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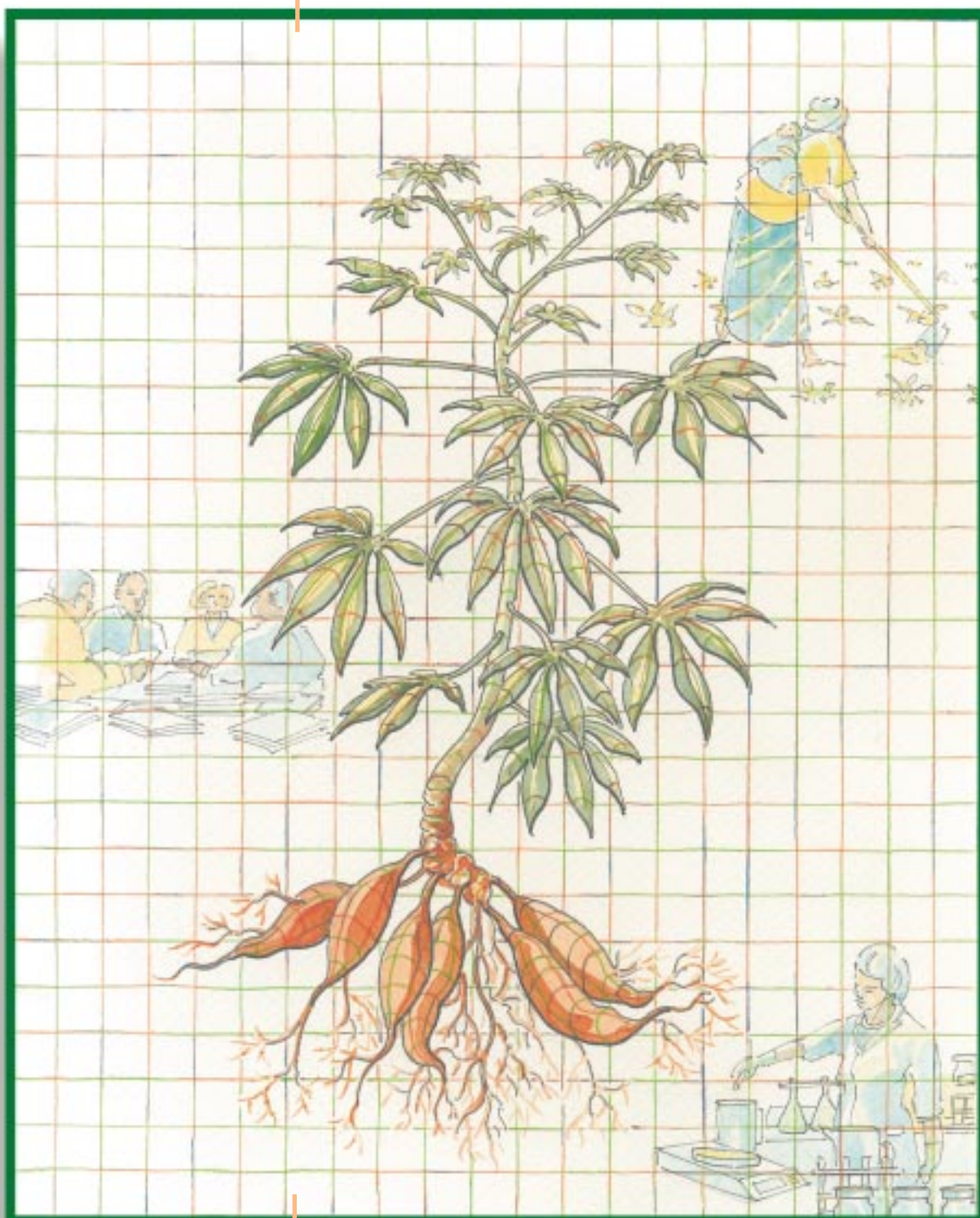
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ISNAR Annual Report 1998

Managing biotechnology in developing-country agricultural research





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Managing biotechnology in developing-country agricultural research

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Highlights

Here are just a few highlights of ISNAR's biotechnology-related work in 1998:

Initial results of a **study of public and private organizations involved in agricultural biotechnology** in five developing countries revealed steady growth in the number of biotechnology researchers. But that growth is rarely accompanied by comparable increases in operating funds. Resources available for day-to-day operations are limited, emphasizing the importance of sharply focused priorities for biotechnology research, along with integration and consolidation of biotechnology work with the broader national agricultural research effort.

An **Internet-based electronic discussion forum** is proving an efficient vehicle for facilitating contacts, partnerships, and collaboration among biotechnology research managers in developing countries. Interested readers can access the forum via ISNAR's Internet site at <http://www.cgiar.org/isnar>.

Much of the international debate on biotechnology focuses on the formulation of national and international legal frameworks and guidelines. At the same time, ISNAR's research continues to show human resources as one major constraint facing developing countries in biotechnology-related issues. Building practitioners' skills via **seminars and workshops** was therefore a main ISNAR activity in 1998.

With the number of products of agricultural biotechnology research increasing, concerns about biosafety are becoming high-priority global issues. ISNAR's research on biosafety includes a two-year collaborative project to **assess the impact of genetically engineered crops** that have been commercially released in developing countries. At the same time, ISNAR is reviewing the biosafety policies and procedures that accompanied the introductions.

By **providing advice and assistance to stakeholders** of agricultural research in developing and developed countries, ISNAR is reaping a sustained harvest from its past research efforts. In 1998, such advisory work included a study done for the Rockefeller Foundation to determine which of five important African crops presented the best opportunities for improvement using biotechnology. Among its conclusions, the report emphasizes that any donor initiative in biotechnology should include aspects of research policy and management, as well as biosafety.

Message from the Board Chair and Director General

It is hard to imagine that we can achieve food security without agricultural research to support better farming. Yet effective agricultural research requires strong research institutions. Awareness is growing in developing countries—and in the richer nations that offer development assistance—that the operational qualities of agricultural research institutions really do matter. The result is a major effort now underway to “retool” national agricultural research systems to increase their effectiveness. ISNAR is playing a vital role in this effort.

The current climate of globalization and trade liberalization is sending conflicting signals to developing countries on how they can best organize their agricultural sectors and their national programs for agricultural research. What’s more, every country is unique. Each must find its own, individual solutions. Blueprints simply do not work.

Retrofitting agricultural research

Nineteen-ninety-eight was ISNAR’s first full year pursuing its new strategy “When NARS Retool.” Responding to the reality of over 800 million food-insecure people, ISNAR sharpened its own tools and is now positioned to better support agricultural research institutions. Also in 1998, ISNAR reorganized. In this period of major economic constraints within the CGIAR system, ISNAR’s aim is to become more focused and effective. Staff reviewed their own capabilities and joined one of three new programs that are designed to address the challenges of globalization, governance, new technologies, and environmental issues related to agriculture.

ISNAR is arguably the only institution in the world with a knowledge base directly relevant to agricultural research institutions in the developing countries in their efforts to meet these new challenges. ISNAR’s continuing work will ensure our ability to continue delivering support to national agricultural research systems (NARS), with their public and private components. Our aim is to help them respond to these emerging challenges, many of which were hardly discussed five years ago.

Diversity and participation

Diversity in staff and management and participatory decision making are two cornerstones of ISNAR’s new organization. Developing-country staff members in senior positions in the institution and significantly more female professional staff add to and exemplify ISNAR’s diversity. ISNAR’s new staff association also plays an increasingly important role in the everyday running of affairs through its elected council.

ISNAR took four other noteworthy steps in 1998:

- It created a new unit, the “ISNAR Global Associates,” to capture and expand the pool of highly skilled experts in developing countries and to supplement ISNAR’s own permanent staff. Read more about the Associates in the box on page 5. ISNAR thanks the Inter-American Institute for Cooperation on Agriculture (IICA) for generously hosting the Associates program. We believe this innovative mechanism has the potential to strengthen the South-South links in ISNAR’s work.

- ISNAR seconded a senior officer to support the NARS Global Secretariat, hosted by the Food and Agriculture Organization of the United Nations (FAO) in Rome. ISNAR wants to see the NARS Secretariat succeed and to act in increasing synergy with existing organizations to maximize the influence of developing countries in setting international agricultural research agendas in the 21st century.
- The institute redoubled its outreach, strengthening ties with two large and powerful agricultural research systems, that of India and Brazil, and taking the first steps to increase collaboration with China. Efforts to strengthen ISNAR's presence in Africa continue into 1999.
- Together with other CGIAR institutes, ISNAR began its full engagement in activities in Central Asia and the Caucasus, in many cases by supporting major development initiatives of the World Bank and bilateral donors. As old institutions in Central Asia are dismantled, ISNAR is assisting in the creation of new, modern institutions that can support agriculture, which will for some time remain central to the emerging economies of these new nations.

Stakeholder support

Continued strong support from unrestricted core donors enabled us to realign our program in the face of new realities. This support has allowed us to strengthen the profile of our research-based services while developing new tools for the future. Core donor support is essential for ISNAR; its import cannot be overstated. Still, the downturn in economic fortunes for some key Asian countries has nonetheless led to indefinite postponement of a series of large ISNAR projects there. Economic weakness in many African countries has also meant that we were not able to initiate several special projects there as planned. Increased demands for ISNAR's services in Latin America have compensated to some extent; we are delighted to assist a number of Latin-American countries in developing new institutional models. But that does mean there was a temporary distortion in the regional distribution of ISNAR's work in 1998. ISNAR has been able to minimize its deficit in 1998 to US \$555,000, without reducing staff, by drawing on reserves. Our funding prospects for 1999 are significantly better and should also enable us to do more work in Africa, redressing the regional balance of ISNAR's program.

The year 1998 has been a year of transition for ISNAR's Board of Trustees. Three long-standing Trustees left: Charley Hess (USA), El Habib Ly (Senegal), and Henk Breman (Netherlands), and three new members joined the Board: Douglas Headley (Canada), Moise Mensah (Benin), and Niels Röling (Netherlands). Following Gora Beye, the new FAO constitutional observer is Jaques Ekebil.

Our work to lay the foundation for a major ISNAR contribution to retooling the NARS will continue as we approach the new century and millennium. We, the Chairperson of the ISNAR Board of Trustees and Director General, invite readers of this annual report to share with the institute's staff and collaborators ISNAR's achievements in 1998. ISNAR knows that in the world of agricultural research, institutions do matter.



Amir Muhammed
Chairperson, Board of Trustees



Stein W. Bie
Director General

New Initiative

ISNAR Global Associates program builds on “brain gain”



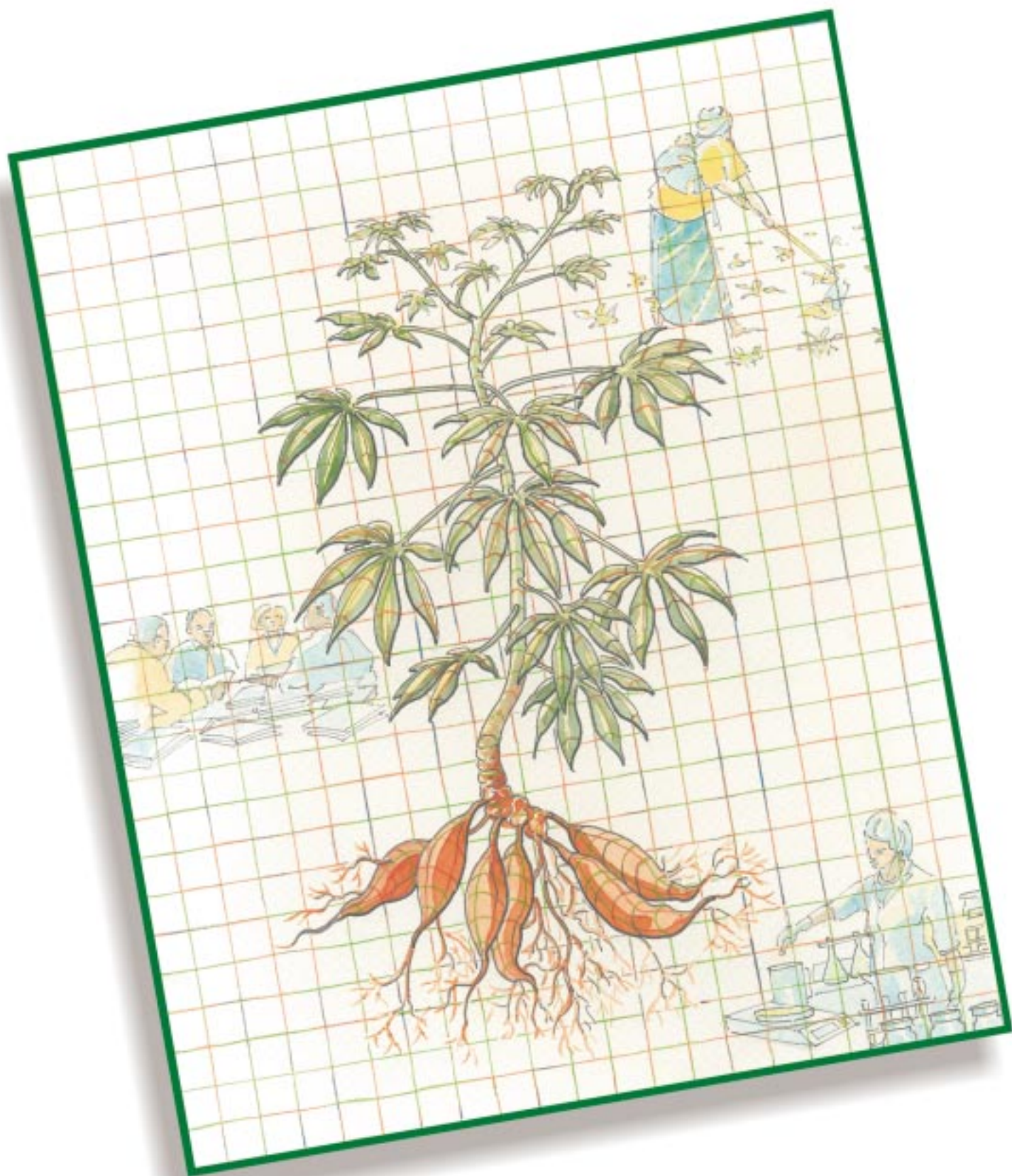
In 1998 ISNAR launched an exciting new program to expand its assistance to developing countries. The initiative will also increase the role of developing-country nationals in ISNAR's research and training, as well as fostering South-South collaboration in institution building. The program is called “ISNAR Global Associates” and is based in Costa Rica.

The Global Associates is a network of outstanding experienced professionals, mostly from developing regions, who work for ISNAR on a part-time, as-needed basis. These staff members, whom ISNAR calls “Associates,” strengthen ISNAR's presence in developing countries. They apply ISNAR-developed tools and research findings in work in the field, that is, in developing-country agricultural research institutions and organizations to strengthen their institutional capacity. According to Hunt Hobbs, director of the Associates program, “The cadre of Associates is a cost-effective way for ISNAR to reach out to more developing countries and organizations.” Through Associates, ISNAR can help more research managers and policymakers answer the questions they face on a daily basis. “It's building a ‘brain gain’ rather than a ‘brain drain’ in developing countries,” says Hobbs. “While contributing to capacity-building in numerous NARS, ISNAR Associates gain greater expertise and experience, which they can then use to strengthen their own organizations.”

ISNAR Board of Trustees, 1998

Seated from left to right: Janice Reid, Charles E. Hess, Amir Muhammed, Maria Nieves Roldan-Confesor, Sami Sunna
Standing from left to right: Geoffrey C. Mrema, Martín Piñeiro, El Habib Ly, Ken-Ichi Hayashi, Stein W. Bie, Alessandro Bozzini, Henk Breman, Just Faaland, Helen Hambly Odame (Secretary to the Board)





Managing Biotechnology in Developing-Country Agricultural Research

Unfolding Issues

In March 1998, the United States issued a patent for an innovation titled “Control of Plant Gene Expression.” The technology, acclaimed as brilliant science by many biologists and genetic engineers, involves the addition to the plant of a gene that blocks the production of fertile seed. The plant is thus sterilized; the seed it produces is unable to germinate. Use of the gene, now widely referred to as the “terminator,” provides seed producers security against unauthorized use of new plant varieties and helps create incentives for their continued investment in research. It could potentially be used in a broad range of commercial seed, from rice to wheat and vegetables.

To its critics, however, the terminator is an ominous symbol of a high-tech world that excludes the poorest segments of society. Its detractors say it could eventually end the ten-thousand-year-old practice in which farmers harvest their crops and save a small portion of seed for replanting. The terminator gene, they say, would compel farmers to purchase seed from patent holders who own the rights to new crop varieties.

Because the practice of saving seeds is widely used in developing countries, the terminator gene could have disproportionately large effects on the world’s poorest farmers. Patents for the gene are now being sought in 40 less-developed countries. These patents, and the scientific and ethical issues surrounding them, have brought issues of biotechnology to the forefront of agricultural research policy and management.

In Uganda, patent applications for the terminator gene were filed in 1998 by the Delta Pine and Land Company, part of the seed and chemical multinational Monsanto. Senior government officials in the East African country were concerned. The government felt it needed to respond quickly, so it turned to its agricultural research experts for advice.

In late August, Prof. Joseph Mukiibi, director general of the country’s National Agricultural Research Organization, was responding to the request from the country’s highest offices. He established a four-member committee to study the new technology and asked them to identify risks and opportunities associated with it. Ultimately, the team was to recommend whether or not

Uganda should outlaw use of the terminator gene within its borders or award its inventors a patent.

The 22-page report that the committee produced reflects the broad range of issues involved in current debates on biotechnology research and its legal, scientific, and ethical aspects. It also underlines the valuable role that national agricultural research leaders can play in informing national science and development policy.

The first of the six recommendations was that the government should not act hastily but, rather, approach the issue slowly and carefully “allowing sufficient time to study the full implications of the new technology.” Other recommendations echoed this care and consideration. They in-

cluded, for example, a statement that the ministry should seek a common regional stand with its neighbors regarding plant patent awards. It also recommended that a technical committee be set

up to advise Uganda's attorney general on biotechnology patent applications, and that provision be made for local professionals to stay apprised of new developments in the field.

Food, Environment, and Biotechnology

Biotechnology is a powerful set of tools used by scientists to alter the genetic makeup of plants and animals. By moving genes between species, scientists can improve a crop's pest resistance, its ability to grow in poor soils, or as in the case of the terminator, change its reproductive capacity. Although few biotechnology applications are wholly uncontested, use of the techniques is nonetheless often hailed as one key to future breakthroughs in agricultural research, particularly for the developing world.

One of its proponents, Dr. M. S. Swaminathan, a respected agronomist and co-author of a World Bank study on transgenic crops, believes the challenge of increasing farm productivity in developing countries can be met only by mobilizing frontier science. This, he says, will require blending traditional technologies and ecological prudence with biotechnology, modern information science, and renewable forms of energy production.

Deciding how best to use biotechnology requires careful judgment and experience. Research managers must weigh productivity increases alongside environmental risks, research priorities, and potential returns on investment. Recognizing the importance of these decisions, ISNAR established

a biotechnology research and advisory program in 1992. Over the past seven years, the "Intermediary Biotechnology Service" (IBS) has built partnerships with advanced research programs in more than 25 developing countries.

