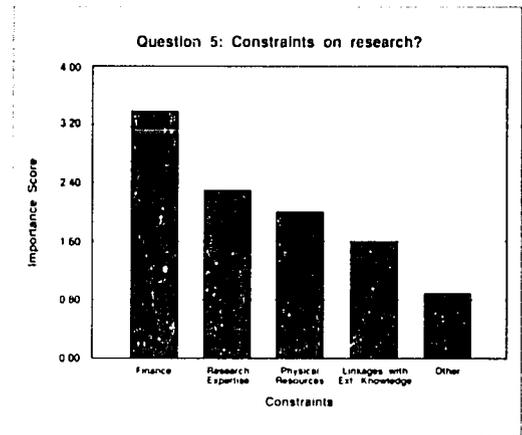
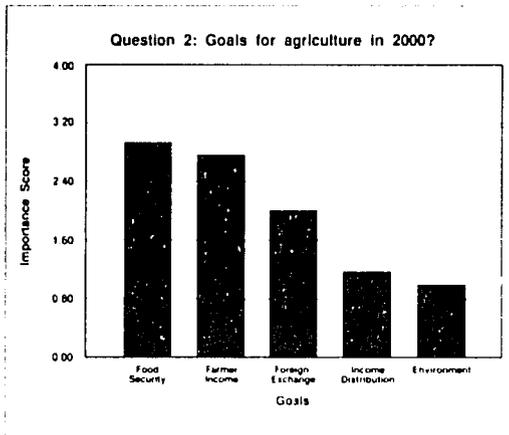
The international workshop was a valuable opportunity for NARS leaders to interact with their counterparts from other nations and share experiences. For ISNAR, a major benefit was the feedback it received from the participants on the future needs of their NARS. During the workshop a questionnaire was distributed to NARS participants. The questions dealt with a range of topics — from the goals of agriculture, to constraints on research, to whether ISNAR’s mandate should cover technology transfer.

Here is a sampling of the questions ISNAR asked. The graphs and pie chart on page 50 show the aggregated answers

from 27 respondents.

- Rank the expected importance of the following goals for agriculture in your country in the year 2000: food security; income generation for farmers; income distribution; foreign-exchange generation; environmental concerns.
- Rank the following possible constraints on agricultural research for the year 2000: lack of experienced researchers; lack of financial resources to support researchers; lack of adequate physical resources; lack of linkages with external knowledge; other.
- ISNAR’s clients often request assistance in the technology-transfer process. Do you feel that ISNAR’s mandate should be enlarged to cover technology transfer per se? (*Note: At present, ISNAR’s stated mandate covers assistance in the areas of agricultural research policy, organization, and management, as well as the links between research and technology transfer.*)
- In the year 2000, which of ISNAR’s possible types of collaboration/support would you expect to be of most relevance to your organization: information and publications; training; direct advisory services; improved knowledge and tools for research policy, organization, and management?

The catalyst for the main discussion at



this year's IARMW was a series of analytical overview papers covering organizational issues in the NARS of five regions: Asia; Latin America and the Caribbean; anglophone Africa; francophone Africa; and West Asia and North Africa. Two of these papers, the West Asian / North African overview (covering only Arab countries) and the Asian overview, were published in 1990 and are available from ISNAR as Working Papers 31 and 32. The

research for the overview papers was supported, in part, by the Canadian International Development Agency (CIDA).

Among the main subtopics were organizational strategies for ensuring adequate research funding, for influencing policy, and for determining programs. The workshop also examined the advantages and disadvantages of various organizational models, such as research foundations, councils, and institutes.

Organizing for sustainable agriculture

With the expansion of the CGIAR network to cover forestry and other natural resources, the issue of sustainable agricul-

ture has moved to the top of the international research agenda. For the national systems, the challenge is how to incorpo-

rate sustainability concerns into research policies, programs, organization, and management. Fresh thinking by the NARS and the international research institutes is needed.

In October ISNAR took an important step in this direction by consulting a few selected NARS leaders on needs in this area. We convened a three-day consultation with six outside specialists and commissioned several background papers to stimulate discussion — one on general issues, and four case descriptions. The meeting was titled Agricultural Research Policy, Organization and Management for Sustainable Agriculture.

Four of the invited specialists were senior research leaders — from Brazil, Egypt, India, and the African regional organization, SACCAR. The other two were agricultural scientists, one from a Dutch institute, the other from UNDP.

Continuity of people and funds

One paper in particular touched on a crucial policy issue — the need to assure continuity of research funding and of personnel because sustainable agriculture demands long-term research. The consultation also raised many other questions. A few examples: How and where will the NARS get the expertise needed for interdisciplinary research? How will the mix of scientific skills currently found in research institutes have to change? In marginal, environmentally sensitive

areas, what will be the best balance between natural resource management and crop improvement? What are the long-term implications for training?

The discussions identified three levels at which NARS need to act if they are to take an integrated approach to sustainability: **policy** on agriculture and research; **research** on production factors, commodities, and systems; and **producer-related issues** such as limited access to knowledge and limited choice of technology.

There was agreement that new organizations or units specifically responsible for sustainability issues need not necessarily be created. Rather, NARS will have to change the way they formulate specific policies, goals, and strategies. They will also need new criteria for setting research priorities, allocating resources, evaluating research, and deciding on the scientific skills required over the long term. In many countries, close cooperation with university faculties of agriculture will be required.

The consulting experts suggested three possible roles for ISNAR: promoting sustainability work in NARS; providing needed approaches and tools; and keeping NARS and others informed of different experiences and options. ISNAR plans to pursue the topic of sustainable agricultural production more actively with its NARS partners in the future.