Lately, even countries that have not considered direct involvement in biotechnology are having to confront the complex issues posed by the new technology. Genetically modified crops arrive daily in ports and markets around the world. Yet only a handful of countries have rules or regulatory agencies that can cope with the new products. As in Uganda, international concern has heightened awareness among policymakers. Indeed, agricultural leaders are increasingly being called on to offer advice—often on short notice.

This article examines biotechnology from the perspective of the practitioner, the research manager, as well as developing-country farmers and consumers. It addresses three principal issues: priority setting, biosafety, and intellectual property rights. It concludes by restating a major lesson that ISNAR has learned in partnership with its developing-country collaborators: Given the pace of global developments in biotechnology, it is essential that developing countries maintain a degree of self-reliance in analyzing the issues that this new technology raises.



Skills

Training builds people power for biotechnology management

While much of the international debate on biotechnology focuses on the formulation of national and international legal frameworks and guidelines, ISNAR's research continues to show human resources as the number one constraint facing most developing countries today in biotechnologies, as well as in new technologies in general. Building skills and experience among the people in charge of the daily management of biotechnology research was therefore a main ISNAR activity in 1998.

With support from the Government of Japan, ISNAR developed and conducted a management training course to help practitioners on the front line of biotechnology management develop their skills. The course took place in China, November 2–13. Twenty participants from the public and private sectors followed the sessions, which led them through a hands-on approach to solving problems. Defining priorities, managing biosafety, and intellectual property rights were among the topics covered. One participant commented, "Learning from others' experience and sharing knowledge was most beneficial and is already paying off in terms of more effective priority setting and time saving." About half the course was devoted to biotechnology management, with the remaining time spent on management of another new technology: information technology.

Typical questions, many of which stemmed from real-life situations, on the management of agricultural biotechnology research were raised. Managers were presented with tools to help them think strategically about their research programs. Special emphasis was placed on individual effectiveness and building leadership qualities.

"The ISNAR management course has helped us to strengthen the link between industry, universities, and research institutions by means of the information we shared during the course," was the enthusiastic response of one participant. Attendees not only improved their knowledge and managerial and leadership skills, but by the end of the workshop, they had also made professional contacts and new friends. Such networks empower them to continue building their skills and exchanging experiences.

The management course is now being offered annually to participants from Indonesia, India, Malaysia, Thailand, Sri Lanka, the Philippines, and Vietnam. There biotechnology is growing rapidly for many agricultural research systems, and managers urgently need expertise to help them carry out their new responsibilities.

Extending the information affluence

The rapid changes taking place in biotechnology represent a major technological and policy challenge to the developing world's scientists and research managers. Even simple hurdles, like accessing news and information, are considerable obstacles in many countries. The task is made even more difficult, says M. S. Swaminathan, by exaggerated claims and high expectations. "One thing is clear," he says. "In the recent debate [on transgenic crops] there's a lack of information and a lot of confusion."

Combating confusion and promoting informed decision making is one of ISNAR's priorities. Printed publications, information on the World-wide Web, networking, and the organization of workshops and seminars are some of the ways that IBS routinely extends information to biotechnology researchers and policy advisors around the globe. Details of some of these ISNAR initiatives are in the boxes accompanying this article.

The revolution in management

The revolutionary qualities ascribed to modern biotechnology pose managerial as well as technical challenges. To cope with the demands posed by new technology, research managers are increasingly emphasizing teamwork, multi-disciplinary research, and cross-institutional alliances. They are also frequently asked to play a more direct role in informing national policy.

**there's a lack of
information and
a lot of confusion**



Information

Statistics support policymaking on biotechnology



Information on the resources available to build capacity for agricultural biotechnology in developing countries is lacking. For this reason ISNAR began an in-depth survey of public and private organizations involved in agricultural biotechnology in five developing countries: Colombia, Indonesia, Kenya, Mexico, and Zimbabwe. "We've already completed the work in Kenya, Mexico, and Indonesia," says Cesar Falconi, economist in ISNAR's biotechnology program. "We went into issues like the growth of public- and private-sector investment and the level of expenditure per researcher and then compared these to the situations in other countries. Our research will examine how institutions mobilize resources and how they make decisions on how much to invest in agricultural biotechnology." Surveys in Zimbabwe and Colombia are to be completed in 1999.

The wealth of new information gained will provide policymakers and research leaders with new insight to improve their decision making. Facts and figures related to human, physical, financial, and managerial aspects already show that in Kenya and Indonesia, some advanced biotechnology research is being conducted. Nonetheless, these countries are still in the early stages of biotechnology development. Mexico, on the other hand, has one of the most developed biotechnology industries of Latin America.

Findings also revealed that the number of researchers in the three countries has grown far more quickly than research expenditures. This shows a definite need for more national and institutional commitment to raise funding for agricultural biotechnology. At the same time, there is an average of one manager for every 2.5 researchers in the organizations surveyed. Survey results also confirmed that most agricultural biotechnology research in developing countries focuses on crops, with less attention being given to livestock.

The survey indicated that a biotechnology policy is urgently needed in Kenya, Indonesia, and Mexico to integrate and consolidate research efforts. It also shows that given the limited resources available, biotechnology research priorities in these countries could be more clearly defined and supported by a sound incentive scheme, one that is integrated and consolidated with the broader agricultural research effort.

Qinfang Wang, head of science management at China's Biotechnology Research Center (BRC) underlines the importance of teamwork. "At BRC/CAAS [the Chinese Academy of Agricultural Sciences] we have close cooperation between biotechnologists and conventional breeders." Wang notes that teamwork is important at each stage of a project, from basic research and development, all the way to the release of finished products. The clear delegation of responsi-

bility for initiating and managing cooperation, she says, has smoothed the way for better collaboration at the institute.

The need for task sharing has also helped expand cooperation. Biotechnology equipment is expensive, and the number of scientific disciplines involved is often beyond the budget capacity of any one institute. The development and commercialization of a virus-resistant potato in Mexico provides an example. In this case, the basic technology was acquired gratis from Monsanto. It was then refined in one of Mexico's advanced research laboratories and applied to local cultivars. Staff from a public-sector agricultural research organization, the local extension service, and a private-sector seed producer then collaborated to commercialize the product and deliver it to farmers.

As the 21st century approaches, decision-makers will increasingly need to consider global trends such as market liberalization, the demand for better public administration, and advances in



**revolutionary qualities
pose managerial as well
as technical challenges**

technology in making policy decisions. Better management, greater cost-effectiveness, and judicious use of technology are now priorities in many countries, rich and poor. Cellular and molecular biology are among the areas most likely to raise a nation's agricultural potential, especially

when combined with traditional farmer knowledge. ISNAR's biotechnology program has emphasized these issues in recent years, giving special emphasis to priority setting, biosafety, and intellectual property rights.

Assigning Priorities to Projects

Carlos Muñoz, general manager of INIA, the Chilean national agricultural research institute, is the leader of Chile's newly proposed biotechnology program. The origins of the program go back to a former government minister who saw biotechnology as important for maintaining the country's competitiveness in international trade. In the past, Chile obtained new varieties and technology from abroad at little cost. But foreign technology has become more expensive, with royalties and licensing payments adding to production costs.

To reduce Chile's dependence on foreign technology, the government agreed to spend US \$44 million over 10 years to establish a modest biotechnology program. But before making that large an investment, the agriculture ministry wanted to put in place a priority-setting process to help them choose the biotechnology research projects with the most potential. Muñoz, the coordinator of the national biotechnology program, was designated to lead the effort. In collaboration with ISNAR and the Swiss Federal Institute of Technology, his team used a decision-support tool known as the "analytical hierarchy process"

or AHP. Their hope was that AHP would take the guesswork out of priority setting.

Priority setting in research is basically a process of choosing between alternative lines of scientific inquiry. It can be done using complex statistical methods or by simpler, more qualitative means such as group discussion and consensus building or by checklist-based scoring. Either way, the process usually entails defining criteria on which projects will be judged. The cost of each project is also estimated and compared with potential benefits. The benefits can be economic, such as increased yields or profits. They may also involve social or institutional factors. An example of a social benefit is improvements to a food commodity that is eaten by the poor. Institutional benefits might include strengthening a country's scientific capacity. In Chile's case, institutional benefits proved to be one of the most important criteria.

Unique aspects of biotechnology

But as researchers tend to agree, some characteristics of biotechnology greatly complicate priority setting. For example, few biotechnology products



are now actually being used by farmers in their fields. That means information on the performance of such technologies is hard to come by. A USDA researcher recently quoted in *Science* magazine believes that some of the current claims about biotechnology may be analogous to the dreams of perpetual-motion machines in the 19th century. “No matter how finely tuned the machine, reality does not allow outputs to exceed inputs,” he says. Added to this, large yield increases can often be achieved more readily by taking existing technology off the shelf.

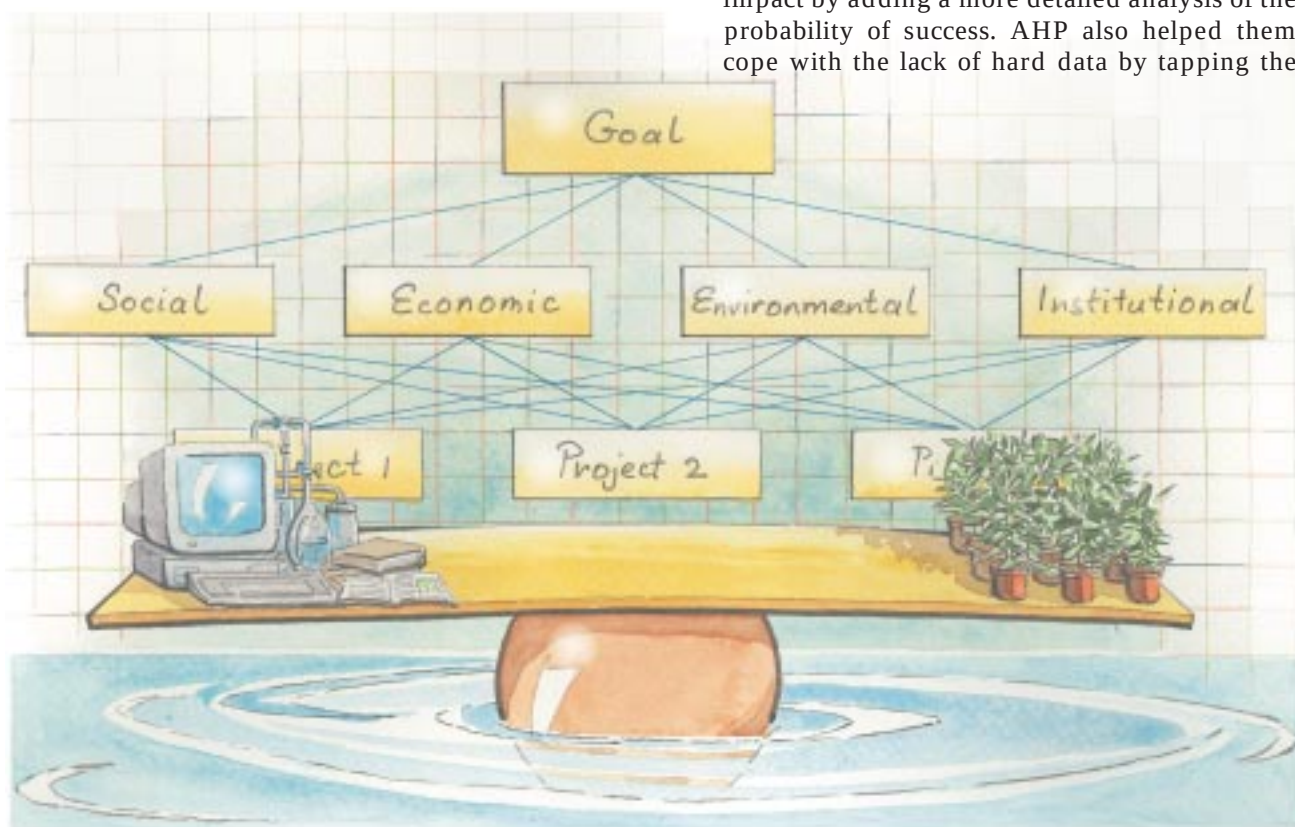
The novelty of the new techniques—and some of the unknowns involved in setting up biotechnology programs—make it difficult to estimate costs, let alone benefits. Yet these calculations are at the heart of formal priority setting. Unless research managers can quantify variables, they are usually compelled to base their decisions on little more than educated guesswork.

Other factors complicate the issue as well. For example, biotechnology programs often generate intermediate products and processes that are used for further research. This contrasts with end products such as seed that can be sold to farmers. Biosafety and intellectual property rights also entail new and untried issues. Both introduce uncertainty about whether or not the products of biotechnology will ever reach farmers, be adopted by producers, or be accepted by consumers.

Setting priorities despite the difficulties

The AHP decision-support system that was tested in Chile was an attempt to account for many of these complications and avoid unnecessary—and expensive—complexity. AHP helps to disaggregate complex problems into simpler units that can be discussed among mixed groups of people with varying degrees of expertise. Using AHP, such groups can compare research alternatives and rank them according to their ability to satisfy the agreed-upon criteria. For example, Chile used four criteria: economic, social, environmental, and institutional. These were further broken down into subcriteria, with the idea that the subcriteria would be specific enough to yield firm judgments. The criterion “social,” for example, included two subcriteria: “distribution of research benefits” and “health risks.”

According to ISNAR scientist Thomas Braunschweig, who was posted at INIA during the testing program, “The AHP exercise produced reasonable and defensible priorities that are intuitively appealing and have since been generally accepted. Project rankings gave a clear indication of how resources could be allocated.” The AHP method, he says, helped the Chilean team incorporate some of biotechnology’s unique characteristics into priority setting. For example, the team adapted AHP to tackle questions about potential impact by adding a more detailed analysis of the probability of success. AHP also helped them cope with the lack of hard data by tapping the



Internet

IBS information supports biotechnology in developing countries



ISNAR responds in a number of ways to prevent a growing information gap between industrialized and developing countries in biotechnology-related areas. When ISNAR established its Intermediary Biotechnology Service (IBS) in 1992, one of its main tasks was to provide ready access to biotechnology information because countries setting their agendas for biotechnology need information on what technologies and expertise are available.

Today this is being done in many ways. The number of requests from developing countries for information services is growing as researchers gain easier access to the Internet. IBS now has an Internet-based information and discussion forum. This not only provides an interactive interface for answering questions about agricultural biotechnology, it also publicizes new initiatives and presents proposals for new collaborations.

The electronic forum is proving to be an efficient vehicle for facilitating contracts, partnerships, and collaboration. John Komen, IBS information specialist, says, "The discussion forum had a long gestation period, but now we are hosting a lively exchange of opinions, ideas, and questions about the issues that developing countries face when planning or implementing research programs in agricultural biotechnology." ISNAR's Web site links a number of public and private advanced research institutes worldwide and provides summaries and full-text versions of selected publications. IBS also set up a database on international agricultural biotechnology, which currently contains information on 44 organizations supporting capacity building in agricultural biotechnology for developing countries.

Interested readers can access the biotechnology Web site via ISNAR's home page or at <http://www.cgiar.org/isnar/fora/biotech/index.htm>.

knowledge, intuition, and experience of different experts. Comparisons of research options based on explicit and descriptive criteria simplified the judgments that had to be made. Finally, group sessions helped eliminate individual biases, promoted ownership, and provided feedback and new insights on the potential impact of new projects.

After attending an ISNAR training course in China in which AHP was introduced, Hafsah

Jaafar, research manager at the Malaysian Rubber Board, hopes to try AHP in her own setting. "I have gained tremendously from ISNAR's advisory help. . . . I think AHP can be applied in Malaysia to set priorities for our national committee," she says.

ISNAR is currently refining the AHP method, for example, to resolve problems posed by communication barriers between stakeholder groups and making sure that farmers and consumers are more directly involved.

Safe Use of Biotechnology in Agriculture

Emerenciana Duran, a member of the Philippine National Committee on Biosafety, has worked with ISNAR since 1997 when she attended an ISNAR course called "Managing Biotechnology in a Time of Transition." She exemplifies a new generation of developing-country researchers who must formulate and implement guidelines and regulations to ensure that biotechnology is applied safely. Duran agrees that training programs like ISNAR's are helping research managers gain confidence. She points out that such skills are often applied all around the negotiating table

**novelty makes it
difficult to estimate costs,
let alone benefits**



Publication

Book bundles five years' expertise in biotechnology management



Biotechnology is regarded as a growth point for many agricultural research systems. But many questions, such as the time horizons needed for research programs, regulatory needs for human and environmental safety, potential benefits, and required investments are difficult to estimate for research managers and policymakers. To help them in this task, ISNAR has compiled a new book, "Managing Agricultural Biotechnology—Addressing Research Program and Policy Implications for Developing Countries," to be published in 1999 by CAB International (CABI) in their Biotechnology in Agriculture Series.

With contributions from international experts, the book is written by and for research managers in developing countries, addressing the problems they face in organizing and managing biotechnology research. Its information is derived from case studies and the experiences of biotechnology research leaders worldwide. According to Gabrielle Persley, general editor of the series, the 21 books on agricultural biotechnology that CABI has published over the past decade continue to be in high demand. The ISNAR volume is the first to look at management issues specifically. "This easy-to-read volume summarizes and synthesizes the main ideas derived from workshops and from information collected by ISNAR over the past five years," says Persley. "The book will be most helpful to agricultural research managers, regulators, directors, and all those involved in the challenges of biotechnology."

during the public debate that often accompanies decision making.

Duran regularly experiences these debates firsthand. Filipino NGOs (nongovernmental organizations), she says, are deeply concerned about biosafety guidelines. "At first we thought that greater public consultation would delay final action," she says. "But we eventually decided to hold even more public consultations as the process accelerated."

Safety issues are often the focus of fierce public debate. The term "biosafety" describes policies and procedures that are adopted to ensure that biotechnology does not harm public health, the environment, or biodiversity. In agriculture, biosafety is usually associated with the use of genetically modified organisms such as transgenic crops or, more generally, with the introduction of

nonindigenous species into natural or managed ecosystems.

The "guidelines" that Duran refers to are formal regulations that are now in place in a number of countries. These help scientists and regulators assess and manage risks to human health and the environment, evaluate the consequences of releasing genetically modified organisms into an area, and then weigh these considerations against the potential benefits of proposed trials. The guidelines are usually formalized in government legislation or in a presidential or ministerial decree. The Philippines established its national committee on biosafety in 1990 by executive order.

Effectiveness of biosafety programs

By definition, an effective biosafety system fosters the rational use of biotechnology to improve agricultural productivity or food quality, secure economic benefits for producers, and protect health and the environment. ISNAR's reviews of biosafety systems suggest four characteristics that are shared by all effective biosafety programs.

First, they are based on written guidelines that clearly define the structure of the system, the roles and responsibilities of those involved, and how the review process will operate. Second, they are run by people who are well trained and confident in their decision-making ability and who have the support of their institutions. Third, the process must be based on up-to-date and relevant scien-



NGOs are deeply concerned about biosafety guidelines

tific information. Fourth, feedback mechanisms are used to incorporate new information and revise the system as needed.

Biosafety first emerged as a global issue at the 1992 UN Earth Summit, which led to the Agenda 21 environmental action plan and the Convention on Biological Diversity. The Convention, which came into force a year later, provides the basis for current international agreements on the preservation of genetic diversity. More than 100 countries are now involved in the tough process of drafting the Convention's "biosafety protocol," which, if successful, will be internationally binding.

One of the difficulties in the negotiations is that the industrialized countries' expectations regarding the international biosafety rules are different from those of developing countries. The group of advanced countries, such as Canada, Japan, the UK, and the USA, favor a protocol with few restrictions. "They've already gone a long way in biotechnology research," says Howard Elliott, ISNAR's deputy director general. "Their governments want to be able to build on their lead in what they see as the next scientific revolution." Private companies, too, want a protocol with few limitations on trade in products and techniques, one that enables them to gain returns on their past investments in biotechnology research and that creates conditions favorable to investments in high-tech industries.

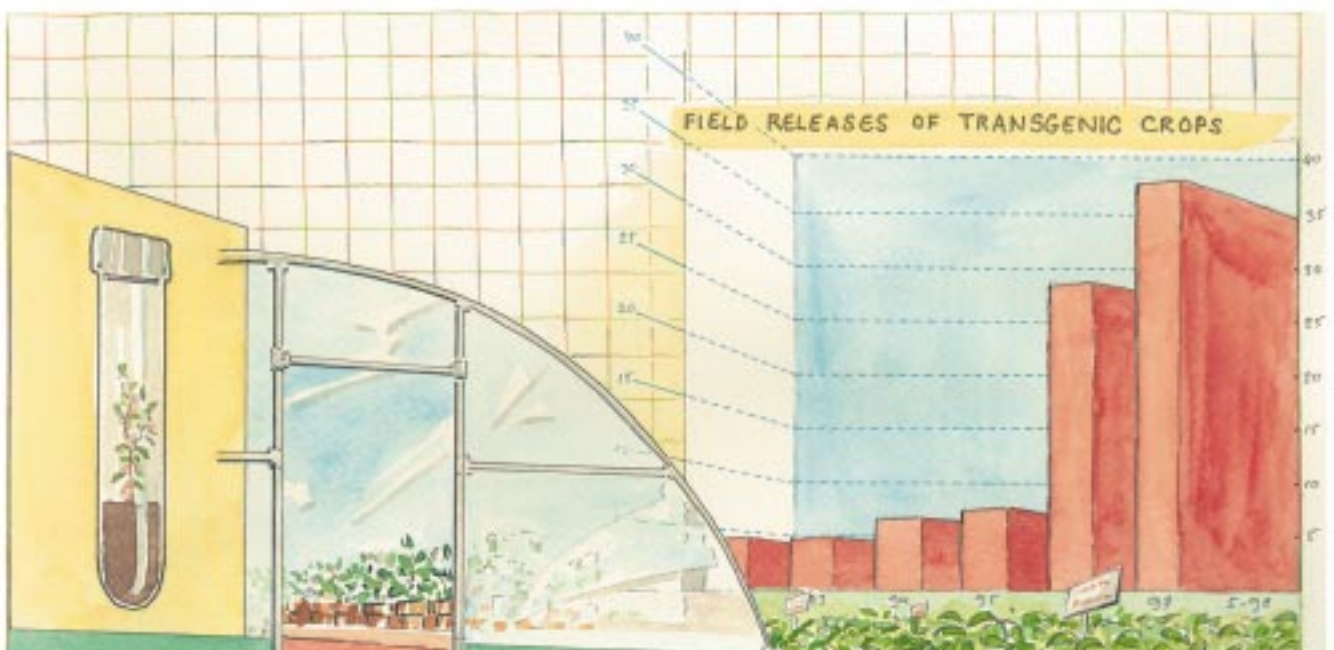
But many developing countries have little experience in biotechnology and biosafety. They are counting on the protocol to protect them against the potentially adverse effects of biotechnologi-

cally altered organisms developed elsewhere. "By providing information and building their skills in biotechnology management, ISNAR's partnerships with developing countries help them judge how far the protocol will be effective in bridging gaps in their own national biosafety policy," says John Komen, associate research officer in ISNAR's biotechnology program.

Issues in implementation

While the public debate has focused on formulating biosafety guidelines and a legal framework from which to operate, implementation is less widely discussed. Most governments have delegated the responsibility to what is called a "competent authority." This most often means a ministry or government agency. As in the Philippines, the competent authority may be assisted by biosafety committees convened at the national level or within organizations involved in biotechnology research.

The people most closely involved in biosafety are the scientists seeking approval to test genetically modified organisms or, like Duran, individuals whose committees must approve the release of a genetically modified organism. While interests may diverge, ISNAR's experience suggests that researchers—and those charged with oversight for biosafety—can work together towards a common goal. For that to happen, however, each participant must be familiar with the relevant health and environmental issues and have a working knowledge of biosafety review processes. They must also be able to recognize what constitutes risk and to suggest which risk-management strat-



egies are most applicable. Finally, as in Uganda, they must be able to communicate their findings to a range of stakeholders, including policymakers and the general public.

In Thailand, where the biotechnology industry is developing steadily, the public perception of biosafety also presents a major challenge. “We have just started to do public education,” says Uthaiwan Grudloyma, policy analyst at the National Center for Genetic Engineering and Biotechnology. “There is much confusion concerning GMOs [genetically modified organisms], which, in turn, influences attitudes towards genetic engi-

neering research and development.” According to Uthaiwan, there is no question that the public-education issues are the responsibility of all, including the private sector, particularly the large multinational companies.

By now, the biosafety debate has alerted many developing countries to the need to prepare positions on the issue and to be proactive in defending their interests. But only knowledgeable, confident negotiators can advocate national viewpoints. Building these skills in people and their agricultural research institutions is a major part of ISNAR’s work.

Ownership of Rights to the Technologies

A researcher spent his sabbatical at an Asian agricultural university where he worked as part of a group studying how to eliminate the toxins found in palm kernel cake fed to sheep. When the sabbatical was over, the visitor returned home where he continued the work. Asian colleagues periodically sent him the palm kernel cakes he needed to continue the experiments. The scientist eventually solved the problem during his home-based research, but a dispute then arose over patent rights to the innovation. The university was faced with a dilemma: “Who owns intellectual property that was developed by a visitor using university resources and facilities?”

In general, a research institute owns the intellectual property generated by its staff and students.

But this only holds true if the intellectual property was created in the course of employment and if the research institute has contributed resources and services. In this case, the issue was not as clear-cut. Because similar situations were bound to occur, the university solved the problem by enacting an intellectual property statute that would apply to students, staff, and visitors.

The fast pace of increase in the number of patents awarded for innovations involving biotechnology has encouraged many agricultural research institutes to follow this Asian university’s example. According to a study published in *Research Policy*, the number of biotechnology-related patents awarded annually has increased 250 percent since 1989. Other factors are also prompting



Policy

Safe and sound, research informs biosafety



Concern about biosafety, including the potential for genetically modified organisms (GMOs) to have a negative effect on the environment and human health, is now a high-priority global issue. That's because products of biotechnology research are now steadily emerging from many advanced research laboratories, especially those in industrialized countries. A number of developing countries, too, particularly in Asia and Latin America, are in the process of moving biotechnology out of the lab and into their agricultural production systems. "Building national competence in biosafety is thus of strategic importance to the successful integration of biotechnology into agricultural research," says Patricia Traynor of Virginia Polytechnic Institute and State University (USA).

"Biosafety has become an integral part of technology transfer, as well as a major component of trade agreements pertaining to GMOs," Traynor says. "Having a means for exercising oversight in the use of agricultural biotechnology fosters a deliberate and informed approach to the use of this new and powerful technology."

ISNAR is expanding its biosafety activities. Its aim is not only to support developing countries in using biotechnology to enhance their agricultural productivity, but also to help them ensure environmentally responsible use of their biotechnology products. Indeed, development of national biosafety guidelines was one of the most commonly cited needs of country delegations attending IBS-sponsored regional policy seminars between 1994 and 1996. This includes establishing a responsive biosafety system and increasing staff capacity to perform risk analysis on genetically modified organisms.

ISNAR is responding to this acutely perceived need on several fronts. Its training course on managing new technologies, "Managing Biotechnology in a Time of Transition," has a session covering the management of biosafety systems, balancing research and biosafety considerations, and building public acceptance. IBS is now preparing to assist a Southeast Asian country in preparing a technical training course for biosafety regulators.

ISNAR has also initiated a two-year collaborative research project with Virginia Polytechnic Institute and State University to assess the impact of genetically engineered crops that were commercially released in developing countries. At the same time, ISNAR is reviewing the biosafety policies and procedures associated with the introductions. In addition to valuable information on the efficacy of the biosafety system, the project will produce recommendations on how developing countries can address gaps in their human, technical, and information resources.

changes in the climate surrounding intellectual property rights (IPR). First, agreement to protect a patent holder's ownership rights to a technology is now a likely precondition for a research institute's participation in a collaborative project. Second, changes resulting from international treaties such as the General Agreement on Tariffs and Trade (GATT) and the Convention on Biodiversity have had an impact on some developing countries' positions on granting patents. Finally, in some technologically advanced countries, researchers have developed plants or technological innovations that may warrant their seeking proprietary rights themselves.

"IPR is often used to control access to an agricultural invention," says Joel Cohen, leader of ISNAR's Intermediary Biotechnology Service. "Following development in the laboratory and the field, protected innovations enter the world of

**public education
issues are the
responsibility of all**



Outreach

Advisory services reap harvest of past research



As part of its 1998 advisory services, ISNAR collaborated with the Rockefeller Foundation to study needs and opportunities for increased investments in biotechnology for improving African crops. The study concluded that there are good opportunities for increased donor support for advanced biotechnology research and training in the region. Such support will certainly enhance ongoing biotechnology research efforts in Cameroon, Côte d'Ivoire, Ethiopia, Kenya, Malawi, Mali, Nigeria, South Africa, Uganda, and Zimbabwe.

John Lynam, program officer for agricultural sciences in Kenya, commented on the work, "Rockefeller requested assistance from ISNAR because they had completed a previous biotechnology study and this gave us confidence. ISNAR had a better entry point into Africa and had 'on the ground' understanding of biotechnology possibilities." As to the report's conclusions, Lynam says, "ISNAR's report recommended that research policy and management aspects of biotechnology, such as biosafety, should be an integral component of a new donor initiative, while the actual funding mechanism should be carefully determined in order to make new initiatives sustainable. It also provided us with invaluable information regarding the biotechnology tools available for each of the five crops being investigated and assessments of relevant capacity."

ISNAR has made it its business over the years to deliver knowledge and tools developed through research in the form of advisory services to client organizations. The Swiss Agency for Development and Cooperation (SDC) was another such organization in 1998. SDC mandated a task force to prepare a new phase of the Indo-Swiss Collaboration in Biotechnology (ISCB) Project in India. A detailed cooperation program between Swiss and Indian institutions will be set up for the promotion of biotechnology research and development capacity in India. The new program will start in April 1999. As part of its advisory assistance, ISNAR is helping with issues like priority setting, managing intellectual property rights and technology transfer, biosafety regulations, and the components needed for building and implementing a strategy for biotechnology.

production and development, subject to the conditions established by the holders of the intellectual property." Products derived from these innovations may take their place beside other inputs that help address farmers' and consumers' needs. "Clarity regarding IPR and the rightful ownership of innovations can build a foundation for equitable relationships between partners who have collaborated to bring a technology to fruition, as well as with those wishing to use the innovation to advance future research developments," Cohen says.



**stronger IPR standards
may increase access to
protected technologies**

Patents and plant variety rights

Patents and plant variety rights are the two most common ways that researchers can protect their rights to a technology. In 1993, ISNAR explained how IPR might affect agricultural research in its Research Report No. 3, "Intellectual Property Rights for Agricultural Biotechnology: Options and Impacts for Developing Countries." A patent grants the inventor exclusive rights to manufacture or sell an invention over a period of roughly 20 years. Issuance of a patent, in turn, requires the developers to make public the details of their innovation. The idea is that disclosure stimulates national economic development by encouraging additional research while ensuring that inventors are sufficiently rewarded to spur future work.

Plant variety rights are similar to patents but pertain specifically to new plant varieties. They grant the breeder exclusive rights to produce and commercialize a variety for at least 15 years. Both patents and plant variety rights apply only in the countries that have granted them. Moreover, both contain provisions for limited unauthorized use of protected materials. For patents

this includes a “research exemption” that allows scientists to study the material as long as they do not reproduce it for commercial purposes. Plant variety rights are more lenient, allowing both a “breeders’ exemption” and “farmers’ privilege.” Using the breeders’ exemption, scientists can use protected material to create new varieties. The farmers’ exemption, in turn, allows producers to use harvested crops for the next planting. ISNAR Research Report No. 3 fully examines the complications and repercussions of these exceptions.

Developing countries’ standpoint

Developing countries have traditionally been reluctant to recognize or enforce any form of IPR, particularly patent rights. Instead, they have taken the stand that patents have kept their industries from catching up with the industrialized world and have deprived them of the benefits of technological innovation. But the shift to liberalized global markets is now raising doubts as to whether such permissive IPR policies are conducive to social and economic development. It is frequently argued that stronger IPR standards may increase developing countries’ access to protected technologies, help them reduce technology gaps, increase the opportunities available to build national scientific know-how, and attract foreign investment.

Mexico’s development of a virus-resistant potato illustrates the point. In 1991, Monsanto granted

the “CINVESTAV” network of public-sector research institutes a nonexclusive, royalty-free license to a company-owned technology. The agreement included not only transfer of the technology, but also collaboration on genetic engineering techniques and training for staff. CINVESTAV was subsequently authorized to develop and sell future generations of virus-resistant potatoes in Latin America and Africa, but was prohibited from exporting them to the United States. In addition, use of the Monsanto technology was limited to just 10 varieties. Nonetheless, the program provided a boost to Mexico’s biotechnology program, enabling it to produce a virus-resistant potato that has been disseminated to Mexican farmers.

Material transfer agreements and licenses

Rights to a patented technology can be transferred in a number of ways. But for purposes of research, one of the most common methods is through a material-transfer agreement (MTA). Formal licenses are a second option, followed by royalty arrangements or rights payments. A 1998 ISNAR survey showed that MTAs were involved in about 70 percent of cases in which international research centers obtained permission to use privately owned technology; about 30 percent of the cases involved licenses. Even so, the permission was usually granted for “research only.” Thus, questions of who will hold the rights to subsequently developed technologies remain.



Indeed, use and dissemination of technologies developed using patented research inputs presents legal and ethical questions, especially to public-sector organizations. First, agricultural research that is financed with public funds usually aims at producing “public goods.” That means the products of research should be available to all at negligible cost. But this view is difficult to reconcile with the current climate of patent awards. A 1997 report of the Consultative Group on International Agricultural Research (CGIAR) expressed the position of the international research centers: The CGIAR stands for free flows of germplasm without regard to profit. However, centers may establish defensive patents to stake out a claim and ensure access to germplasm and technologies for the benefit of developing countries.

Another question involves the cost of legal expertise. Few agricultural research institutes can afford to maintain on staff experts on international patent law. Even the relatively well-off CGIAR centers feel that they do not have the information they need to anticipate, for example, the difficul-

ties that could arise from the use of research products generated from proprietary technologies. Problems are especially likely to occur when exports are involved. For example, ISNAR Briefing Paper No. 39, “Proprietary Biotechnology Inputs and International Agricultural Research,” described a contractual agreement between an international center and a private multinational who, as owner of a proprietary input technology, stipulated that research outputs could be distributed only in selected countries. Such agreements could limit the dissemination of technologies and germplasm that have traditionally been seen as public goods.

Within the CGIAR, there is growing recognition that legal expertise is urgently needed to help resolve these types of problems. ISNAR is currently following up its 1998 IPR survey with a study of 20 research groups involved in public-sector agricultural research in five Latin American countries. Results, due in mid-1999, should provide a good indication of whether developing countries do indeed face issues similar to those confronting the international centers.



Results

Study documents in the IPR situation in CGIAR research



Technologies and genetic materials owned by private-sector research organizations are playing an increasing role in research done in the CGIAR, according to an ISNAR study done on behalf of the CGIAR Expert Panel on Proprietary Science and Technology. “Much new biotechnology is proprietary [privately owned, managed, or protected through some sort of intellectual property rights],” says the panel’s chairperson, Tim Roberts. “Commercial companies are big players and they must have IPRs [intellectual property rights] to recover their research investments.”

According to Roberts, the CGIAR needs IPR expertise and, in some cases, IPRs of their own. “The CGIAR must act quickly,” he says.

While the range of proprietary technologies used in CGIAR research is extremely broad, very little patent protection is being sought by centers for their own innovations, according to the ISNAR findings. The reason is the “public good” tradition of CGIAR products, the lack of familiarity among CGIAR scientists and managers with issues related to intellectual property rights, and the unsuitability of most current IPR options.

In its report, which was submitted in April, ISNAR specifically highlighted the procedures that currently govern research inputs protected by IPR. “MTAs” or material-transfer agreements are the most common way for centers to obtain permission to use materials, although they, too, have limitations. Confidentiality obligations, for instance, may be imposed on visitors and research partners when the owner of a technology regards it as a trade secret.

Findings also show that the international research centers are now moving into a new phase in which biotechnology is being used to create a new generation of inputs for use in the laboratory and on farmers’ fields. Unlike the situation in the 1980s, many CGIAR research centers are now using modern biotechnology techniques. Figures show that as a whole, the CGIAR spends about US \$24 million each year on biotechnology. This amount is still very small compared with the biotechnology investments of the commercial sector. Still, it is a clear signal that public-sector national and international agricultural research organizations are deepening their involvement in proprietary technologies. These expenditures may reinforce the need to rethink IPR policies to ensure that the fruits of the centers’ research remain freely available for developing countries.

Among the study’s seven recommendations was that the CGIAR develop its expertise on and encourage awareness of IPR issues. A central “expert facility,” perhaps, could be established that would help keep centers abreast of changes occurring in national IPR positions. The findings also emphasized the urgent need for consistent, systemwide legal advice. The legal complexity of proprietary technologies gives rise to many issues that the CGIAR must be fully prepared to deal with.

Back to Uganda

ISNAR’s work in biotechnology policy, organization, and management repeatedly shows the importance of establishing a national capacity in developing countries to understand and analyze the issues that this emerging technology presents. “Given the pace of world developments, a degree of self-reliance is essential,” says Cohen. In questions like the patent issues facing Uganda, the programming decisions that Chile is poised to make, and the biosafety organizational issues in the Philippines, there is a sense of urgency as well.

Whether or not Uganda does, in the end, award patent protection to the terminator gene will have

repercussions for future agricultural development. In a few years, seed incorporating the gene may well be available in Africa. But this seed will not reach farmers in countries that have not implemented a means to protect and enforce the rights of patent holders.

This puts decision makers in the position of weighing technology’s new options for their farmers against the value of current farming practices, perhaps including reliance on saved seed. In such assessments, a strong analytical capacity within the national agricultural research organization is essential.