Sharing experiences: Angolan researchers participating in a SADCC/ISNAR management workshop in Maputo, Mozambique, visit an experimental plot of cassava at the Umbeluzi Research Station. The evaluation of these cultivars is part of the root and tuber program of Mozambique's Instituto Nacional de Investigação Agronomica. The training workshop, held last July, focused on research planning and human resource management. The event marked the beginning of ISNAR collaboration with the national research systems of Angola and Mozambique.



Training events and conferences by region

The following section lists 1990 training workshops, conferences, and other meetings which ISNAR either organized alone, conducted jointly with other organizations, or contributed to by providing resource people. The event description is followed by the date, the location, and the number and types of participants.

Africa

KARI/ISNAR Agricultural Research Management Linkage Training Project.

No. 1. **Workshop on Issues in the Reorganization of KARI and the Implementation of the National Agricultural Research Program (NARP).** July 23-27. Nairobi, Kenya. 44 middle- and senior-level managers from KARI.

No. 2. **Workshop on Scientific Writing and Presentation.** Aug. 6-10. Thika, Kenya. 15 researchers and 4 middle- and senior-level managers from KARI.

No. 3. **KARI Annual Scientific Conference.** Sept. 2-8. Nairobi, Kenya. Sponsorship of 19 researchers and managers.

No. 4. **Review of the National Maize Research Program.** Nov. 19-23. Kakamega, Kenya. 45 participants from KARI, the Kenya Seed Company, the Ministry of Agriculture, universities, CIMMYT, and other organizations.

MOA/ISNAR/SACCAR Workshop on the Formulation of Guidelines in the Preparation of a Research Work Plan for Zambia. Jan. 22-26. Livingstone, Zambia. 21 middle- and senior-level national agricultural research managers.

Integration of Management at INERA. Feb. 19-23. Bobodioulasso, Burkina Faso. 31 program heads and station managers from the Institut d'Etudes et de Recherches Agricoles (INERA).

DR&SS/SACCAR/ISNAR Workshop on the Management of Change in DR&SS. Feb. 19-23. Kariba, Zimbabwe. 21 participants, mainly senior managers from the Department of Research and Specialist Services.

DAR/SACCAR/ISNAR Workshop on Managing Change in DAR. May 21-31. Mzuzu, Malawi. 32 research managers from the public and private sector, mainly the Department of Agricultural Research.

IAR Strategic Planning Workshop. July 16-18. Addis Ababa, Ethiopia. 64 researchers and program leaders of the Institute of Agricultural Research.

Mozambique/Angola SADCC/ISNAR Workshop on Human Resource Development. July 16-27. Maputo, Mozambique. 14 Angolan and 24 Mozambican researchers and managers.

Workshop on Research-Extension Linkages. Nov. 4-9. Bamako, Mali. 37 Malian managers comprising researchers from the Institut d'Economie Rurale and extension managers from various agencies.

Fifth FGCR Agricultural Research Management Course, FAO/CIRAD. Planning Module: Priority-setting. Regional event: francophone Africa. Nov. 12-13. Marseilles, France. 24 middle-level research managers from 14 countries.

Asia

Agricultural Research Management Training Seminar on planning, priority-setting, human resources development, and linkages. Sept. 13-19. Zhengding, Hebei Province, People's Republic of China. 33 high- and middle-level agricultural research managers.

International Workshop on Management Information Systems for Agricultural Research. Regional event: China and South Asia. Sept. 17-29. Hyderabad, India. 33 agricultural scientists, research administrators, and resource people from Bangladesh, the People's Republic of China, India, Nepal, Pakistan, and Sri Lanka.

International Workshop on Management Information Systems for Agricultural Research. Regional event: Southeast Asia. Nov. 13-23. Los Baños, the Philippines. 36 agricultural scientists, research administrators, and resource people from Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, the Philippines, and Thailand.

Latin America and Caribbean

FAO/ISNAR/IICA/INIAP Workshop on Strategic Planning and Management of Agricultural Research. Regional event: **Latin America.** Apr. 2-6. Quito, Ecuador. 14 directors of planning and station managers from Latin American countries, and 14 research managers from Ecuador.

Workshop: Economic Evaluation of Agricultural Research. (Introduced main concepts and presented methodology and results of soybean case study.) May 25. Santa Cruz, **Bolivia.** 20 junior and mid-level agricultural researchers from CIAT (Santa Cruz).

Conference: Economic Evaluation of Agricultural Research — the Case of Soybeans. (Presented study results and made the case for more investments in agricultural research.) May 30. Santa Cruz, **Bolivia.** 15 participants: farmer representatives, ministry of agriculture officials, local newspaper journalists.

CARDI/FAO/IICA/ISNAR Workshop on Strategic Planning for Small-Country NARS. Regional event: **Caribbean.** Sept. 24-28. Kingston, Jamaica. 25 research leaders from Bahamas, Barbados, Grenada, Guyana, Haiti, Jamaica, St. Lucia, Trinidad and Tobago, Dominica, and Suriname.

Workshop on Monitoring and Evaluation. Oct. 8-9. Santa Cruz, **Bolivia.** 13 research managers, including program leaders, from the Centro de Investigación Agrícola Tropical (CIAT).

West Asia and North Africa

Workshop: Preparing the Local Study Team to Implement a Diagnostic Review of the NARS. Aug. 12-13. Sanaa, **Yemen.** 5 senior agricultural research managers from various national institutes in Yemen, all members of a multidisciplinary review team.