ISNAR Activities in 1998



Country	Activity	Donors/ collaborators
Asia and South Pacific		
China, India, Malaysia, Sri Lanka, Iran	New technologies: conducted two-week training course on managing biotechnology for participants from the region (<i>see also box, page 9</i>)	DGIS / NEDA, Government of Japan (ODA), SDC, CAAS, IRRI
Indonesia, Philippines, Thailand, Vietnam, India	New technologies: conducted regional workshop on information management for agricultural research, second in series under the ISNAR project, <i>New Technologies for Agricultural Research</i> ; workshop focused on practical issues in IM/IT, such as major options for NARS in next 5 to 10 years and organizational and resource implications of different choices	DGIS / NEDA, Government of Japan (ODA), SDC, AIT
Kenya, Indonesia	Participatory research: continued building ISNAR's knowledge base on participatory approaches to agricultural research through evaluation of two types of participatory research: farmer field schools in Kenya and action research facilities in Indonesia; framework presented at international symposium of Association for Farming Systems Research and Extension—South Africa and published as a discussion paper	CGIAR System-wide Program on Participatory Research and Gender Analysis
China	Information strategy for China: undertook planning mission to Chinese NARS; produced plan and budget for development exercise on information management/information technology	CAAS, CABI
Indonesia	IBS: surveyed resources available to build national capacity for agricultural biotechnology (<i>see also box, page 10</i>)	DGIS / NEDA, SDC
Eastern Europe/Former Soviet Union		
Central Asia and Caucasus	Strengthening NARS in transitional economies: continued working in CGIAR Collaborative Research Program for Central Asia and the Caucasus: • organized and conducted expert consultation on agricultural research policy, organization, and management in Central Asia and the Caucasus • with support from IFAD, began developing profiles of research in several countries in the region • made progress in analyzing the process and options for organizational change in emerging market economies, assisting selected countries in developing detailed responses to implementing reforms in policy, organization, and management	World Bank, UAAS, IFAD
Croatia	Training: conducted skill-building workshop on research program formulation and priority setting; assisted in planning a regional pilot program for 1999	
Georgia	Strengthening NARS: assisted Georgia's Ministry of Agriculture and Academy of Agrarian Sciences in preparing for reorganization	World Bank, IFAD

ISNAR's ability to respond to requests with targeted funding depends on the base created by the generous support of its unrestricted core donors

Ukraine	Strengthening NARS: continued collaboration with Ukraine following December 1997 review of the Ukrainian Academy of Agricultural Sciences (UAAS); developed workplan for restructuring UAAS with support of a World Bank IDF grant	World Bank, IFAD, UAAS
Latin America/Caribbean		
	Agricultural science and technology indicators: began survey of investments in Caribbean with CARDI and CEDAF	CARDI, CEDAF
	Benchmarking studies: completed study of four cases of “best management practices” with publication of two briefing papers: one based on case study in Costa Rica and one based on Uruguay	
	Capacity building: organized workshop at CGIAR Secretariat on assessing the impact of capacity building, representatives of NAROs in region, TAC, the CGIAR Impact Assessment and Evaluation Group, IDB, IDRC, and ISNAR’s PM&E project team	IDB, IDRC, CGIAR, TAC
	Institutional assessment: organized two special sessions on organizational and institutional assessment at European Evaluation Society	EES
	ISNAR/IICA strategic alliance: formal agreement to collaborate and carry out complementary activities in the region was advanced in a meeting on technical cooperation for the management of technological innovation and institutional issues in R&D in agriculture	IICA, PROCIs, CATIE
	Supporting regional collaboration: helped create regional focal point at CARDI for PROCICARIBE to (1) link Caribbean NARS with IARCs and (2) strengthen CARDI and UWI as essential linkages for partnerships among individual NARS	CARDI, PROCICARIBE, UWI
Argentina, Brazil, Chile, Colombia, Mexico, Venezuela	Agroindustry and natural resource management: conceptual framework for NARS / IDB / ISNAR project on new technological demands published in Spanish and English; conducted two training workshops; completed six country reports and two training modules on analytical approach to diagnosing and improving the responsiveness of research to new technological demands	DGIS / NEDA, CTA, ANPEI, Colciencias, CORPOICA, DANE, DNP, EMBRAPA, FINEP, IBGE, IICA, MC&T
Brazil, Chile, Colombia, Costa Rica, Mexico	IBS: surveyed use of proprietary inputs in biotechnology research in selected Latin American NARS	DGIS / NEDA, SDC
Cuba, Panama, Venezuela	PM&E: pilot cases on planning, monitoring, and evaluation carried out in three missions to each country; the first missions involved technical support for final steps of institutionalizing integrated PM&E systems in each country; the second involved support for internal self-assessments to document lessons and experiences associated with collaboration in the project; the third documented experiences and compiled lessons learned	IDB, IDRC, SDC, MINAG, FONAIAP, IDIAP
Panama, Nicaragua, El Salvador, Costa Rica	Supporting regional collaboration: provided comprehensive support to establishing and managing SICTA; supported 5th meeting of SICTA’s board in Nicaragua; conducted workshop on assessing training needs for SICTA members	DGIS / NEDA, CENTA, IDIAP, MAG, INTA
Chile	Priority setting in biotechnology: in collaboration with INIA (Chile) and ZIL (Switzerland), continued development of an analytic hierarchy approach to priority setting that takes account of the special characteristics of biotechnology	ZIL, INIA, ETH
Mexico	Strengthening capacity for biotechnology: surveyed resources available to build national capacity for agricultural biotechnology (<i>see also box, page 10</i>)	DGIS / NEDA, SDC

Unrestricted Core Donors

Australia	Canada	European Union	India	Japan	Norway	Spain	United Kingdom
Belgium	China	France	Iran	Mexico	Philippines	Sweden	United States
Brazil	Denmark	Germany	Italy	Netherlands	South Africa	Switzerland	World Bank



Sub-Saharan Africa		
	Africa overview study: analyzed long-term trends in investments in agricultural research and development; documented findings in three discussion papers	SPAAR, DANIDA, USAID
	IARC-NARS training group: fulfilled ISNAR's commitment to developing competitive and self-supporting training programs in the region; national trainers from Swaziland, Nigeria, and Kenya trained 22 research program leaders in INTG's annual agricultural research management training program for sub-Saharan Africa; direct costs were financed by participants' fees	CIAT, CIP, CMRT-Egerton University, ICRISAT, IITA, WARDA, DART, ECABREN, KARI, NARO-Uganda, PRAPACE
	Biotechnology for African crops: Conducted study in 10 countries on biotechnology for African crops for Rockefeller Foundation: Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Nigeria, South Africa, Uganda (see also box, page 18)	DGIS / NEDA, Rockefeller Foundation, SDC
	Livestock development policies: in collaboration with CTA, completed and published results of 1997 seminar held in Swaziland on livestock development policies in Eastern and Southern Africa; prepared summary report of two CTA / OAU-IBAR regional seminars on livestock development policies in sub-Saharan Africa	CTA
	Role of universities in sub-Saharan African NARS: published proceedings of the synthesis workshop held in late 1997 in French and English; began synthesis of lessons learned and a how-to manual for research managers to help enhance the contribution of universities in their NARS	CTA, DSE
	Strengthening regional organizations: provided technical support to CORAF consultant in charge of developing CORAF's strategic plan	CORAF
Kenya, Indonesia	Participatory research: continued building ISNAR's knowledge base on participatory approaches to agricultural research through evaluation of two types of participatory research: farmer field schools in Kenya and action research facilities in Indonesia; framework presented at international symposium of Association for Farming Systems Research and Extension—South Africa and published as a discussion paper	CGIAR System-wide Program on Participatory Research and Gender Analysis
Cameroon	Biotechnology: assisted in developing a program for a workshop organized by Cameroon's Ministry of Forests, National Biosafety Focal point; managed USAID funds for the workshop on behalf of the Government of Cameroon	USAID, DGIS / NEDA, Government of Japan (ODA), ZIL
Guinea	Medium-term plan: assisted IRAG in sharpening the focus of their agricultural research by introducing an integrated planning, budgeting, monitoring, and evaluation system based on methodology jointly developed by IRAG, INRA-Morocco, and ISNAR	IRAG
Kenya	Building capacity for agricultural biotechnology: surveyed resources available to build national capacity for agricultural biotechnology (see also box, page 10)	DGIS / NEDA, Government of Japan (ODA), ZIL
Kenya	Planning and priority setting: in collaboration with KARI, copublished <i>Research Priority Setting: Information Investments for the Improved Use of Research Resources</i> ; written by KARI and ISNAR staff based at KARI, documenting advances in processes and tools for priority setting that took place over several years of KARI-ISNAR collaboration (see also box, page 31)	KARI

Many of ISNAR's core donors also provide targeted contributions

Kenya	Priority setting for livestock research: continued development of priority-setting model for livestock research in association with Humboldt University, Berlin	Humboldt University, Berlin
Kenya	Training master plan: developed five-year plan for strengthening coordination and financing of training at KARI based on the 1996–97 assessment of training needs and organizational constraints	EU, KARI
Kenya	Transforming agricultural research systems: report on past and present work done in Kenya, including evaluation of the Kenyan NARS and other PM&E activities, to be published in forthcoming book, <i>Transforming the Agricultural Research System in Kenya: Lessons for Africa</i>	Rockefeller Foundation
Nigeria	Research policy: completed and published study on instability of NARS in sub-Saharan Africa, based on the experience of Nigeria; provides basis for methodological development and input to future policy dialogues	
Uganda	Strengthening research management: continued institutional development with (1) evaluating organizational performance, (2) assessing staff performance, (3) assessing performance of the DG and DDG, and (4) preparing a phase II research and training project	NARO, Uganda, World Bank
West Asia/North Africa		
	Assessment of management needs and performance: supported and participated in a workshop with AOAD and ICARDA on needs assessment and capacity building for NARS leaders from 13 countries in the region	AOAD, ICARDA
Cyprus	Institutional development: assisted ARI in assessment of the institute's performance; ARI staff identified strengths and weaknesses in terms of output, productivity, and performance in key areas of management	ARI, Cyprus
Iran	Strengthening research management: provided technical support in activities including development of an information strategy, training in rapid rural appraisal, and research program planning	Iran, AREEO
Palestine	National review and planning: assisted in a review and planning exercise for the Palestinian NARS in collaboration with local teams; approach to be institutionalized by strengthening the capacity of the local team	UNDP, Palestine National Authority
Global		
	Agricultural science and technology indicators: contributed two articles on agricultural research policy to a special issue of <i>World Development</i> ; published discussion paper on public and private-sector investment	
	Assistance to NARS Secretariat: seconded a senior adviser to assist in establishing and managing the steering committee for the NARS Secretariat of the Global Forum on Agricultural Research in Rome, aimed to achieve a stronger voice at regional levels for NARS and a stronger focus for their collective voice in the CGIAR and the Global Forum	FAO, IFAD
	CSI and poverty mapping: participated in start-up workshop of CGIAR Consortium for Spatial Information for Agricultural Research (CSI) and the CGIAR initiative on poverty mapping	UNEP/GRID
	Distance training: held preliminary workshop to review objectives of the distance training project and to identify potential contributions of partners; project will evaluate the effectiveness of distance education in training front-line researchers to more effectively address the problems of resource-poor farmers in agricultural research programs	DFID, COL, NAARM, Wye College
	Ecoregional fund workshop: hosted review workshop under the Fund for Support to Ecoregional Research to synthesize methodological developments to date and to help researchers develop new proposals for submission to the fund	Fund for Methodological Support to Ecoregional programs

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Belgium	China	France	Iran	Mexico	Philippines	Sweden	United States
Brazil	Denmark	Germany	Italy	Netherlands	South Africa	Switzerland	World Bank



	Finance sourcebook: Published <i>Financing Agricultural Research: A Sourcebook</i> , a 360-page collection of commissioned papers offering both conceptual and practical guidance on policy, fiscal, structural, and management issues in financing and managing research (<i>see also box, page 29</i>)	
	Gender: Hosted intercenter consultation for the CGIAR Gender Staffing Program	CGIAR
	Globalization: recruited a senior research officer to lead in this area, starting January 1999; added an associate expert to concentrate in this area; developed conceptual framework for research in globalization; began work on a comprehensive literature review; designed survey of selected NARS; began preparations for expert consultation to be held in 1999	
	Governance: highlighted issues in governance in literature review and published comparison of different schools of thought in discussion paper	
	IBS: • synthesized and published findings of four regional policy seminars on biotechnology held between September 1994 and October 1996; published as ISNAR Briefing Paper No. 38 • surveyed the use of proprietary materials and inputs in work of IARCs; published results as ISNAR Briefing Paper No. 39 (<i>see also box, page 21</i>) • continued work on a sourcebook for managers responsible for agricultural biotechnology programs in developing countries, to be published by CAB International as part of its biotechnology series (<i>see also box, page 14</i>)	DGIS / NEDA, SDC
	Impact assessment: contributed to CGIAR Impact Assessment and Evaluation Group study on methods of evaluating collaborative projects between IARCs and NARS in region	DANIDA, ACIAR, SDC, IDRC, DGIS / NEDA, IFAD, CGIAR
	Information management: continued work on a handbook on managing information for NARS information specialists and research managers	
	Institutional performance assessment and governance: senior officer outposted to India • to assist NAARM in strengthening its research and training programs to enhance its capacity to serve the Indian NARS and those of the region • to provide overall coordination to ISNAR-ICAR activities in India	ICAR, NAARM
	Internet development: • AROW: refined the directory of agricultural research organizations on the Web; with hyperlinks to over 1,000 agricultural research organizations and institutes with Internet sites, it is now the most comprehensive listing of agricultural research-related homepages in the world	
	• <i>Discussion fora:</i> completed and assessed the first phase in developing electronic information and discussion fora on priority setting and management of biotechnology research in agriculture; to be expanded with more topics in 1999 (<i>see also box, page 13</i>)	

Unrestricted core support enables ISNAR
to deploy resources to meet CGIAR goals, priorities, and strategies

	ISNAR Global Associates: laid groundwork for a decentralized unit—headquarters to be hosted at IICA in Costa Rica—to coordinate a network of resource persons located throughout the world and able to respond to requests for assistance from developing countries rapidly using ISNAR-supported approaches and tools (<i>see also box, page 5</i>)	IICA
	Library development: moved ISNAR's library database from CDS/ISIS to MINISIS for Windows; began development of an interface for the World Wide Web so that partners and collaborators can access ISNAR's library resources	IDRC
	New partnerships: prepared, participated in, and documented joint workshop with GTZ and NARS representatives on new partnerships for agricultural innovations	GTZ
	Planning agricultural research: continued work on <i>Planning Agricultural Research: A Sourcebook</i> , to be published by CAB International in 1999	
	Policy and natural-resource management: published report of a workshop and commissioned papers analyzing cases where results of technical research have been convincing enough to change national policies	ECDPM
	Special journal issue on evaluation: prepared special issue of <i>Knowledge, Technology and Policy</i> on evaluation in developing countries	
	Training modules on research management: continued developing new training modules; converted 10 more modules to electronic format for posting on ISNAR's Internet site	

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ISNAR Publications and Other Documents

Most ISNAR publications are published both on paper and in electronic format. The electronic versions are accessible via ISNAR's Web site at www.cgiar.org/isnar and can be downloaded at no charge.

Corporate and General Publications

Annual report 1997

Medium-term plan 1999–2001

ISNAR's achievements, impacts, and constraints: An assessment of organizational performance and institutional impact, by R. Mackay, S. Debela, T. Smutylo, J. Borges-Andrade, and C. Lusthaus

New technological demands: The methodological framework for an INIAs/BID/ISNAR project

Books

Financing agricultural research: A sourcebook, edited by S.R. Tabor, W. Janssen, and H. Bruneau
Contributors: G. Alex, H.M. Baur, H. Bruneau, E.G. Brush, D. Byerlee, J.I. Cohen, S. Crespi, B. Dhar, R.G. Echeverría, H. Elliott, T. Eponou, S. Fan, M. Fuchs-Carsch, W. Janssen, J. McIntire, H.M. Mule, P.G. Pardey, C.E. Pray, J. Roseboom, S.R. Tabor, H. Tollini, E.J. Trigo

Agricultural research priority setting: Information investments for improved use of research resources, edited by B. Mills
Contributors: P. Audi, B. Mills, M. Kamau, D. Kilanbya, J. Lynam, A. Mbabu, V. Muniy, P. Mwangi, S. Nandwa, S.W. Omamo, L.M. Ragwa, S. Wood

Science under scarcity: Principles and practice for agricultural research evaluation and priority setting, by J.M. Alston, G.W. Norton, and P.G. Pardey.
Wallingford, UK: CAB International (originally published in hardback by Cornell University Press, Ithaca, NY, in 1995)

Briefing Papers

No. 35S. Estudio de caso gerencial exitoso. Una asociación con los productores para una investigación participativa: El caso del CENTA en El Salvador. By S.H. Hobbs, J.F. Larios, F.R. Arias Milla, and J.E. Vides

No. 37. Benchmark study. The creation of a coordinated national agricultural research system: The case of Costa Rica. By S.H. Hobbs, F. Mojica Bentancour, O. Bonilla Bolaños, and E. Solís

No. 38. Strategic decisions for agricultural biotechnology: Synthesis of four policy seminars. By J.I. Cohen, C. Falconi, and J. Komen

No. 39. Proprietary biotechnology inputs and international agricultural research. By J.I. Cohen, C. Falconi, J. Komen, and M. Blakeney

No. 40. Benchmark study. The agricultural technology development fund for contract research: An INIA (Uruguay) initiative. By S.H. Hobbs, C. Valverde, E. Indarte, and B. Lanfranco

No. 40S. Estudio de caso gerencial exitoso. El Fondo para contratar investigación para la promoción de tecnología agropecuaria: Una iniciativa del INIA (Uruguay). By S.H. Hobbs, C. Valverde, E. Indarte, and B. Lanfranco

Research Reports

No. 13. Instability of national agricultural research systems in sub-Saharan Africa: Lessons from Nigeria. By F.S. Idachaba

Research Management Guidelines

No. 5. Ten tools for managing change in national agricultural research organizations. By S.H. Hobbs

Reports of Meetings

Highlights of a workshop. Strengthening the role of universities in the national agricultural research systems in sub-Saharan Africa. Cotonou, Benin, 17–21 November 1997. Edited by H. Michelsen and D. Shapiro

Points forts d'un atelier de travail. Renforcement du rôle des universités au sein des systèmes nationaux de recherche agricole d'Afrique subsaharienne. Cotonou, Bénin, 17–21 novembre 1997. Edited by H. Michelsen and D. Shapiro

External Publications by ISNAR Staff Members

These titles do not include papers presented at meetings unless they are part of published proceedings.

Allmand, M. Networking civil society in Latin America. In *Civil society and international development*, by A. Bernard, H. Helmich, and P.B. Lehning. Paris: Organisation for Economic Co-operation and Development

Alston, J.M., P.G. Pardey, and J. Roseboom. Financing agricultural re-

search: International investment patterns and policy perspectives. *World Development* 26 (6): 1057–1071

Batz, F.J., K.J. Peters, and **W. Janssen**. Adoptionsstudien als Orientierungshilfe für die landwirtschaftliche Beratung. Ein Fallbeispiel aus dem Bereich des Technologietransfers in der kenianischen Milcherzeugung. In *Technischer Fortschritt im Spannungsfeld von Ernährungssicherung und Ressourcenschutz*. Tagungsband zum Tropentag 1997, edited by T. Loop, M. van de Sand, and J. Greiling. Stuttgart: University of Hohenheim

Bie, S.W. China and ISNAR. In *China and CGIAR: Proceedings of the China-CGIAR forum*, edited by **Y. Yan** and W. Wightman. Beijing: China Agricultural Sciencetech Press

Bie, S.W. Food supplies for the global poor by the global rich—Is this a solution? In *The role of free market or market interventions in the agricultural policy*. Lectures held at the seminar of the 50th anniversary of NILF and BFI, January 21, 1998. Edited by H. Romarheim and A. Haglerød. Oslo: Norsk institutt for landbruksøkonomisk forskning

Bie, S.W. Rettigheter til land og sikring av disse rettighetene—en utfordring for utviklingslandene? *Kart og Plan* Vol. 57: 135–139

Bie, S.W. The missing scientific links to plan sustainable land management at farm level—past and future. Address to the Congress on Geo-Information for Sustainable Land Management. Special congress issue of the International Journal of Aerospace Survey and Earth Sciences. *ITC Journal* 1997-3 / 4: 284–286

Bie, S.W. Keynote address to the inaugural technical session. In *Agriculture in the Caribbean: Issues and challenges (UWI Ag. 50)*. Proceedings of UWI Ag 50, August 19–21 1998. Vol. 1: 28–32. St. Augustine, Trinidad and Tobago: University of West Indies, Faculty of Agriculture and Natural Sciences, CEPAT

Braunschweig, T. and N. Gotsch. Cocoa biotechnology research and issues in competitiveness: Guidelines for assessing potential economic impact. A study prepared for ISNAR. Schriften des Zentrums für regionale Entwicklungsforschung der Justus-Liebig-Universität Gießen. Hamburg: LIT Verlag

Cohen, J. Making a difference: Considering beneficiaries and sustainability while undertaking research in biotech-

New Book

Policy, planning, and management are keys to increasing research funding ■



ational agricultural research systems may be able to increase or stabilize their funding base by implementing a mixture of better research policies, entrepreneurial planning and resource mobilization, and improvements in financial management, according to ISNAR's "sourcebook" on financing agricultural research published in 1998. The sourcebook is the result of a year-long project to bring into focus the funding problems currently facing developing-country agricultural research systems.

Particularly worrying is the fact that financial shortfalls in agricultural research are emerging at a time when food security, poverty, and concerns about the environment pose greater challenges than ever before. The finance sourcebook helps research leaders address the problems of research funding. It brings together an assessment of the current financing situation with a review of available policy options. It also presents strategies for improving resource mobilization and ways to enhance financial management. Interested readers can access and download the electronic edition of the book via ISNAR's Internet site at www.cgiar.org/isnar.

Content **Part Finance Policy for Agricultural Research** Towards an appropriate level of agricultural research finance (S.R. Tabor). Capital investment policies and agricultural research (H. Tollini). Recurrent-operating cost policies and agricultural research (S.R. Tabor). Remuneration policy (E.G. Brush). Coping with fiscal stress in developing-country agricultural research (J. McIntire). Towards more effective use of external assistance in building agricultural research systems (D. Byerlee and G. Alex). Financing agricultural research: Do organization and structure make a difference? (H. Elliott). **Part Resource Mobilization and Accountability** Alternative funding mechanisms: How changes in the public sector affect agricultural research (W. Janssen). Four strategies for protecting public research funding (H.M. Baur and H.M. Mule). How to mobilize donor funds (M. Fuchs-Carsch). Private funding for public research (C.E. Pray). Should I seek legal protection for my research results? (J.I. Cohen, S. Crespi, and B. Dhar). Financing research through regional cooperation (T. Eponou). **Part Financial Management** Principles and practices of good financial management (H. Bruneau). **Part Trends in Agricultural Research Funding** Trends in financing African agricultural research (P.G. Pardey and J. Roseboom). Financing agricultural research in Latin America (R.G. Echeverría, E.J. Trigo, and D. Byerlee). Trends in financing Asian and Australian agricultural research (P.G. Pardey, J. Roseboom, and S. Fan).

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Mackay, R., D. Horton, and S. Debel. Accounting for organizational results: An evaluation of the International Service for National Agricultural Research. *Canadian Journal of Development Studies* Special Issue XVIII: 711–734

Mills, B., R.M. Hassan, and P. Mwangi. Estimating potential benefits from research and setting research priorities for maize in Kenya. In *Maize technology development and transfer: A GIS application for research planning in Kenya*, edited by R.M. Hassan. Wallingford, UK: CAB International

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Perry, M.C. and **P. O’Nolan.** Bâtir un réseau d’information mondial pour la recherche agricole et rurale : le système SINGER. *Agriculture & Rural Development* 5(1): 40–44

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

Stichele, P. van der, and **S.W. Bie.** How can farmers take advantage of new media: The last mile? *Agriculture & Rural Development* 5(1): 29–31.

Stichele, P. van der, and **S.W. Bie.** How can farmers take advantage of new media: The last mile? *Entwicklung & Ländlicher Raum* 31-2-97:7–9

Stichele, P. van der, and **S.W. Bie.** Comment les agriculteurs peuvent-ils tirer parti des nouveaux médias : la « dernière étape ». *Agriculture & développement rural* 5(1): 31–34

Tabor, S.R. and D.C. Faber (Eds.). Closing the loop: From research on natural resources to policy change.

ECDPM Policy Management Report No. 8. Maastricht: European Centre for Development Policy Management
Other ISNAR contributors:
M. Loevinsohn, G. Meijerink, S.W. Omamo, H. Tollini

Waithaka, M. Integration of a user perspective in research priority setting: The case of dairy technology adoption in Meru, Kenya. Kommunikation und Beratung No. 22. Weikersheim, Germany: Margraf Verlag [Part of ISNAR/HUB/KARI collaborative project]

Wood, S. and P.G. Pardey. Agroecological dimensions of evaluating and prioritizing research from a regional perspective. In *Priorities for agricultural research in Latin America and the Caribbean*, edited by E. Lindarte. San Jose, Costa Rica: Inter-American Institute for Cooperation on Agriculture [Part of ISNAR’s collaboration in the project “Priorities for Agricultural Research in Latin America and the Caribbean”]

Discussion Papers

Discussion papers are preliminary reports of work in progress at ISNAR. They are neither edited nor formally reviewed, and their circulation is limited.

DP 98–1. A cumulative indicator for measuring agricultural research performance: Accumulating performance measures of agricultural R&D operations in a developing country. By F. Hartwich

DP 98–2. Assessing the institutional impact of development cooperation: A case from agricultural R&D. By D. Horton and R. Mackay

DP 98–3. ISNAR’s achievements, impacts and constraints 1991–1996. By R. Mackay, S. Debel, T. Smutylo, and J. Borges

DP 98–4. Accounting for organizational results: An evaluation of the International Service for National Agricultural Research. By R. Mackay, D. Horton, and S. Debel

DP 98–5. Evaluation of agricultural research in Latin America and the Caribbean. By J. Borges-Andrade and D. Horton

DP 98–6. Educating agricultural researchers: A review of the role of African universities. By N.M. Beintema, P.G. Pardey, and J. Roseboom

DP 98–7. Assessing the organizational impact of development cooperation: A case from agricultural R&D. By D. Horton and R. Mackay

DP 98–8. Instituciones sostenibles para el desarrollo sostenible: El caso del

Partnership

Book showcases priority-setting in Kenyan agricultural research



ISNAR concluded an important strand of its priority-setting work in 1998 by publishing, in collaboration with the Kenya Agricultural Research Institute (KARI), a book with both practical and theoretical information on how to set program-level priorities in agricultural research institutes. The book is called *Agricultural research priority setting: a practical guide for agricultural research institutes*.

It is unique in a number of respects. First, each chapter concludes with a set of practical exercises that lead readers through specific steps in organizing priority setting or collecting and analyzing data. Some of the exercises use the example spreadsheets included on a computer diskette accompanying the book. The exercises and spreadsheets give readers hands-on experience in doing some of the calculations, letting them put their analytical skills to the test. Second, it has a strong focus on issues of information collection and analysis, including how to extract useful information from geographical information systems (GIS) and how to estimate the accuracy of available data.

The book is based on experience gained by editor Bradford Mills and 12 contributing authors at KARI in the context of a Rockefeller-supported project. The authors address the practical issues that they saw managers facing in the design of procedures for agricultural research priority setting. Similarly, they provide concrete advice for socioeconomists and others who implement or facilitate priority-setting processes. This includes the role and placement of socioeconomists in organizations conducting program-level priority setting. Examples from KARI illustrate every step of the methods and issues discussed.

Content The role of and levels for agricultural research priority setting (B. Mills and A. Mbabu). Research objectives and priority-setting criteria (B. Mills and S.W. Omamo). Spatial targeting of program research (B. Mills, D. Kilanbya, and S. Wood). Translating farmer constraints into research themes (P. Audi and B. Mills). Methods for prioritizing research options (B. Mills and M. Kamau). Data requirements for agricultural research priority setting (B. Mills, V. Munyi, and P. Mwangi). Information and human resource investments for research priority setting (A. Mbabu, B. Mills, and J. Lynam). Technology, location, and trade: Kenyan vegetables (M. Kamau and B. Mills). Beyond economic benefits: Sorghum in Kenya (B. Mills and L. M'Ragwa). Priority setting in a production-factor research program (D. Kilanbya, S. Nandwa, and S.W. Omamo).

SINCITA de Cuba. By M.A.M Bode, A.M. Boza, and J. de Souza Silva

DP 98-9. Agricultural biotechnology research indicators: Kenya. By J. Wafula and C. Falconi

DP 98-10. Experiences with research planning, monitoring and evaluation in Kenya. By N. Mbabu and D. Horton

DP 98-11. Agricultural research policy in a changing context: Institutional change at the Panamanian Agricultural Research Institute. By G. Middendorf and L. Busch

DP 98-13. Developing integrated pest management with Kenyan farmers: Evaluation of a pilot project. By M.E. Loevinsohn, G. Meijerink, and B. Salasya

DP 98-14. Practicing evolution: Theory for understanding and evaluating participatory research. By M.E. Loevinsohn

DP 98-15. Expert consultation on agricultural research systems in Central Asia and the Caucasus, June 3-5, 1998, The Hague, The Netherlands. By H. Elliott

DP 98-16. Will competitive funding improve the performance of agricultural research? By R.G. Echeverría

DP 98-17. The changing organizational basis of African agricultural research. By J. Roseboom, P.G. Pardey, and N.M. Beintema

DP 98-18. Country profile: Agricultural research in the Republic of Georgia. By M. Boyd

DP 98-19. Building capacity in planning, monitoring and evaluation: Lessons from the field. By D. Horton

DP 98-20. Agricultural biotechnology research indicators: Mexico. By M. Qaim and C. Falconi

Other Unofficial Publications

This section lists publications produced for specific ISNAR projects or activities. Like Discussion Papers, they have not been formally peer reviewed and their circulation is limited.

KARI training master plan 1997/98-2001/02. Kenya Agricultural Research Institute and ISNAR

Nuevas demandas tecnológicas: Marco metodológico de un proyecto INIAs/BID/ISNAR

Proceedings of the methodological research at the ecoregional level review workshop held at ISNAR, The Hague, April 20-22 1998

Assessing methods for ecologically-oriented research. By M. Loevinsohn

Renforcement du rôle des universités et grandes écoles au sein du système national de recherche agricole de la

Burkina Faso: Rapport analytique. By Z.I. Kaboré and J.D. Zongo, in collaboration with ISNAR

Renforcement du rôle des universités et grandes écoles au sein du système national de recherche agricole de la Côte d'Ivoire: Recommandations et plans d'action. Le Ministère de l'enseignement supérieur, de la recherche et de l'innovation technologique; rapport réalisé en collaboration avec l'ISNAR

Strengthening the role of Makerere University in the national agricultural research system of Uganda. By G. Kiwuwa and M. Nabasirye, in collaboration with ISNAR



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* Joined ISNAR in 1998.
 ** Left ISNAR in 1998.
 *** Joined and left ISNAR in 1998.



Financial Report for 1998

ISNAR closed its 1998 accounts with a deficit of US \$550,000. Unrestricted grants, which amounted to almost 70 percent of ISNAR's total revenue in 1998, continue to be the mainstay of ISNAR's funding. Their importance cannot be overstated. Continuing solid support from these donors, who are listed in the bar graph on page 37, is essential for ISNAR. They allow us to fulfill our mandate and ensure some continuity in our work in the developing world. In 1998, ISNAR was encouraged by increases in unrestricted support from Belgium, Norway, and South Africa. It also welcomed one new donor, Mexico. Unrestricted grant revenue, nonetheless, decreased from \$6.9 million in 1997 to \$6.5 million in 1998.

Targeted support, in the form of restricted grants and complementary projects, also made a significant contribution to ISNAR resources during the year. In 1998, these totaled \$2.6 million. Thanks are due to many supporters here, and they are listed on the following pages.

The financial statements that follow were prepared in association with the independent accounting firm, Deloitte and Touche. A complete financial report is available from ISNAR upon request.



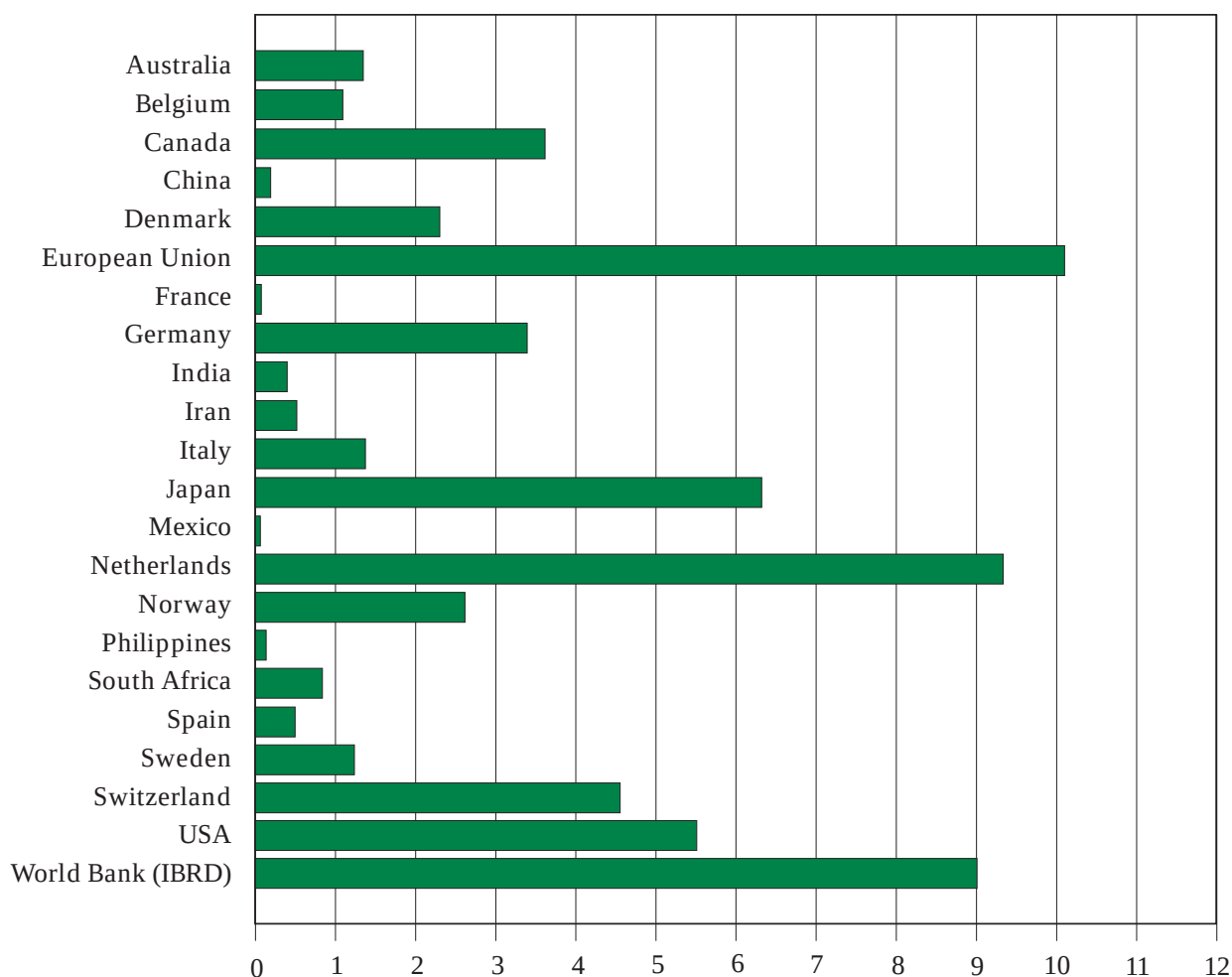
Statement of Activity

	US \$000's				
Revenue	Core Unrestricted	Core Restricted	Complementary	Total 1998	Prior Year
Grants	6,495	568	1,958	9,021	9,882
Other Revenues	337			337	281
Total Revenue	6,832	568	1,958	9,358	10,163
Operating Expenses					
Policy and System Development Program	1,564	250	1,056	2,870	2,934
Management Program	1,922	318	464	2,704	2,598
Collaborative Services and Training	294		56	350	253
Information Services	1,060		60	1,120	1,155
Management and Administration	2,543		322	2,865	3,447
Total Operating Expenses	7,383	568	1,958	9,909	10,387
Shortfall over Expenditure	(551)	-	-	(551)	(224)
Allocated as follows:					
Capital Fund					
Operating fund	(551)			(551)	(224)
Total Allocation	(551)	-	-	(551)	(224)
Operating Expenses by Cost Category					
Personnel Costs	5,217	176	711	6,104	5,926
Supplies and Services	1,731	292	877	2,900	3,426
Operational Travel	297	100	370	767	890
Depreciation of Fixed Assets	138			138	145
Total Operating Costs	7,383	568	1,958	9,909	10,387

1. Until July 31, ISNAR's work was organized into two client-oriented programs supported by four specialized service units. A reorganization that took effect in August replaced these programs and units with three new programs and the ISNAR Global Associates. These financial statements are based on the pre-reorganization structure, which was in place at the start of 1998.