Workshop: Preparing the Local Study Team to Implement a Diagnostic Review of the NARS. Oct. 2-3. Algiers, **Algeria.** 5 senior agricultural research managers from various national institutes in Algeria, all members of a multidisciplinary review team.

Global

Workshop: Issues and Methodology for the Analysis of NARS in Small Countries. Jan. 29 - Feb. 2. The Hague. 7 researchers and 7 outside advisors to the ISNAR Small-Country project, plus 8 ISNAR advisors.

Research Management Workshop. ISNAR contribution to the International Course for Development Oriented Research in Agriculture (ICRA). Feb. 21-23. Wageningen, The Netherlands. 21 young agricultural scientists from developing countries.

Consultative meeting: Agricultural Research Policy, Organization, and Management for Sustainable Agriculture. Oct. 15-17. The Hague. 4 senior research managers from developing countries, 2 resource people from outside agencies, plus senior ISNAR staff.

International Agricultural Research Management Workshop. Nov. 5-9. ISNAR, The Hague. 32 senior research leaders from developing countries, plus ISNAR staff.

Consultative meeting: Monitoring and Evaluation of Agricultural Research. Nov. 12-14. The Hague. ISNAR staff plus 12 advisors: 11 senior research managers and 1 outside specialist in planning and evaluation.

IV. Information

Publications Unit

The unit produced 51 publications in 1990 (see page 57) and our mailing list experienced modest growth to about 4200 names. Apart from editing, designing, and seeing manuscripts through to final printed form as official ISNAR publications, the unit edited numerous papers for meetings and conferences. During the year our staff also wrote and produced four issues of the *ISNAR Newsletter*.

Early in the year we were saddened by

the death of Albert V.J. "Bob" Martin, our long-time friend and French editor who joined the Publications Unit in 1984. Bob had retired in late 1989 and was working on a short contract for ISNAR at the time of his death. His contribution will long be remembered.

Following the introduction of personal computers in 1989, the unit consolidated its computer-based operations by introducing more PCs and training several more staff in desktop publishing. We re-

ISNAR's library collection of 14,500 volumes focuses on the organization and management of agricultural research.



cruited a graphic artist at the beginning of 1990 and purchased special software. These actions resulted in a major improvement in our in-house graphics capacity, as well as substantial cost savings

in the production of publications.

During the year, we also took several steps toward the introduction of a new corporate visual image. This annual report is a concrete example.

Library

The ISNAR library serves mainly ISNAR staff, consultants, and the Dutch scientific community. It also responds to external requests from research institutes, donor agencies, and other organizations around the world.

The library collection increased by some 4000 documents to a total of 14,500 in 1990. Because the collection is small and its subject focus is the organization and management of research, we rely on the services of outside libraries to provide many of the documents needed by our staff.

During 1990, the ISNAR library coordinated a joint effort by 18 international agricultural research centers to identify at least one depository library for their publications in each developing country. By the end of the year, libraries in about 100 countries were actively participating.

Our library also worked with ISNAR program staff to design a study of how research information is managed in small countries. With support from CTA, we will carry out a number of case studies and consultations in 1991-92.

Computing services

ISNAR's new premises were wired prior to our 1989 office move to support future PC networking. That future began in 1990 as we took other important steps to replace our centralized WANG system with a PC network.

A DEC VAX 3800 computer and an Ethernet network were installed to connect the first 25 personal computers. The

network was subsequently expanded to provide access by a growing number of PC users at ISNAR. Many of our laser printers were connected to enable them to be used by PC users for the first time as well as by WANG users.

The network will be expanded in 1991 with the addition of more than 50 new PCs.

ISNAR Publications 1990

Publications about ISNAR

- Annual Report 1989. May 1990.
 Rapport Annuel 1989. Octobre 1990.
 Informe Anual 1989. Octubre 1990.
 ISNAR Newsletter No. 12. January 1990.
 ISNAR Newsletter No. 13. April 1990.
 ISNAR Newsletter No. 14. August 1990.
 ISNAR Newsletter No. 15. December 1990.
 Catalog of Publications (trilingual). July 1990.

Conference and Workshop Reports

A Celebration of ISNAR's First Decade. Text of speeches by Maina Wanjigi and Jan Tinbergen. ISNAR's tenth anniversary ceremony, May 25, 1990.

Methods for Diagnosing Research System Constraints and Assessing the Impact of Agricultural Research. Volumes I and II. Proceedings of the ISNAR/Rutgers Agricultural Technology Management Workshop, 6-8 July 1989. Rutgers University, New Jersey, USA, 1990.

Organization and Structure of National Agricultural Research Systems: Selected Papers from the 1989 International Agricultural Research Management Workshop. June 1990.

The Technology Triangle: Linking Farmers, Technology Transfer Agents, and Agricultural Researchers. Summary report of an international workshop held at ISNAR, The Hague, 20th to 25th November 1989. September 1990.

Working Papers

- No. 31. Organization and Structure of Arab National Agricultural Research Systems (NARS). May 1990.
 No. 32. Overview of the Organization and Structure of National Agricultural Research Systems in Asia. July 1990.
 No. 33. Organization and Management of Agricultural Research in Sub-Saharan Africa: Recent Experience and Future Direction. September 1990.
 No. 34. Decentralizing Agricultural Research Management: The Case of the Regional Consortia in the Philippines. October 1990.
 No. 35. Structural Linkages for Integrating Agricultural Research and Extension. November 1990.

No. 36. Problems and Solutions for Decentralizing National Agricultural Research Systems. October 1990.

OFCOR Series

Case Studies

No. 8 — Panama — Organización y Manejo de Programas de Investigación en Finca en el Instituto de Investigación Agropecuaria de Panamá (IDIAP). Agosto 1990.

Comparative Studies

No. 5 — Staff Management Issues in On-Farm Client-Oriented Research. April 1990.

Discussion Papers

Research-Extension Liaison Officers in Zambia: Bridging the Gap between Research and Extension. September 1990.

Research-Technology Transfer Linkages Series

Discussion Papers

- No. 4. The Impact of Improved Institutional Coordination on Agricultural Performance: The Case of the Nariño Highlands in Colombia. January 1990.
 No. 5. Informal Linkage Mechanisms and Technology Transfer: The PACO Project in Côte d'Ivoire. May 1990.
 No. 5f. Mécanismes informels et transfert de technologie : le cas du projet PACO en Côte d'Ivoire. Mai 1990.
 No. 6. Managing the Links between Research and Technology Transfer: The Case of the Agricultural Extension-Research Liaison Service in Nigeria. May 1990.
 Num. 7s. Efectos de los Cambios Estructurales en el Ministerio de Agricultura y Ganadería de Costa Rica, Sobre la Relación Entre Investigación y Transferencia de Tecnología en Maíz. Julio 1990.
 No. 8. The Training and Visit System and the Links between Rice Research and Extension in the Matara District of Sri Lanka. October 1990.
 No. 9. Integration and Overlapping Tasks: Some Cases in the Philippines. October 1990.
 No. 10f. Efficacité des Mécanismes de Liaison et

Types de Technologies : le Cas des Zones Savanicoles de la Côte d'Ivoire. October 1990.

Training Series

Human Resource Management Series

No. 1. Strategic Planning for Human Resources in National Agricultural Research Systems. October 1990.

No. 2. Socialization of Staff in NARS. October 1990.

No. 3. Some Aspects of Training in National Agricultural Research Systems. October 1990.

No. 4. Recruitment and Selection. October 1990.

No. 5. Careers and Career Development. October 1990.

No. 6. Country Report: Lesotho. October 1990.

No. 7. Country Report: Zimbabwe. October 1990.

No. 8. Country Report: Tanzania — MALD. October 1990.

No. 9. Country Report: Zambia. October 1990.

No. 10. Country Report: Botswana. October 1990.

No. 11. Staffing Requirements and Staffing Pyramid for the Tanzania National Agricultural and Livestock Research System. A Case Study. October 1990.

No. 12. Recruitment and Selection of Staff in the Department of Agricultural Research, Malawi. A Case Study. October 1990.

No. 13. The Practice of Delegation. October 1990.

No. 14. Performance Assessment Factors for Agricultural Researchers. October 1990.

No. 15. Socialização: Enquadramento de Pessoal nos SINIAS. Outubro 1990.

No. 16. Liderança e Administração/Gestão nos Sistemas Nacionais de Investigação para a Agricultura — Breve Introdução. Outubro 1990.

Country Activities

R46f — Analyse du Systeme National de Recherche Agronomique du Mali. Rapport au Ministère de l'Agriculture, République du Mali. Janvier 1990.

R50 — A Strategic Update of Somalia's National Agricultural Research Plan. August 1990.

R51 — Review of Botswana's Agricultural Research System. November 1990.

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Echeverria, R.G. 1990. Public and private investments in maize research in Mexico and Guatemala. CIMMYT Economics Working Paper No. 90/03. Mexico: Centro Internacional de Mejoramiento de Maíz y Trigo.

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ISNAR Consultants 1990

Tonyawo Aithnard, Ministère de Développement Rural, Togo. Assisted in preparing a case study of the national agricultural research system (NARS) in Togo.

Julian Alston, University of California at Davis, U.S.A. Assisted in preparing an ACIAR/ISNAR project paper and a companion manual for the "Priorities for Agricultural Research" manuscript and brought it up to publication standard.

Gustavo Andrade, Rome, Italy. Worked out the administrative issues and procedures for INTAGRES in Italy.

Ornella Arimondo, Rome, Italy. Helped finalize the country case study for ISNAR's Small-Country project in Togo.

Richard Bawden, University of Western Sydney, Australia. Presented a seminar on "Rural Universities for Development: A Systematic Perspective" at ISNAR headquarters.

P.C. Bélem, Institut d'Etudes et de Recherches Agricoles (INERA), Burkina Faso. Prepared a paper about the planning of agricultural research in Burkina Faso.

Stephen Biggs, University of East Anglia, Norwich, United Kingdom. Prepared a study on the nature of cooperation, for the OFCOR project.

A.H. Bunting, University of Reading, United Kingdom. Prepared a policy on agricultural research in Tanzania; also presented the resulting analytical paper.

S.G. Campbell, Cornell University, Ithaca, U.S.A. Prepared a livestock research plan covering production, health, and nutrition of cattle, poultry, goats, pigs, and rabbits in conformity with the livestock development policy of the Ministry of Animal Industries in Uganda.

Joaquim Cesar Huambo, Angola. Developed and/or adapted training materials in Portuguese for the SACCAR/ISNAR project and participated in the Angola/Mozambique workshop held in Maputo on research planning and human resource management.

Chayce Publication Service, Devon, United Kingdom. Simor Chater and Kay Sayce prepared the summary report of the workshop "Making the Link".