Donors Supporting ISNAR's Program in 1998

Contributors of Unrestricted Grants (US \$100,000's)



Contributors of Restricted and Complementary Grants

Australia: Australian Centre for International Agricultural Research (ACIAR)

Benin: Institut National des Recherches Agricoles du Bénin (INRAB)

Canada: Canadian International Development Agency (CIDA)

Canada-Egypt McGill Agricultural Response Program (CEMARP)

Consultative Group on International Agricultural Research (CGIAR)

Croatia: Ministry of Agriculture and Forestry

Cyprus: Ministry of Agriculture, Natural Resources and the Environment

Denmark: Danish International Development Agency (Danida)

European Centre for Development Policy Management (ECDPM)

European Union (EU)

Food and Agriculture Organization of the United Nations (FAO)

Germany: Bundesministerium für Wirtschaftliche Zusammenarbeit (BMZ)

Germany: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

Germany: Deutsche Stiftung für Internationale Entwicklung (DSE)

Guinea: Institut de Recherche Agronomique de Guinée (IRAG)

Instituto Interamericano de Cooperación para la Agricultura (IICA)

Inter-American Development Bank (IDB)

International Development Research Centre (IDRC)

International Fund for Agricultural Development (IFAD)
Iran: Agricultural Research, Education, and Extension Organization (AREEO)
Japan: Japan International Research Center for Agricultural Sciences (JIRCAS)
Kenya: Kenya Agriculture Research Institute (KARI)
Natural Resources Institute—UK (NRI)
Netherlands Development Assistance (NEDA)
Palestine: Ministry of Agriculture
Raad van Advies van het Wetenschappelijk Onderzoek / Ontwikkelingssamenwerking (RAWOO)
Rockefeller Foundation
Spain: Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA)
Switzerland: Swiss Agency for Development and Cooperation (SDC)
Technical Centre for Agricultural and Rural Cooperation—ACP-EEC Lomé Convention (CTA)
Uganda: National Agricultural Research Organization (NARO)
United Kingdom: Department for International Development (DFID)
United Nations Development Programme (UNDP)
University of Arkansas
USA: United States Agency for International Development (USAID)
World Bank / International Bank for Reconstruction and Development (IBRD)
World Health Organization (WHO)

Abbreviations

ACIAR	Australian Centre for International Agricultural Research	GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit, Germany
AFSRE	Association for Farming Systems Research and Extension, South Africa	IARC	international agricultural research center (Fundação) Instituto Brasileiro de Geografia e Estatística (Brazilian census bureau)
AHP	analytical hierarchy process	IBGE	Intermediary Biotechnology Service
AIT	Asian Institute of Technology	IBS	Indian Council of Agricultural Research
ANPEI	Associação Nacional de Pesquisa e Desenvolvimento das Empresas Industriais, Brazil	ICAR	information and communications technology
AOAD	Arab Organization for Agricultural Development, Sudan	ICT	Inter-American Development Bank
AREEO	Agricultural Research, Education, and Extension Organization, Iran	IDB	Institutional Development Fund (World Bank Fund)
ARI	Agricultural Research Institute, Cyprus	IDF	Instituto de Investigaciones Agropecuarias de Panamá
AROW	Agricultural Research Organizations on the Web	IDIA	International Development Research Centre, Canada
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa	IDRC	International Fund for Agricultural Development
BRC/CAAS	Biotechnology Research Institute of CAAS	IFAD	ISNAR Global Associates Program
CAAS	Chinese Academy of Agricultural Sciences	IGA	Instituto Interamericano de Cooperación para la Agricultura, Costa Rica
CABI	CAB International—International Centre for Agriculture and Biosciences, UK	IICA	information management/information technology
CARDI	Caribbean Agricultural Research and Development Institute	IM/IT	Instituto Nacional de Investigaciones Agropecuarias
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica	INIA-Chile	Institut National des Recherches Agricoles du Bénin
CDS/ISIS	Computerized Documentation System—Integrated Set for Information System	INRAB	Institut National de la Recherche Agronomique
CEDAF	Centro para el Desarrollo Agropecuario y Forestal, Dominican Republic	INRA-Morocco	Instituto Nacional de Tecnología Agropecuaria, Nicaragua
CENTA	Centra Nacional de Tecnología Agropecuaria y Forestal, El Salvador	INTA	IARC/NARS Training Group
CGIAR	Consultative Group on International Agricultural Research	INTG	intellectual property rights
CINVESTAV	Centro de Investigación y de Estudios Avanzados del IPN, Mexico	IPR	Institut de Recherche Agronomique de Guinée
CMRT-Egerton U	Crop Management Research Training Project, Project of the University of Egerton	IRAG	Indo-Swiss Collaboration in Biotechnology Project
COL	Commonwealth of Learning	ISCB	Japan International Research Center for Agricultural Sciences
COLCIENCIAS	El Instituto Francisco José de Caldas para el Desarrollo de la Ciencia y la Tecnología	JIRCAS	Kenya Agricultural Research Institute
CORAF	Conférence des Responsables de la Recherche Agronomique Africains	KARI	Ministerio de Agricultura y Ganadería, Costa Rica
CORPOICA	Corporación Colombiana de Investigación Agropecuaria	MAG	Ministério da Ciência e Tecnologia, Brazil
CSI	Consortium for Spatial Information for Agricultural Research	MC&T	Ministerio de Agricultura, Cuba
CTA	Technical Centre for Agricultural and Rural Cooperation (ACP-EEC Lomé Convention)	MINAG	material transfer agreement
DANE	Departamento Administrativo Nacional de Estadística, Colombia	MTA	National Academy of Agricultural Research Management, India
DANIDA	Danish International Development Agency	NAARM	national agricultural research organization
DART	Department of Agricultural Research and Training, Namibia	NARO	National Agricultural Research Organization, Uganda
DFID	Department for International Development, UK	NARO	national agricultural research system(s)
DGIS/NEDA	see <i>NEDA</i>	NARS	Netherlands Development Assistance (formerly DGIS: Directorate-General for International Cooperation)
DNP	Departamento Nacional de Planificación, Colombia	NEDA	nongovernmental organization
DSE	Deutsche Stiftung für Internationale Entwicklung (German Foundation for International Development)	NGO	Organisation for African Unity / Interafrican Bureau for Animal Resources
ECABREN	Eastern and Central African Bean Research Network	OAU-IBAR	Official Development Assistance, Ministry of Foreign Affairs, Japan
ECDPM	European Centre for Development Policy Management	ODA	planning, monitoring, and evaluation
EES	European Evaluation Situation	PM&E	Programme Régional d'Amélioration de la Pomme de Terre et de la Patate Douce en Afrique Centrale et de l'Est/Regional Potato and Sweetpotato Improvement Program in Eastern and Central Africa
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária (Brazilian Agricultural Research Corporation)	PRAPACE	Program for Cooperation in Agricultural Science and Technology in the Caribbean
ETH	Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology)	PROCICARIBE	programas cooperativos de investigación y transferencia de tecnología agropecuaria
EU	European Union	PROCI	research and development
FAO	Food and Agriculture Organization of the United Nations	R&D	Raad van Advies van het Wetenschappelijk Onderzoek/Ontwikkelingssamenwerking, the Netherlands
FINEP	Financiadora de Estudos e Projectos, Brazil	RAWOO	Swiss Agency for Development and Cooperation
FONAIAP	Fondo Nacional de Investigaciones Agropecuarias, Venezuela	SDC	Sistema de Integración Centroamericano de Tecnología Agrícola
GATT	General Agreement on Tariffs and Trade	SICTA	Special Program for African Agricultural Research (World Bank)
GFAR	Global Forum on Agricultural Research (CGIAR initiative)	SPAAR	Technical Advisory Committee (CGIAR)
GMO	genetically modified organism	TAC	Ukrainian Academy of Agricultural Sciences
		UAAS	United Nations Development Programme
		UNDP	United Nations Environment Programme/Global Resource Information Database
		UNEP/GRID	United States Agency for International Development
		USAID	United States Department of Agriculture
		USDA	University of the West Indies, Trinidad and Tobago
		UWI	West Asia and North Africa
		WANA	Schweizerisches Zentrum für Internationale Landwirtschaft (Swiss Centre for International Agriculture)
		ZIL	

Pour une gestion raisonnée des biotechnologies dans le monde en développement

Quelques faits récents

En mars 1998, le gouvernement des États-Unis a délivré un brevet pour une innovation qui consiste à introduire dans le patrimoine génétique d'une plante, un gène qui l'empêchera de produire des graines fécondes. Les graines de la plante ainsi stérilisée ne pourront pas germer. L'ajout du gène en question, aujourd'hui communément appelé « gène terminateur », constitue une technique que l'on pourrait appliquer à une gamme de semences commerciales allant du riz au blé, et aux légumes. Or il se peut que les entreprises semencières commerciales soient les seules à pouvoir tirer profit de cette innovation. L'introduction du gène terminateur risque de mettre fin à la pratique agricole traditionnelle consistant à préserver une portion des graines récoltées pour les replanter à la saison suivante. En effet, les paysans se verront peut-être contraints de racheter chaque année de nouvelles semences. Et comme l'usage de garder des graines de semence est le plus répandu parmi les agriculteurs à faible revenu des pays en développement, la technique du gène stérilisant peut entraîner des conséquences démesurées pour cette partie du monde.

Les inventeurs du gène cherchent actuellement à faire valider le brevet dans environ 80 autres pays, dont plus de 40 sont parmi les moins développés du monde. Ces demandes de brevet, et les problématiques scientifiques et morales qu'elles suscitent, placent une fois de plus les biotechnologies au centre des débats sur les politiques et la gestion de la recherche agricole.

L'alimentation, l'environnement et les biotechnologies

Les « biotechnologies » constituent un ensemble puissant de techniques moléculaires dont se servent les scientifiques pour améliorer la constitution génétique de plantes et d'animaux — par exemple, pour rendre une culture plus robuste ou plus résistante à la sécheresse. Les faits présentés en introduction illustrent quelques aspects extrêmes du débat moral et scientifique que suscitent l'avènement des biotechnologies modernes et certaines de leurs utilisations en agriculture. Peu d'applications biotechnologiques sont exemptes de controverse. Néanmoins, la mise en pratique de ces techniques est souvent considérée comme étant l'amorce d'innovations agronomiques futures qui bénéficieront en particulier aux pays en développement. Même si les innovations scientifiques ne pourront pas, à elles seules, éliminer la faim et la pauvreté en ce monde, les biotechnologies fournissent des outils pour atténuer la pénurie alimentaire qui menace aujourd'hui des millions de personnes.

C'est pour cette raison que, depuis 1992, l'ISNAR dirige un programme de recherche et de service en matière de politiques, d'organisation et de gestion de la recherche biotechnologique. Au cours des six premières années de son existence, le Service de liaison en biotechnologie (SLB) a établi non seulement des partenariats bilatéraux avec des scientifiques et des responsables de la recherche biotechnologique dans plus de 25 pays en développement, mais aussi des associations multilatérales avec des groupements internationaux. L'équipe du SLB adopte une approche globale et centrée sur les personnes impliquées, dans ses analyses et dans les conseils qu'elle propose pour aider à relever les défis associés aux recherches en biotechnologie. Travaillant en étroite collaboration avec des partenaires en Afrique, en Asie, en Amérique latine et au Moyen-Orient, le SLB explore l'éventail complet des besoins des pays qui envisagent d'établir des programmes de recherche en biotechnologie.

Le point de mire de ce rapport annuel est le travail du SLB. La mise en valeur de certaines caractéristiques particulières des biotechnologies montre quelles influences peuvent agir sur l'aptitude des directeurs de recherche à prendre des décisions politiques et de programmation.

Une révolution scientifique

Les progrès scientifiques se succédant à un rythme accéléré, il incombe aux chercheurs et aux responsables de la recherche de se tenir au courant des derniers développements dans le domaine des biotechnologies. Or, plusieurs pays du monde en développement souffrent d'un manque chronique

Points saillants

Quelques activités de l'ISNAR relatives aux biotechnologies



Les résultats d'un sondage mené dans cinq pays en développement auprès des organisations de recherche publiques et privées s'intéressant aux questions de biotechnologie agricole ont révélé que l'effectif des chercheurs en biotechnologie n'a cessé d'augmenter. Mais cette croissance ne s'accompagne que rarement d'une augmentation parallèle et comparable des fonds opérationnels. Les ressources disponibles étant limitées, il serait bon de mieux définir les priorités de recherche relatives aux biotechnologies et de les intégrer fermement dans le programme global

de la recherche agricole.

2. Le forum de discussion électronique lancé sur Internet s'avère un moyen efficace pour faciliter les échanges entre les responsables de la recherche biotechnologique des pays en développement et promouvoir l'établissement de partenariats et de collaborations. Les lecteurs intéressés peuvent accéder au forum en passant par le site Internet de l'ISNAR ou bien en se rendant directement à <http://www.cgiar.org/isnar/fora/biotech/index.htm>

3. Tandis qu'une grande partie du débat international sur les questions de biotechnologie se concentre sur la formulation de cadres juridiques et de principes directeurs nationaux et internationaux, les recherches de l'ISNAR continuent à montrer que, dans les pays en développement, l'entrave au développement des biotechnologies la plus pressante se situe au niveau des ressources humaines. Une des tâches prioritaires de l'ISNAR en 1998 a donc été d'organiser des séminaires et des stages de formation pour permettre aux praticiens de développer leurs compétences.

4. À l'heure où les premiers produits d'interventions biotechnologiques commencent à émerger des laboratoires de recherche des pays industrialisés, la nécessité de veiller à la sécurité biologique devient une préoccupation mondiale de première importance. Le programme de recherche de l'ISNAR sur les questions de biosécurité comprend entre autres un projet de collaboration de deux ans pour évaluer les effets connus de plantes génétiquement modifiées qui ont été mises sur le marché dans les pays en développement. En même temps, l'ISNAR procède à l'évaluation des politiques et des procédures touchant à la biosécurité qui ont accompagné cette mise en circulation.

5. Les conseils et l'assistance que l'ISNAR fournit aux parties prenantes de la recherche agricole dans les pays développés et en développement lui permettent régulièrement de récolter les fruits de recherches entreprises dans le passé. Une des activités de service-conseil réalisées en 1998 pour le compte de la Fondation Rockefeller fut l'étude de cinq cultures africaines. L'objectif du projet était de déterminer quelles cultures présentaient les meilleures chances d'être améliorées suite à des interventions biotechnologiques. Le rapport de l'ISNAR a souligné que les propositions de projets soumises par des bailleurs de fonds doivent prévoir des composantes relatives aux politiques et à la gestion de la recherche, y compris des composantes se rapportant à la sécurité biologique.

d'information. Souvent, les chercheurs accèdent avec difficulté aux nouvelles données et aux documents qui assureront l'actualité et la qualité scientifique de leurs applications biotechniques. Leur travail est souvent rendu plus difficile encore par la diffusion fréquente d'informations qui exagèrent les avantages et les risques potentiels liés aux biotechnologies.

En outre, il s'avère que les qualités révolutionnaires attribuées aux biotechnologies modernes relèvent autant de la gestion que de la technique. Par exemple, pour effectuer des recherches en biotechnologie, il faut de plus en plus faire appel au travail en équipe et à des alliances pluri-institutionnelles. En raison de la complexité et des coûts élevés de ces recherches, aucune personne ou institution ne peut espérer avoir à sa disposition toutes les connaissances, qualifications professionnelles et ressources requises pour mener à bon terme un projet de recherche en biotechnologie.

Par ailleurs, la capacité potentielle des biotechnologies de résoudre des problèmes de production agricole et de contribuer à la protection de l'environnement dans les pays en développement fait encore l'objet de discussion. Les produits de la biotechnologie sont encore trop peu nombreux et trop peu

développés pour donner lieu à des données concrètes sur les résultats réels obtenus en exploitation agricole. En outre, il est probable que dans les régions les moins développées du monde, les accroissements de rendements peuvent être réalisés plus facilement et plus rapidement en appliquant des techniques existantes relativement simples, telle la lutte intégrée contre les ravageurs.

Il peut être extrêmement difficile d'estimer les coûts ou les avantages potentiels des recherches en biotechnologie, en raison de la nouveauté même de certaines des techniques. Les programmes de recherche biotechnologique aboutissent généralement à des résultats intermédiaires destinés à être utilisés dans des recherches ultérieures. Il est rare qu'ils donnent un produit final, une semence par exemple, qui sera directement vendable aux paysans. Par ailleurs, l'adoption des produits finaux par les paysans, et leur acceptation par les consommateurs, sont encore très incertaines.

Définir des priorités en dépit des difficultés...

Pour tenir compte de la complexité des biotechnologies, l'ISNAR et l'INIA, l'institut national chilien de recherche agricole, ont adapté une méthode existante pour définir les priorités d'un programme de recherche biotechnologique. La méthode de base utilisée fut le « procédé d'analyse hiérarchique », soit AHP (de l'anglais « Analytical hierarchy process »). Cette méthode peut servir de guide à une équipe chargée d'établir des priorités : elle consiste à décomposer un problème complexe en des éléments plus simples qui se prêtent mieux à une discussion entre spécialistes venant d'horizons différents.

L'adaptation de la méthode n'est certes pas encore achevée, mais les premiers résultats obtenus au Chili sont encourageants. Grâce à l'AHP, l'équipe chilienne a pu s'attaquer au problème de l'incertitude relative au potentiel des biotechnologies, en effectuant une analyse détaillée de la variable « probabilité de réussite de la recherche ». Les chercheurs ont pallié le manque de données concrètes sur les bénéfices potentiels en appliquant une approche de prise de décision en groupe qui mettait à profit les connaissances spécialisées et les intuitions éclairées de tous les participants. Le recours à des critères explicites et descriptifs a simplifié la formulation des jugements. Enfin, les séances en groupe ont éliminé les partis pris et promu l'adhésion des membres du groupe aux jugements prononcés collectivement ; les chercheurs ont pu bénéficier d'un feedback concret et de l'échange d'idées éclairées concernant l'impact potentiel de leurs projets. L'ISNAR est actuellement en train de tester et d'enseigner la méthode AHP dans d'autres pays.

La biosécurité

La « biosécurité » suscite un des débats les plus vifs menés en rapport avec les biotechnologies. Le terme décrit l'ensemble des politiques et procédures que les pays adoptent pour préserver la santé publique, l'environnement et la diversité biologique des risques liés aux biotechnologies. S'agissant d'agriculture, le terme se rapporte généralement à la dissémination d'organismes génétiquement modifiés — de plants transgéniques, par exemple.

L'expérience de l'ISNAR laisse présumer que tous les programmes de biosécurité efficaces ont quatre caractéristiques communes. D'abord, ils sont basés sur des directives écrites qui définissent clairement la structure du système, les rôles et les responsabilités des personnes impliquées, et la procédure d'évaluation à suivre. En second lieu, ces programmes sont mis en œuvre par des personnes dotées d'une bonne formation en la matière et qui jouissent de l'appui de leur institution. Troisièmement, la procédure d'évaluation a pour base une information scientifique de date récente. En quatrième lieu, le recours à des mécanismes de feedback assure l'intégration des informations nouvelles et l'actualisation du système en fonction des besoins.

Les personnes les plus directement impliquées dans les procédures d'évaluation des risques sont les scientifiques, du secteur public comme du secteur privé, chargés de contrôler les organismes génétiquement modifiés, et les membres des comités de décision chargés d'autoriser ou d'interdire la dissémination, en laboratoire ou en champ, d'un organisme génétiquement modifié. Les personnes auxquelles sont confiées ces tâches doivent connaître les aspects environnementaux associés à certains produits biotechnologiques. Elles doivent de plus être capables de déceler les risques potentiels et de déterminer quelles stratégies permettront de maîtriser ces risques. L'ISNAR s'efforce de munir ces personnes des compétences nécessaires à l'exécution de leurs responsabilités.

Les droits de propriété intellectuelle

La plupart des instituts de recherche agricole vont bientôt (si ce n'est déjà le cas) ressentir les effets de l'accroissement du nombre d'attributions de droits de propriété pour des innovations biotechnologiques en agriculture. Une analyse publiée en 1996 montre qu'à lui seul, le nombre de brevets a, depuis 1989, augmenté au rythme d'environ 250 brevets par an. D'autres facteurs encore signalent aux organisations de recherche que le climat international relatif aux droits de propriété intellectuelle (DPI) est en pleine évolution.