E. Clayton, United Kingdom. Assisted in the

Uganda project with the socioeconomic perspectives and insights in developing an economically realistic research master plan matching with the current and prospective resource availability, and institutional capacity.

Mario Contreras, La Lima, Departamente de Cortes, Honduras. Prepared a case study paper of the national agricultural research system (NARS) in Honduras.

John Coulter, Sussex, United Kingdom. Produced a guideline paper on ISNAR views on planning definitions, concepts, and necessary process sequences.

Barbara Craig, Oberlin College, U.S.A. Finalized two chapters for the Agricultural Research Policy volume.

Graham Currell, Bristol Polytechnic, United Kingdom. For the Tanzanian project, advised on upgrading of laboratory equipment for the agricultural research system in Tanzania.

Aly Rucai Dauto, Ministry of Agriculture, Maputo, Mozambique. Planned and managed the workshop secretariat in Maputo, Mozambique.

T. Dahniya, Njala University, Freetown, Sierra Leone. Prepared a case study paper of the national agricultural research system (NARS) in Sierra Leone.

Charles Douglas, University of the West Indies Campus at St. Augustine, Trinidad and Tobago. Prepared a case study paper on the national agricultural research system (NARS) in Jamaica.

K.R. Ellinger, Drysdale, Australia. Assisted in the Tanzanian project by making projections of financial resources expected to be available to the research system in the next 5 to 10 years.

Paul Engel, Wageningen Agricultural University, Netherlands. Wrote a synthesis paper "Different Agricultural Technology Systems Require a Different Design and Management of Linkages".

Thomas Eponou, Abidjan, Ivory Coast. Consulted with the core working group on the synthesis of the RTTL study; prepared a strategy for this synthesis in consideration of past trends.

Jan J.A. Feyen, Blanden, Belgium. Assisted and participated in the Tanzanian project.

William K. Gamble, Minneapolis, U.S.A. Prepared a statement on the research policy of the Government of Tanzania for the next 5 to 10 years.

Gregory Gibbons, Melbourne, Australia. Updated the database on biotechnology in the ASEAN-member countries; advised and updated the methodology used in the Biotechnology Country Case Studies to be conducted by ISNAR in 1990; prepared a workplan for the provision of advice to countries on agricultural biotechnology and information on technology acquisition.

Elon Gilbert, Serrekunde, Gambia. Assisted in the preparation of the draft National Agricultural Research Plan for Uganda.

Ayéle-Mawuto Gninofou, Ministère de Développement Rural, Lomé, Togo. Prepared a case study paper of the national agricultural research system (NARS) in Togo.

P.S. Gooch, on behalf of C.A.B. International, Wallingford, United Kingdom. Updated a report prepared by the FAO on documentation systems.

Gerrit Jan de Graaf, Amsterdam, Netherlands. Prepared a research plan embracing all aspects of lake fisheries, aquaculture, and fish processing for the Uganda project.

Theodore Graham-Tomasi, University of Minnesota, St. Paul, U.S.A. Prepared a paper which helped NARS in the formulation of their research policy and in the planning of their research programs.

Arnold J. Grayson, Farnham, Surrey, United Kingdom. Prepared a realistic research plan covering natural forest, plantation forest, agro-forestry, wood processing and preservation, and environmental protection for the Uganda project.

J.M. Hirst, Bristol, United Kingdom. Assisted and advised the Tanzanian project members of working groups in formulating the research programs; prepared a final draft plan.

Robert Kern, Ames, Iowa, U.S.A. Prepared the annual report 1989; prepared and delivered the KARI/ISNAR workshop in Kenya on Scientific Writing and Presentation.

La Gro Lawyers c.s., Gouda, The Netherlands, provided legal advice on a variety of issues of international private and international public law, associated with ISNAR's legal status.

Reginald MacIntyre, Ottawa, Canada. Edited commissioned papers and a synthesis report of the biotechnology study.

B.N. Majisu, National Council for Science and Technology, Nairobi, Kenya. Analyzed the agricultural research planning activities in Kenya; wrote a paper on planning issues, mechanisms, and procedures in the National Council for Science and Technology.

J. Manrakhan, University of Mauritius. Prepared a case-study paper on the national agricultural research system (NARS) in Mauritius.

Albert V.J. Martin, Oegstgeest, Netherlands. Did French-language editing and translation.

Jean McAllister, New York, U.S.A. Prepared a complete first draft of an OFCOR comparative study paper; assisted on managing institutional linkages within OFCOR.

Bonnie McClafferty, Connecticut, U.S.A. Assisted in the small-countries project and the seminar.

T. Namane, Ministry of Agriculture and Marketing, Maseru, Lesotho. Prepared a case-study paper of the national agricultural research system in Lesotho.

Fred E. Nichols, Stockton, Kansas, U.S.A. Assisted and participated in the Lanzanian project.

Peter Oram, IFPRI, Washington, D.C., U.S.A. Conducted a review of the structure and function of the Bangladesh Agricultural Research Council.

Edwin B. Oyer, Ithaca, U.S.A. Assisted in the establishment of the Center for Agricultural Research Planning for the AARD based in Jakarta.

R.S. Paroda, India Agricultural Research Institute Campus, New Delhi. Developed a training module for the SADCC/ISNAR project.

William J.A. Payne, Worcestershire, United Kingdom. Carried out a review of the national agricultural research system in Botswana; also prepared a livestock research plan covering production, health and nutrition of cattle, poultry, goats, pigs, and rabbits in conformity with the livestock development policy of the Ministry of Animal Industries in Uganda.

Rodrigues Perreira, Instituto Nacional de Investigações Agrícolas, Maputo, Mozambique. Developed and/or adapted training materials in Portuguese for the Angola/Mozambique workshop.

Tarcizio Quirino, Brasília, Brazil. Collected documents (research plans, etc.) for training materials, developed and/or adapted these in Portuguese; participated in the Angola/Mozambique workshop.

M.V. Rao, New Delhi, India. Prepared a realistic crops research plan for the Ministry of Agriculture in Uganda.

Walter Rockwood, Chelsea, Vermont, U.S.A. Prepared guidelines on MIS development for Asian agricultural research managers; prepared training materials for two workshops.

Niels Röling, Wageningen Agricultural University, Netherlands. Wrote a synthesis paper on "Different

types of technologies require different types of linkages”.

John E.A. Russell, Exeter, United Kingdom. Assisted the Tanzanian project in the analysis and interpretation of data, determined additional data requirements, and supervised their collection; participated in writing reports and other outputs for NARM final draft plan.

H.J. Schwartz, Technical University of Berlin, F.R.G. Assisted and advised the Tanzanian project members of working groups in formulating the research programs; prepared a final draft plan.

George Sempeho, Dar es Salaam, Tanzania. Coordinated the preparation of the National Agricultural Research Master Plan in Tanzania; clarified and standardized human resources data for analysis for the Tanzanian project.

Philip Serafini, University of Arkansas, Fayetteville, U.S.A. Determined the requirements for development of the existing and new research stations to improve Uganda's agricultural research capacity.

Param Sivan, University of South Pacific, Alafua Campus, Apia, Western Samoa. Prepared a case study paper on the national agricultural research system (NARS) in Fiji.

W.D. Smilde, Wageningen, Netherlands. Assisted the MIS group with the finalization of the 1990-1991 Sri Lanka MIS work; prepared study material for training purposes; prepared profiles of ISNAR's collaboration with the different national agricultural research systems under the Advisory Service Program.

Leopold Some, INERA, Ouagadougou, Burkina Faso. Participated as a moderator to the workshop on "Le Systeme de Recherche et Application des Resultats de Recherches au Mali", in Bamako, Mali; wrote a workshop report for the AGIR-ISNAR project.

Krystyna Stave, New York, U.S.A. Prepared materi-

als and made presentations for the seminar "Information for Human Resources Management", held at ISNAR headquarters.

El Hadj Tall, Bamako, Mali. Participated in and organized the workshop on "Les Perspectives d'Integration des Systemes de Gestion" in Burkina Faso.

Geoffrey Tansey, Hebden Bridge, West Yorkshire, United Kingdom. Prepared feature materials of ISNAR's tenth anniversary for media outlets.

Emmanuel D. Tebong, Director, Institute of Animal Research, Yaounde, Cameroon. Analyzed the agricultural research planning activities in the Institute of Animal Research as part of the national research system in Cameroon.

Beatriz Uribe, The Hague, Netherlands. Implemented a library reference database on M&E of agricultural research in developing countries; produced an indexed bibliography; drafted sections of a literature review.

Sondra Wentzel, Berlin, F.R.G. Prepared for publication the Indonesian OFCOR Case Study.

Stanley Wood, Bogor, Indonesia. Drafted an ACIAR-ISNAR project paper; also provided direct assistance to CAER research personnel.

A.M. Woodward, Cardiff, United Kingdom. Assisted in the Tanzanian project in determining the requirements for the establishment of an information documentation facility.

T. Wormer, Muiden, Netherlands. Assisted in the Tanzanian project in the identification of research priorities for coffee, tea, rice, and cotton.

Fang Zhou, The Hague, Netherlands. Participated in the preparation for a workshop.

Lawrence Zuidema, Lansing, U.S.A. Assisted in the Uganda project in developing the manpower plan or the research system.

ISNAR Staff 1990

PRINCIPAL AND ASSOCIATE STAFF

Christian Bonte-Friedheim, **

Director General

Howard Elliott, Deputy Director

General, Research and Training

H.K. Jain, Deputy Director

General, Collaboration with NARS

Coenraad A. Kramer,

Administrative Officer

Luke Abe, Senior Research

Officer, Training

Peter Ballantyne, Librarian

N'Guetta Bosso, Senior Research

Officer

Roban Bougeois, Research

Associate

Edwin Brush, Senior Research

Officer

Marie-Hélène Collion, Senior

Research Officer, Research

Planning

Rudolf Contant, Senior Research

Officer

Roy da Costa, Accountant

Matthew Dagg, Senior Research

Officer

Ruben Echeverría, Research

Officer

Tnomas Eponou, ** Senior
Research Fellow

Pablo Eyzaguirre, Research
Officer

Shenggen Fan, ** Research
Associate

Alan Fletcher, Senior Research
Officer, Publications

Dely Gapasin, Senior Research
Fellow

Peter Goldsworthy, Senior
Research Officer

Govert Gijsbers, Research
Associate

Ghazi Hariri, Senior Research
Officer

Huntington Hobbs IV, Senior
Research Officer

Douglas Horton, ** Senior
Research Officer

Charles Kramer, ** Senior
Research Officer

Gregory Krapp, Planning and
Development Coordinator

Paul Marcotte, Senior Research
Officer, Training

Adiel Mbabu, ** Research Fellow

Deborah Merrill-Sands, Senior

Research Officer

Byron Mook, Senior Research

Officer

Barry Nestel, Senior Research
Officer

George Norton, Senior Research
Fellow (part-time)