Par exemple, un institut de recherche d'un pays en développement désireux de participer à un projet de collaboration international peut devoir s'engager à protéger une technologie ou un matériel génétique donnés. Ou encore, les politiques nationales relatives aux DPI risquent de changer sous l'effet de négociations internationales, telles celles menées dans le cadre du GATT (Accord général sur les tarifs douaniers et le commerce) ou bien de la Convention sur la diversité biologique. Dans les pays avancés au plan scientifique, il est enfin possible que des groupes de recherche produisent déjà des matériaux ou des technologies justifiant leurs efforts en vue d'obtenir des droits de propriété pour protéger l'accès à leurs innovations ou bien les revenus potentiels qu'ils peuvent en tirer.

Par le passé, les pays en développement étaient peu disposés à reconnaître ou à faire respecter des droits de propriété intellectuelle quels qu'ils soient, en particulier les royautés sur les brevets. Ils ont fréquemment maintenu que les brevets les privent des bénéfices offerts par de nouvelles technologies. Mais la libéralisation accrue des marchés mondiaux soulève à présent des doutes de savoir si le relâchement des politiques relatives aux DPI est vraiment propice au développement économique et social du tiers monde. Pour ce qui est des biotechnologies agricoles en particulier, la position actuelle consiste à maintenir que l'application plus stricte des DPI fournira aux pays en développement un meilleur accès aux technologies protégées. Elles peuvent en effet conduire à des collaborations nationales et internationales plus nombreuses et promouvoir le flux d'investissements étrangers vers les industries agricoles.

En 1998, l'ISNAR a fait un sondage auprès des centres internationaux de recherche agricole pour prendre connaissance de leurs expériences dans l'utilisation de matériaux génétiques ou d'autres intrants de recherche protégés par des DPI, dans la conduite de leurs propres recherches. Les résultats de l'enquête ont révélé que, dans environ 70 pour cent des cas, l'autorisation d'utiliser une technique spécifique avait été obtenue sur la base d'un contrat privé appelé « accord de transfert de matériel » (ou « MTA », sigle du terme anglais). Des permis ont été utilisés dans presque 30 pour cent des cas. Ce vaste recours aux MTAs soulève un grand nombre de questions morales et éthiques au sein des instituts à financement sur fonds publics. Un des problèmes consiste à trouver le moyen de réconcilier le caractère exclusif du brevet avec la notion « de bien public » qui est habituellement associée aux résultats de la recherche agricole publique. Une autre question est de savoir comment payer les conseillers auxquels il faut faire appel pour résoudre les problèmes juridiques.

L'ISNAR étend actuellement le champ de l'enquête en y incluant 20 groupes de recherche travaillant dans des institutions de recherche agricole du secteur public dans cinq pays d'Amérique latine. Les résultats du sondage, qui seront connus vers le milieu de l'année 1999, montreront dans quelle mesure les pays en développement sont confrontés à des problèmes semblables lorsqu'ils veulent utiliser des technologies protégées par des droits de propriété.

Pour finir...

Ce rapport annuel présente quelques uns des problèmes et des défis principaux relatifs aux biotechnologies, auxquels doivent faire face les scientifiques, gestionnaires et décideurs politiques des pays en développement. L'expérience de l'ISNAR montre que, dans ces pays, il y a urgence à développer les ressources humaines dans le domaine des biotechnologies. C'est pourquoi l'ISNAR concentre ses efforts sur le développement et la consolidation des connaissances et des capacités des personnes impliquées. En fin de compte, c'est le niveau d'expertise et de compétence des personnes chargées de formuler et d'exécuter les programmes de recherche en biotechnologie qui déterminera la qualité de ces programmes, à savoir leur productivité, leur pertinence par rapport aux besoins des populations les plus démunies, et leur contribution à une utilisation prudente du patrimoine naturel.

La Gestión de la Biotecnología en el Mundo en Desarrollo

Asuntos emergentes

En marzo de 1998 los Estados Unidos emitió una patente para cubrir una innovación mediante la cual científicos agregan un gen a una planta para bloquear su producción de semilla fértil. De esta manera la planta es esterilizada y la semilla que produce es incapaz de germinar. El gen, en la actualidad ampliamente conocido como el “gen exterminador”, podría ser usado potencialmente en una gama de semillas comerciales, que comprende desde arroz hasta trigo y hortalizas. Pero los beneficios de la innovación pueden ser obtenidos solamente por productores de semillas comerciales. El uso del gen exterminador puede poner fin a una práctica tradicional de los agricultores mediante la cual guardan las semillas de una cosecha para resembrarla durante la próxima temporada. En vez, si la práctica tradicional se perdiese, estarían forzados a comprar nueva semilla cada año. Debido a que la práctica de guardar semillas para resembrarlas es más común entre los agricultores pobres en países en desarrollo, la tecnología de la semilla exterminadora podría tener considerables efectos en el mundo en desarrollo, en una manera desproporcionada.

Actualmente, los “inventores” del gen están buscando extender a cerca de 80 países la protección que le otorga la patente sobre su innovación; incluyendo a más de 40 países considerados entre los más pobres. Esas aplicaciones de patente y los aspectos científicos y éticos que los rodean han traído nuevamente asuntos relacionados a la biotecnología a primer plano, en lo que se refiere a la gestión y las políticas de la investigación agrícola.

Los alimentos, el medioambiente y la biotecnología

La “biotecnología” es un conjunto de técnicas moleculares poderosas usadas por los científicos para mejorar la composición genética de plantas y animales, por ejemplo, para hacer un cultivo más fuerte o resistente a la sequía. La historia anterior ilustra algunas de las controversias más extremas en cuanto a los aspectos éticos y científicos que rodean algunas de las aplicaciones emergentes de biotecnología en agricultura. Muy pocas aplicaciones de la biotecnología están libres de controversia. Sin embargo, el uso de las técnicas es con frecuencia aclamado como clave para futuros descubrimientos en la investigación agrícola, particularmente para el mundo en desarrollo. A pesar que sabemos que las innovaciones científicas de por sí no van a erradicar ni el hambre ni la pobreza en el mundo, las técnicas biotecnológicas podrían proporcionar herramientas que alivien la falta de alimentos que enfrentan millones de personas en la actualidad.

Por esta razón, desde 1992 el ISNAR ha conducido un programa de investigación y asesoría sobre políticas, organización y gestión de la biotecnología. Durante sus primeros seis años este “Servicio Intermediario de Biotecnología” (IBS) ha formado asociaciones con científicos y gerentes de investigación en biotecnología en más de 25 países en desarrollo, así como internacionalmente. El IBS toma una perspectiva integral, con un enfoque centrado en la gente, y analiza y ofrece asesoría sobre los retos asociados con la investigación en biotecnología. Trabajando hombro a hombro con colaboradores en Africa, Asia, América Latina y el Medio Oriente, el IBS explora todo el espectro de los requerimientos de los países que están considerando establecer programas de investigación biotecnológica.

Este informe anual se enfoca en el trabajo del IBS. Esto hace resaltar algunas de las características únicas de la biotecnología y como éstas afectan las habilidades de los líderes de investigación de emitir políticas y tomar decisiones programáticas.

La revolución en la ciencia

La rapidez de los avances científicos ha impuesto sobre los investigadores y gerentes la responsabilidad de mantenerse a la vanguardia de los desarrollos relacionados con la biotecnología. Pero en muchas partes del mundo en desarrollo padecen de falta de información. En dichos países los investigadores tienen dificultad en acceder a noticias y documentos científicos que podrían informales sobre

Eventos importantes

Actividades del ISNAR referente a biotecnología



Una encuesta profunda de las organizaciones públicas y privadas involucradas en la biotecnología, realizada en cinco países en desarrollo, reveló un constante crecimiento del número de investigadores dedicados a la biotecnología. Pero el crecimiento es rara vez comparable con incrementos similares en los montos de los fondos operacionales disponibles. Dado los limitados recursos a disposición, las prioridades de la investigación biotecnológica en dichos países pudieron ser definidos con mayor claridad y ser integrados y consolidados con un esfuerzo de

investigación agropecuario más amplio.

2. Un foro electrónico apoyado en la "Internet" está probando ser un medio eficiente para facilitar contactos, asociaciones y colaboraciones entre los gerentes de la investigación biotecnológica en países en desarrollo. Los lectores que estén interesados pueden acceder el foro a través de la sede del ISNAR en la "Internet" o en <http://www.cgiar.org/isnar/fora/biotech/index.htm>.

3. A pesar que el debate internacional sobre la biotecnología se enfoca en la formulación de marcos y guías legales nacionales e internacionales, la investigación del ISNAR continua demostrando que los recursos humanos constituyen la restricción más importante que los países en desarrollo enfrentan en la actualidad, en cuanto a asuntos referentes a biotecnología. Por tanto, desarrollar las habilidades de los practicionistas mediante seminarios y talleres de trabajo fue una de las prioridades del ISNAR en 1998.

4. Ahora que los productos de la investigación biotecnológica están empezando a emerger de los laboratorios de investigación avanzada de los países industrializados, existe la preocupación que la bioseguridad se haya convertido en un problema universal de alta prioridad. La investigación del ISNAR sobre bioseguridad incluye un proyecto colaborativo de dos años, que tiene como objetivo evaluar el impacto de los cultivos genéticamente modificados que han sido lanzados en países en desarrollo con fines comerciales. Simultáneamente, el ISNAR está revisando las políticas y los procedimientos sobre bioseguridad que acompañaron la introducción.

5. Al proporcionar asesoría y asistencia a los interesados en la investigación agropecuaria en los países en desarrollo y desarrollados, el ISNAR obtiene frutos duraderos de sus anteriores esfuerzos en investigación. En 1998, dicho trabajo de asesoría incluyó un estudio realizado por la Fundación Rockefeller, sobre cinco cultivos africanos. El objetivo era determinar cuáles de los cultivos presentaban las mejores oportunidades para mejoramientos mediante el uso de la biotecnología. Entre sus recomendaciones, el informe enfatiza que toda iniciativa de un donante interesado en biotecnología debe incluir una investigación sobre los aspectos relacionados a las políticas y a la gestión, así como a la bioseguridad.

aplicaciones de investigación de biotecnología. Su tarea se hace aun más difícil debido a las declaraciones exageradas hechas frecuentemente acerca de los potenciales riesgos y beneficios de la biotecnología.

Mas aún, las cualidades revolucionarias atribuidas a la biotecnología moderna han demostrado ser tanto gerenciales como técnicas. Por ejemplo, en biotecnología hay una necesidad creciente de trabajar en equipo y de hacer alianzas inter-institucionales. Debido a la complejidad y a los gastos involucrados, no hay un solo individuo ni institución que tenga el acervo de conocimiento, las habilidades ni los recursos necesarios para implementar exitosamente un proyecto de biotecnología.

El potencial de la biotecnología de resolver problemas de producción agrícola y de proteger el medioambiente en los países en desarrollo es también materia de discusión. Debido a que los productos biotecnológicos son pocos y están emergiendo recientemente, especialmente en las partes del mundo menos desarrolladas, se podría argumentar que los aumentos en el rendimiento podrían ser logrados más fácilmente mediante el uso de tecnologías relativamente simples ya existentes, como es el manejo integrado de plagas.

La novedad de algunas de las técnicas también dificultan en extremo estimar los costos o los beneficios potenciales de dicha investigación. Los programas de investigación biotecnológica generalmente generan productos intermedios que luego son usados para generar más investigación. Raramente están incorporados en productos finales, como en semillas, que podrían ser vendidos directamente a los agricultores. Finalmente, existe la incertidumbre si los productos finales de la biotecnología algún día serán adoptados por los agricultores o aceptados por los consumidores.

Determinando las prioridades a pesar de las dificultades

Para dar cuenta de la complejidad de la biotecnología, el ISNAR y el instituto nacional de investigación agrícola de Chile, INIA, adaptaron un método para determinar prioridades para el programa de investigación biotecnológica y pusieron a prueba la nueva aplicación. El método usado fue el Proceso Jerárquico Analítico (AHP). El AHP guía al equipo que está priorizando, en la desagregación de un problema complejo o una pregunta en partes más simples que son más apropiadas para ser discutidas entre personas con diferentes antecedentes y experiencias.

A pesar de que el método aún requiere mayor adaptación, los resultados logrados en Chile fueron muy alentadores. El AHP habilitó al equipo chileno a enfrentar la incertidumbre alrededor del potencial de la biotecnología mediante un análisis detallado de la variable “oportunidades de éxito”. El equipo consideró la falta de datos evidentes sobre beneficios potenciales a través de un enfoque de toma de decisiones, que hace uso eficaz de la experiencia e intuición de una amplia gama de individuos conocedores. El uso de criterios explícitos y descriptivos simplificó el juicio a ser emitido. Finalmente, las sesiones en grupo ayudó a las personas a liberarse de prejuicios, promovió entre los miembros del grupo el sentimiento que los juicios emitidos les pertenecían y proporcionó retroalimentación a los investigadores y discernimiento sobre el impacto potencial de sus proyectos. Actualmente el ISNAR está comprobando el AHP y dando capacitación sobre su uso en varios países fuera de Chile.

Bioseguridad

La bioseguridad es uno de los asuntos relacionados a la biotecnología que genera los debates más ardientes. El término describe las políticas y los procedimientos que los países adoptan para asegurar que las aplicaciones de la biotecnología son seguras para la salud pública, el medioambiente, y la biodiversidad. En la agricultura, generalmente está asociada con el lanzamiento de organismos genéticamente modificados tales como cultivos transgénicos.

La experiencia del ISNAR sugiere que todos los programas de bioseguridad efectivos comparten cuatro características: Primero, los programas están basados en guías escritas que definen claramente la estructura del sistema, los roles y las responsabilidades de los involucrados y cómo opera el proceso de revisión. Segundo, son dirigidos por personas que están bien capacitadas y que cuentan con el apoyo de sus instituciones. Tercero, el proceso de revisión está basado en información científica actualizada. Cuarto, se usa mecanismos de retroalimentación para incorporar nueva información y revisar el sistema a medida que sea necesario.

La gente involucrada de manera más cercana en revisiones de bioseguridad son científicos de los sectores público y privado quienes buscan probar organismos genéticamente modificados, y miembros de comités que deciden aprobar o no una proposición sobre el lanzamiento en el laboratorio o en el campo de un organismo genéticamente modificado. Las personas involucradas en estas tareas deben estar familiarizadas con asuntos referentes al medio ambiente asociados con productos biotecnológicos. Los mismos deben ser capaces de reconocer qué constituye un riesgo potencial y qué estrategias para manejar el riesgo podrían ser aplicable. Por tanto el desarrollar estas destrezas en los practicantes es uno de los focos más importantes del trabajo del ISNAR relacionado a la biotecnología.

Derechos de Propiedad Intelectual

La mayoría de los institutos de investigación agrícola pronto sentirán los efectos del incremento en las emisiones de derechos de propiedad por innovaciones en biotecnología agrícola, si no los han sentido ya. Tomando en consideración sólo el número de patentes, éste ha incrementado a cerca de 250 por año desde 1989, de acuerdo a un análisis publicado en 1996. Así mismo, otros factores dan señales a las

organizaciones de investigación sobre los cambios en el ambiente internacional tendiente hacia los derechos de propiedad intelectual (DPI).

Por ejemplo, la protección de una tecnología o de un material genético podría ser una condición para que un instituto de un país en desarrollo participe en un proyecto colaborativo internacional. O las políticas nacionales sobre DPI podrían cambiar como resultado de negociaciones internacionales, tales como el Acuerdo General sobre Tarifas y Mercado (GATT) o la Convención sobre la Biodiversidad. Finalmente, en países científicamente avanzados, algunos grupos de investigación podrían estar ya desarrollando materiales o tecnologías que garantizan sus búsquedas de derechos de propiedad para proteger su acceso o ingresos potenciales como por ejemplo regalías.

Tradicionalmente los países en desarrollo han mostrado rechazo a reconocer o apoyar cualquier tipo de DPI, especialmente derechos de patentes. Con frecuencia han tomado la posición que el mundo de las patentes los ha privado de los beneficios de nuevas tecnologías. Pero el cambio hacia mercados globales más liberales está causando dudas sobre si políticas liberales de DPI serían conducentes a desarrollo social y económico en el Tercer Mundo.

Particularmente en biotecnología agrícola, actualmente se argumenta que los estándares de DPI en realidad van a proporcionar mayor acceso a los países en desarrollo a tecnologías protegidas. Los mismos podrían incrementar la oportunidad de participar en iniciativas de colaboración nacionales e internacionales y ayudar a atraer inversión extranjera a industrias agrícolas.

En 1998, el ISNAR llevó a cabo una encuesta entre centros internacionales de investigación agrícola para descubrir cuáles eran los problemas que ellos enfrentan en cuanto al uso en sus trabajos científicos de materiales genéticos, u otros insumos de investigación, protegidos con DPI. La encuesta reveló que un contrato privado llamado acuerdo de transferencia de material, o "ATM", era usado cerca del 75 por ciento de los casos para obtener permiso para usar una tecnología específica. Las licencias eran usadas casi el 30 por ciento del tiempo. El uso extensivo de ATM presenta a los institutos financiados con fondos públicos con una serie de cuestiones legales y éticas. Una de ellas es cómo reconciliar la exclusividad de las patentes con la naturaleza tradicional del "bien público" de los productos de la investigación agrícola financiada con fondos públicos. Otra es cómo pagar por la asesoría requerida para resolver las cuestiones legales involucradas.

Actualmente el ISNAR ha extendido la encuesta a 20 grupos de investigación en organizaciones de investigación agrícola del sector público en cinco países latinoamericanos. Los resultados, que estarán disponibles a mediados de 1999, demostrarán si los países en desarrollo enfrentan asuntos similares con el uso de tecnologías apropiadas.

Finalmente

Este informe anual ha tocado algunos de los asuntos más importantes de la biotecnología y los retos que los científicos, gerentes y formuladores de políticas de los países en desarrollo tienen que enfrentar. De acuerdo a la experiencia del ISNAR, el desarrollo de los recursos humanos es el único reto más inmediato que enfrentan los países en desarrollo en la actualidad en los asuntos referentes a la biotecnología. Es por esta razón que el continuo trabajo del ISNAR en esta área se enfoca principalmente en desarrollar el conocimiento y las capacidades de las personas. Al final, la formulación y ejecución de programas de investigación biotecnológica que son productivos, relevantes a las necesidades de los más pobres y que aseguran prudencia ecológica, dependen de las destrezas y experiencia que la gente contribuye a sus tareas.