Paul O'Nolan, Information
Management Specialist

Philip Pardey, Senior Research
Officer

Paul Perrault, ** Senior Research
Officer

Gabrielle Persley, ** Senior
Research Officer

Warren Peterson, Research
Associate

Kham Pham, Senior Research
Officer, Research Management

(based in Cameroon)

Robert Raab, Research Associate

Motlubor Rahman, ** Senior
Research Officer (based in

Uganda)

Ralph Retzlaff, Senior Research
Officer (based in Tanzania)

Guy Rocheteau, Senior Research
Officer

Han Roseboom, Research
Associate

Jonathan Sands, Research
Associate



Kathleen Sheridan, Editor
Krystyna Stave, * Research Associate
Willem Stoop, * Senior Research Officer
Ajibola Taylor, Senior Research Officer
Gerald Toomey, Editor
Carlos Valverde, Senior Research Officer
Robert Witters, Senior Research Officer, Research Management (based in Bangladesh)
Dennis Wood, Senior Research Officer, Research Management (based in Indonesia)

SUPPORT STAFF

Els Buytelaar, Accounts Assistant
Maureen Byrne, * Publications Assistant
Richard Claase, ** Artist/Designer
Jeanette Connelly, Senior Secretary
Willy Dooren, ** Secretary
Anne Duhr, Senior Secretary
Wilhelmina Eveleens, Research Assistant
Viviana Galleno, Planning and Development Assistant
Sandra Gardner, Library Assistant
Helen Gaskin, ** Secretary
Mary Gavin, Central Files

Specialist
Pamela Gené, Secretary
Monique Hand, Secretary
Fionnuala Hawes, ** Secretary
Isabelle Henchoz, ** Secretary
Hans Hendriks, ** Maintenance Assistant
Johanne Hoddinott, Secretary
Monique van Kempen, * Receptionist
Manon Kleinveld, Senior Secretary
Cocky Kuyvenhoven, Secretary
Bert Lockhart, * Supplies Assistant
Concilio McNeill, Central Files Asst/Telecommunications Operator
Isabel Modders, Administrative Assistant, IIFPRI
Sarah Neal, ** Supplies Assistant
Tatiana van der Noordaa, Senior Secretary
Andrew Okello, Research Assistant
Rivka Peyra, Senior Secretary
Tracy van Putten, Secretary
Ima de Quack, * Administrative Assistant
Arlene Slijk, Secretary
Hilly Smeenge, Travel Coordinator
Bob Solinger, Computer Systems Manager

Christine Solinger, Secretary
Louise Spenceley, Secretary
Kathy Sutherland, Computer Trainer
Dolinda Tetteroo, Receptionist
Lisa Thompson, * Secretary
Christine Tipper, ** Publications Assistant
Peter van Urk, ** Computer Systems Manager
Deirdre van Veen, Senior Secretary to the Director General
Anita Varkevisser, Accounts Assistant
Jacobine Verhage, Secretary
Anne Verschoor, ** Administrative Assistant
Martha Vonk, Central Files Asst/Telecommunications Operator
Joyce Voorn-Ogiste, Senior Secretary
Anna Wuyts, Research Assistant

** Joined during 1990
 * Left during 1990



ISNAR Financial Summary

ISNAR BALANCE SHEET as of December 31, 1990 (stated in US dollars)

	<u>1990</u>	<u>1989</u>
<u>Current Assets</u>		
Cash	2,395,490	3,014,187
Receivables from Donors	433,878	366,000
Other Receivables	361,420	420,390
Prepayments	184,028	31,011
Total Current Assets	<u>3,374,816</u>	<u>3,831,588</u>
 <u>Fixed Assets</u>		
Vehicles	10,153	23,234
Furnishings and Office Equipment	<u>2,085,242</u>	<u>1,987,880</u>
Total Fixed Assets	<u>2,095,395</u>	<u>2,011,114</u>
 <u>TOTAL ASSETS</u>	 <u>5,470,211</u>	 <u>5,842,702</u>
 <u>Liabilities</u>		
Advance received on 1990 Core Donation	83,921	83,921
Accrued Expenses	873,480	999,902
Total Liabilities	<u>957,401</u>	<u>1,083,823</u>
 <u>Fund Balances</u>		
Invested in Fixed Assets	2,095,395	2,011,114
Unexpended Funds:		
- Core-Unrestricted	(45,743)	126,459
- Core-Restricted	288,641	470,132
- Working Fund	1,750,000	1,750,000
- Special Projects	424,517	401,174
Total Fund Balances	<u>4,512,810</u>	<u>4,758,879</u>
 <u>TOTAL LIABILITIES AND CAPITAL</u>	 <u>5,470,211</u>	 <u>5,842,702</u>

ISNAR RECEIVABLES FROM DONORS AS OF DECEMBER 31, 1990 (stated in US dollars)

<u>Donor</u>		<u>Amount Pledged in Original Currency</u>	<u>US\$ Equivalent at time of Pledge</u>		<u>Payment in Original Currency</u>	<u>Received during the Year</u>	<u>Losses/(Gains) Arising on Exchange Differences</u>	<u>Balance Outstanding at the Year End</u>
<u>CORE UNRESTRICTED OPERATING GRANTS</u>								
Australia	Aus\$	265,000	207,000	Aus\$	265,000	210,145	(3,145)	0
Belgium	Bfrs	1,000,000	27,000	Bfrs	1,000,000	32,147	(5,147)	0
Canada	Can\$	600,000	515,000	Can\$	600,000	522,375	(7,375)	0
China	US\$	10,000	10,000	US\$	10,000	10,000	0	0
EEC	ECU	590,000	571,000	ECU	325,000	440,122	0	130,878
Federal Rep. of Germany	DM	300,000	168,000	DM	255,000	182,443	(14,443)	0
France	FF	1,750,000	288,000	FF	0	0	0	288,000
IBRD	US\$	1,750,000	1,750,000	US\$	1,750,000	1,750,000	0	0
Italy	L	250,000,000	153,000	L	250,000,000	171,167	(18,167)	0
Japan	Yen	55,700,000	388,000	US\$	425,029	425,029	(37,029)	0
Netherlands	Dfl	900,000	447,000	Dfl	900,000	488,380	(41,380)	0
Philippines	US\$	15,000	15,000	US\$	0	0	0	15,000
Spain	US\$	30,000	30,000	US\$	30,000	30,000	0	0
Sweden	Skr	700,000	110,000	Skr	700,000	116,463	(6,463)	0
Switzerland	Swf	600,000	375,000	Swf	600,000	399,699	(24,699)	0
UK	PdsSt	140,000	235,000	PdsSt	140,000	244,005	(9,005)	0
USAID	US\$	1,085,000	1,085,000	US\$	1,085,000	1,085,000	0	0
Total Core Unrestricted Operating Grants 1990			6,374,000			6,106,975	(166,853)	433,878
<u>CORE RESTRICTED OPERATING GRANT</u>								
Belgium	Bfrs	2,000,000	54,000	Bfrs	2,000,000	60,569	(6,569)	0
Federal Rep. of Germany	DM	300,000	168,000	DM	300,000	175,362	(7,362)	0
Italy	US\$	250,000	250,000	US\$	250,000	250,000	0	0
Total Core Restricted Operating Grants 1990			472,000			485,931	(13,931)	0
Total Core Unrestricted and Restricted Operating Grants 1990			6,846,000			6,592,906	(180,784)	433,878
Earned Income Received during the year			1,128,515					
Unexpended balance prior year			499,228					
<u>TOTAL REVISED 1990 BUDGET</u>			8,473,743					

**ISNAR STATEMENT OF SOURCE AND APPLICATION OF FUNDS FOR THE
YEAR ENDED DECEMBER 31, 1990.**
(stated in US dollars)

<u>Source of Funds</u>	<u>1990</u>	<u>1989</u>
1.- Core Operations		
Unrestricted	6,374,000	6,777,000
Restricted	472,000	688,000
Unrestricted balance from prior year	29,096	3,117
Restricted balance from prior year	470,132	0
Earned Income Applied to Core Operations	<u>1,128,515</u>	<u>309,583</u>
	<u>8,473,743</u>	<u>7,777,700</u>
2.- Capital		
Unrestricted balance from prior year	97,363	0
Earned Income Applied to Capital	<u>0</u>	<u>219,001</u>
	<u>97,363</u>	<u>219,001</u>
3.- Working Fund		
Unexpended balance from prior year	1,750,000	1,650,000
Earned income Applied to Working Fund	<u>0</u>	<u>100,000</u>
	<u>1,750,000</u>	<u>1,750,000</u>
4.- Special Projects - Cumulative Income on Projects not Completed	<u>7,474,102</u>	<u>4,859,850</u>
<u>TOTAL SOURCE OF FUNDS</u>	<u>17,795,208</u>	<u>14,606,551</u>
<u>Application of Funds</u>		
1.- Core Operations		
Advisory Services to NARS	3,444,042	2,493,236
Research	2,161,882	1,716,811
Training	1,380,745	1,274,938
Program Support	515,593	518,726
Management & Administration	<u>728,583</u>	<u>1,177,398</u>
	<u>8,230,845</u>	<u>7,181,109</u>
2.- Capital		
Capital Additions	<u>97,363</u>	<u>219,001</u>
3.- Special Projects - Cumulative Expenditure on Projects not Completed	<u>7,049,585</u>	<u>4,458,676</u>
4.- Unexpended Balance		
Core - Unrestricted	(45,743)	126,459
Core - Restricted	288,641	470,132
Working Fund	1,750,000	1,750,000
Special Projects	<u>424,517</u>	<u>401,174</u>
	<u>2,417,415</u>	<u>2,747,765</u>
<u>TOTAL APPLICATION OF FUNDS</u>	<u>17,795,208</u>	<u>14,606,551</u>

CGIAR-Supported International Agricultural Research Centers

1. **CIAT** Centro Internacional de Agricultura Tropical, Cali, Colombia
2. **CIMMYT** Centro Internacional de Mejoramiento de Maíz y Trigo, El Batán, Mexico
3. **CIP** Centro Internacional de la Papa, Lima, Peru
4. **IBPGR** International Board for Plant Genetic Resources, Rome, Italy
5. **ICARDA** International Center for Agricultural Research in the Dry Areas, Aleppo, Syria
6. **ICRISAT** International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India
7. **IFPRI** International Food Policy Research Institute, Washington, DC, U.S.A.
8. **IITA** International Institute of Tropical Agriculture, Ibadan, Nigeria
9. **ILCA** International Livestock Centre for Africa, Addis Ababa, Ethiopia
10. **ILRAD** International Laboratory for Research on Animal Diseases, Nairobi, Kenya
11. **IRRI** International Rice Research Institute, Los Baños, Philippines
12. **ISNAR** International Service for National Agricultural Research, The Hague, The Netherlands
13. **WARDA** West Africa Rice Development Association, Bouaké, Côte d'Ivoire