发展中国家生物技术的管理

出现的问题

1998年3月，美国为一项革新颁发了专利。通过这项革新，科学家在一种植物中加入了一项基因，以阻止它生长出有繁育能力的种子。由此，这种植物被绝育，它生成的种子无法生长发芽。这种基因现被广泛称作“灭绝基因”，它可以被用在从水稻到小麦和蔬菜等一系列商业种子中。然而，只有商业种子的生产者才能从此项革新中受益。灭绝基因的使用，可能会使农民从自己的收获中保留种子在下一季中继续播种这一传统作法宣告结束。相反，他们将不得不每年购买新的种子。由于保留种子重新播种的作法在发展中国家的贫困农民中最为流行，因此种子灭绝技术会在发展中国家造成尤其严重的影响。

这种基因的“发明者”目前正在试图将其革新的专利保护扩展至大约80个国家，其中包括世界上的40多个最不发达国家。这些专利申请以及围绕它们的科学和伦理问题使得生物技术问题再次出现在农业研究政策与管理的前沿。

粮食、环境与生物技术

“生物技术”是科学家们为改进植物和动物的基因组成（例如通过使一种作物更加强壮或具有更强的抗旱能力）而采用的一整套强有力的分子技术。上面的故事揭示了围绕生物技术在农业中的某些新兴应用而产生的一些较为极端的伦理和科学争议。生物技术的应用很少不带来争议。尽管如此，这些技术的使用通常被视为未来在农业研究，特别是发展中国家的农业研究中取得突破的关键。虽然我们知道仅靠科学革新并不能根除全球的饥饿与贫困，但是生物技术可以为缓解当今困扰千百万人口的粮食短缺提供手段。

为此，国家农业研究国际服务中心（ISNAR）从1992年以来在生物技术政策、组织和管理领域开展了一项研究与咨询项目。在其最初的六年里，“生物技术中介服务中心”（IBS）与国际上以及超过25个发展中国家的科学家和生物技术研究管理人员建立了伙伴关系。生物技术中介服务中心采取了一种全面的、以人为核心的方针，对生物技术研究涉及的挑战进行了分析，并提供了咨询。通过与非洲、亚洲、拉丁美洲和近东的合作者并肩工作，生物技术中介服务中心探讨了正在考虑设立生物技术研究项目的国家所面对的各种各样的要求。

本年度报告集中涉及生物技术中介服务中心的工作。报告着重介绍了生物技术的一些独有特征，以及它们对研究领导人制定政策和项目决策的能力产生的影响。

科学领域的革命

科学进步的迅猛发展使得研究人员和管理者有责任及时了解围绕生物技术取得的进展。然而，许多发展中国家缺乏信息。在那里，研究工作者有时难以获得能够为他们提供生物研究应用信息的新闻和科学文献。通常对于生物技术的潜在风险和效益所作的各种夸大之辞，使他们的任务更加困难。

除此之外，事实证明，现代生物技术所具备的革命性质，不仅体现在技术方面，同时也体现在管理方面。例如，在生物技术领域，对集体协作和跨机构联盟的要求日益加

概要

国家农业研究国际服务中心在生物技术方面的工作



对五个发展中国家介入农业生物技术领域的公共和私营组织的一项深入调查显示，生物技术研究人员的数量稳步增长。但是，在此项增长的同时，可供使用的操作经费却很少取得同步的增加。鉴于可供使用的资源有限，这些国家生物技术研究的优先次序可以制定得更加明确，并与更为广泛的农业研究努力相互融合和巩固。

2.事实证明，在互联网上设立的一个电子论坛，是促进发展中国家生物技术研究管理者之间建立联系、伙伴关系以及相互协作的一个有效的工具。有兴趣的读者可以通过国家农业研究国际服务中心的互联网络站点或在以下网址访问该论坛 <http://www.cgiar.org/isnar/fora/biotech/index.htm>。

3.尽管国际上关于生物技术问题的辩论大多集中于国家和国际法律框架和准则的制定，但是国家农业研究国际服务中心的研究继续表明，人力资源是当今发展中国家在与生物技术有关的问题上面临的首要制约因素。因此，通过研讨会和讲习班培养实际工作者的技能，是国家农业研究国际服务中心在1998年的工作重点。

4.鉴于生物技术研究的成果目前已开始从工业化国家的先进实验室中呈现出来，对于生物安全的关切已经成为一项引起高度重视的全球性问题。国家农业研究国际服务中心在生物安全方面的研究包括一项为期两年的合作项目，用以评估在发展中国家商业推出的基因工程作物所产生的影响。与此同时，国家农业研究国际服务中心正在审评随其一起出台的各项生物安全政策和程序。

5.通过向发展中国家和发达国家的农业研究利益各方提供咨询和帮助，国家农业研究国际服务中心从它过去的研究努力中不断取得收获。1998年，此类咨询工作包括为洛克菲勒基金会开展的一项关于五种非洲作物的研究。其目的是确定哪些作物最有机会通过生物技术得到改良。报告在其建议中强调，在生物技术领域的任何由捐助人发起的研究倡议必须包括生物安全，以及研究政策和管理方面的内容。

强。由于所涉问题之复杂，费用之昂贵，任何个人或单独的机构都无法具备足够的知识、技能和资源，使一项生物技术项目取得成果。

生物技术对解决发展中国家农业生产与环境保护问题所具有的潜力，还尚在讨论之中。由于生物技术产品为数极少，且刚刚出现，目前还缺乏有关它们在农民土地上的实际表现的确凿数据。除此之外，尤其是在一些最不发达国家，对产量的提高方式存在争议，如可以通过采用类似综合虫害管理等相对简单的现有技术来实现。

某些技术的新奇性也使得很难对其研究费用或潜在效益作出估计。生物技术研究项目往往产生的是中间产品，以供进一步的研究使用。它们很少表现为可以直接卖给农民的最后产品，如种子。最后，也存在生物技术的最后产品是否终能为农民所采纳或为消费者所接受的不确定性。

面对困难，确立优先次序

为了应付生物技术的复杂性，国家农业研究国际服务中心与智利国家农业研究所（INIA）在为生物研究项目制定优先次序中，采用并测试了一种新的方法。所采用的方法称作“分析等级化处理法”（AHP）。“分析等级化处理法”引导一个优先次序确立小组将一个复杂的课题或问题分解为若干较为简单的课题或问题，使之适合由具有不同背景和专业知识的人们一起讨论。

虽然这一方法仍需进一步改进，但在智利取得的结果是令人鼓舞的。“分析等级化处理法”使智利小组得以通过细致地分析“研究的成功机会”这一变数，着手处理围绕生物技术的潜力所存在的不确定性。针对有关潜在效益的确凿数据不足的问题，他们采取了一种集体决策的作法，从而发挥了各界知识渊博的个人的专业知识与洞察力。通过采纳明确而带有描述性的标准，简化了需要作出的判断。最后，小组讨论帮助消除了个人的偏见，增强了小组成员对所作判断的所有感，并使研究人员对其研究项目的潜在影响取得了反馈，获得了深入的了解。国家农业研究国际服务中心目前正在智利以外的一些国家试验和传授“分析等级化处理法”。

生物安全

生物安全是生物技术中辩论最激烈的问题之一。生物安全一词是指各国为确保生物技术的应用对公共健康、环境以及生物多样性的安全无害而采取的各项政策和程序。在农业领域，它通常与诸如转基因作物之类的遗传修饰生物的推出有关。

国家农业研究国际服务中心的经验表明，所有有效的生物安全方案都有四个特征：第一，方案都以*书面准则*为基础，明确规定系统的结构、所涉人员的作用和责任、以及审查过程的运作方式。第二，它们都由经过良好培训并有各自的机构在背后提供支持的人加以运行。第三，审查过程以最新的科学*信息*为基础。第四，采用了*反馈机制*，以注入新的信息，并在必要时对系统作出修改。

与生物安全审查工作关系最为密切的是那些尝试对遗传修饰生物进行测试的公共和私营部门的科学家，以及一些委员会的成员，这些委员会负责决定批准或不批准一种遗传修饰生物在实验室或实地的拟议推出。从事这些任务的个人必须熟悉生物技术产品所涉及的环境问题。他们还必须有能力识别什么会构成一种潜在的风险，以及可以采用哪些风险管理战略。因此，在实际的工作者身上培养这些技能，成为国家农业研究国际服务中心在生物技术方面工作的一个主要核心。

知识产权

大多数农业研究机构很快将感受到授予农业生物技术革新的专利数量的增加所产生的影响，如果它们尚未感受到这种影响的话。据1996年出版的一项分析，自从1989年以来，仅专利数字，便每年增加约250件。其他一些因素也向各研究机构发出信号，在知识产权问题上，国际气候正在发生变化。

例如，对一项技术或基因材料的保护可能成为一个发展中国家的机构参加一项国际合作项目的条件。或者，国家在知识产权方面的政策可能会因象《关税及贸易总协定》（GATT）或《生物多样性公约》这样的国际谈判而发生变化。最后，在一些科学先

进的国家，一些研究团体可能已经在开发某些能够控制其获取，或保护来自使用费的潜在收入的材料或技术，从而达到专利保护的目的。

传统上讲，发展中国家一向不大情愿承认或推行任何形式的知识产权，尤其是专利权。它们通常采取的立场是，专利环境使得它们无法从新技术中受益。但是，随着向更加自由化的全球市场的转变，目前正在对宽松的知识产权政策是否有助于第三世界的社会 and 经济发展提出疑问。尤其是在农业生物技术领域，人们现在争辩说，提高知识产权标准实际上将增加发展中国家获取受保护技术的可能性。它可以增加参与国家和国际合作行动的机会，并帮助吸引向农业产业的外国投资。

1998年，国家农业研究国际服务中心对一些国际农业研究中心作了调查，以发现它们在将受到知识产权保护的基因材料或其他研究投入用于其科学工作时遇到了哪些问题。调查显示，在75%的案例中，都采用了一种所谓“材料转让协议”（MTA）的私下合同，以便获得一项特定技术的使用许可。在将近30%的情况下使用了许可证。“材料转让协议”的广泛使用，给各个公共资助的机构带来了一系列法律和伦理问题。其中之一是如何协调专利的排他性与公共资助的农业研究成果传统上的“公益”性质之间的矛盾。另一个问题是如何负担因解决所涉法律问题而需要的咨询费用。

国家农业研究国际服务中心目前正在将调查扩展至五个拉丁美洲国家公共部门农业研究组织中的20个研究团体。结果将在1999年中期取得，它将显示发展中国家在使用专利技术的过程中是否面临类似的问题。

结束语

本年度报告涉及了发展中国家的科学家、管理者和决策者遇到的一些主要的生物技术和挑战。国家农业研究国际服务中心的经验表明，人力资源的开发是当今发展中国家在与生物技术有关的问题方面遇到的最为紧迫的挑战。正是为此，国家农业研究国际服务中心在此领域的持续不断的工作主要以培养人的知识和能力为重点。归根结底，能否制定和实施一套既有成效、又照顾到最贫困人口的需要、同时又确保在生态上慎重行事的生物技术研究项目，要取决于人们在从事任务时所表现的技能和专业知识。

Управление биотехнологией в развивающемся мире

Возникающие проблемы

В марте 1998 года в США был выдан патент на изобретение, которое позволяет ученым добавлять к растению ген, блокирующий выработку этим растением плодородного семени. Таким образом происходит стерилизация растения, а вырабатываемое им семя теряет способность прорасти. Данный ген, который сегодня широко известен как “ген-терминатор”, потенциально может использоваться во многих товарных семенах, начиная от риса и кончая пшеницей и овощными культурами. Однако выгоды из этого изобретения могут быть получены исключительно производителями товарных семян. Использование гена-терминатора может положить конец традиционной практике, связанной с сохранением фермерами семян, оставшихся после урожая, для их повторного посева в следующий сезон. Вместо этого они будут вынуждены ежегодно закупать новые семена. Поскольку практика сохранения семян для посева особенно распространена среди бедных фермеров в развивающихся странах, технология стерилизации семян может иметь чрезвычайно серьезные последствия в развивающемся мире.

“Изобретатели” гена сегодня добиваются увеличения числа стран, где обеспечивается защита патента на их изобретение, до примерно 80 стран, более 40 из которых входят в число наименее развитых в мире. Эти заявки на выдачу патентов и связанные с ними научные и этические проблемы вновь вывели вопросы биотехнологии на передний край политики и управления в области сельскохозяйственных исследований.

Продовольствие, окружающая среда и биотехнология

“Биотехнология” представляет собой эффективный набор молекулярных методов, используемых учеными для совершенствования генетического строения растений и животных, например, на основе повышения морозостойкости растений или их сопротивления засухе. Вышеприведенный пример указывает на некоторые из наиболее ожесточенных этических и научных споров, которые ведутся по поводу некоторых новых направлений практического применения биотехнологии в сельском хозяйстве. Вообще говоря, не многие применения биотехнологии не сопровождаются спорами. Вместе с тем использование таких методов зачастую рассматривается положительно как ключ к будущим прорывам в области сельскохозяйственных исследований, особенно в развивающемся мире. Конечно, нам известно, что научные изобретения сами по себе не приведут к искоренению голода и нищеты во всем мире, однако биотехнологические методы могут обеспечить средства смягчения проблем нехватки продовольствия, с которыми сегодня сталкиваются миллионы людей.

По этой причине ИСНАР с 1992 года осуществляет научно-исследовательскую и консультативную программу в области биотехнологической политики, организации и управления. За первые шесть лет своего существования эта “Посредническая биотехнологическая служба” (ПБС) установила партнерские взаимоотношения с учеными и руководителями биотехнологических исследований более чем в 25 развивающихся странах, а также на международном уровне. При анализе и разработке рекомендаций относительно задач биотехнологических исследований ПБС придерживается комплексного подхода, ставящего во главу угла человека. Сотрудничая с коллегами в Африке, Азии, Латинской Америке и на Ближнем Востоке, ПБС изучает широкий диапазон потребностей стран, рассматривающих возможность внедрения программ биотехнологических исследований.

В этом ежегодном докладе основное внимание уделяется деятельности ПБС. В нем освещены некоторые уникальные особенности биотехнологии и их влияние на способность руководителей научных исследований принимать политические и программные решения.

Революция в науке

Быстрые темпы развития науки требуют от исследователей и руководителей быть в курсе самых последних достижений в области биотехнологии. Вместе с тем во многих странах развивающегося мира информации недостаточно. Исследователям-практикам трудно получить доступ к новым сведениям и научным документам и руководствоваться ими в своих биотехнологических исследованиях. Их задача еще более осложняется преувеличенными толками в отношении опасностей и преимуществ биотехнологии.

Краткие сведения

Деятельность ИСНАР, связанная с биотехнологией



Углубленное обследование государственных и частных организаций, работающих с сельскохозяйственной биотехнологией в пяти развивающихся странах, обнаружило наличие устойчивого роста численности исследователей биотехнологии. Этот рост, однако, редко сопровождается пропорциональным увеличением суммы имеющихся на это средств. С учетом ограниченности ресурсов приоритетные задачи в области биотехнологических исследований в этих странах могли бы быть определены более четко и интегрированы и объединены с более широкой деятельностью в области сельскохозяйственных исследований.

2. Электронный дискуссионный форум в сети “Интернет” доказывает свою эффективность в качестве средства содействия контактам, партнерским взаимоотношениям и сотрудничеству между руководителями биотехнологических исследований в развивающихся странах. Заинтересовавшиеся читатели могут получить доступ к форуму через страницу ИСНАР в сети “Интернет” либо по адресу: <http://www.cgiar.org/isnar/fora/biotech.index.htm>.

3. В центре международных дебатов по биотехнологии в основном стоят вопросы разработки национальной и международной правовой базы и руководящих принципов, однако, исследования ИСНАР по-прежнему показывают, что главные трудности, с которыми сегодня сталкиваются развивающиеся страны в вопросах, связанных с биотехнологией, касаются людских ресурсов. Развитие навыков практической работы при помощи семинаров и практикумов было поэтому одним из основных направлений работы ИСНАР в 1998 году.

4. Сегодня, когда начинает появляться биотехнологическая продукция, созданная в исследовательских лабораториях развитых стран, проблемы биобезопасности стали высокоприоритетным мировым вопросом. Исследования ИСНАР в области биобезопасности включают двухлетний проект сотрудничества в области оценки влияния генетически созданных культур, которые поступили в продажу в развивающихся странах. Одновременно ИСНАР анализирует политику и процедуры в области биобезопасности, сопровождавшие этот процесс.

5. Предоставляя консультативное содействие и помощь лицам, заинтересованным в сельскохозяйственных исследованиях в развивающихся и развитых странах, ИСНАР использует плоды своей прошлой исследовательской деятельности. В 1998 году консультативная деятельность включила исследование пяти африканских культур, подготовленное для Фонда Рокфеллера. Была поставлена задача определить, какие культуры открывают наилучшие возможности для их совершенствования с использованием биотехнологии. В рекомендациях доклада подчеркивалось, что любая инициатива доноров в области биотехнологии должна включать аспекты политики и руководства исследованиями, а также вопросы биобезопасности.

Кроме того, как показывает жизнь, приписываемые современной биотехнологии революционные качества носят как управленческий, так и технический характер. Например, в области биотехнологии возрастает потребность в коллективной работе и межведомственном сотрудничестве. Ввиду сложности и дороговизны биотехнологических проектов один человек или организация никогда не смогут обладать необходимым кругом знаний, навыков и ресурсов для их успешного завершения.

Открываемые биотехнологией возможности для решения проблем сельскохозяйственного производства и охраны окружающей среды в развивающихся странах также по-прежнему являются предметом обсуждения. Поскольку биотехнологические продукты характеризуются своей немногочисленностью и новизной, существует нехватка подтвержденных данных о результатах их фактического использования на полях фермеров. Кроме того, утверждения о том, что повышения урожайности легче добиться на основе использования относительно простых существующих технологий, таких как комплексное использование средств защиты растений, особенно в наименее развитых странах мира, также имеют под собой некоторое основание.

Новизна некоторых методов крайне осложняет также оценку издержек или потенциальных выгод таких исследований. Программы биотехнологических исследований, как правило, создают промежуточные продукты, которые затем используются в последующих исследованиях. Они редко воплощаются в конечных продуктах, таких как семена, которые могут напрямую продаваться фермерам. Наконец, существует неопределенность относительно того, будут ли конечные продукты биотехнологии когда-либо взяты на вооружение фермерами или приняты потребителями.

Определение приоритетов, несмотря на трудности

С учетом сложности биотехнологии ИСНАР и Чилийский национальный институт сельскохозяйственных исследований, INIA, провели адаптацию и апробацию нового метода определения приоритетных направлений программы биотехнологических исследований. При этом использовался метод “аналитического иерархического процесса” (АНР). Метод АНР помогает группе, определяющей приоритеты, расчленив сложную проблему или вопрос на более простые, которые могут быть обсуждены людьми, обладающими разным опытом и специальными знаниями.

Этот метод по-прежнему нуждается в дальнейшей адаптации, однако, результаты, полученные в Чили, были обнадеживающими. АНР позволил чилийским коллегам рассмотреть вопрос о неопределенности в связи с открываемыми биотехнологией возможностями на основе подробного анализа такого фактора, как “вероятность успешных результатов исследований”. Они постарались преодолеть проблему нехватки проверенных данных относительно потенциальных преимуществ биотехнологии при помощи коллективного принятия решений с привлечением специальных знаний и интуиции широкого круга специалистов. Поиску решений способствовало использование четких и описательных критериев. Наконец, проведение совещаний группы помогло преодолеть личные пристрастия, стимулировало чувство ответственности членов группы за достигнутые выводы, а также позволило исследователям получить отклик пользователей и улучшить понимание потенциальных последствий их проектов. В настоящее время ИСНАР проводит апробацию метода АНР и обучение его применению в ряде стран за пределами Чили.

Биобезопасность

Одним из наиболее горячо дебатированных вопросов биотехнологии является биобезопасность. Этот термин используется для описания политики и процедур, применяемых странами, стремящимися обеспечить безопасность применения биотехнологии с точки зрения здоровья населения, экологии и биоразнообразия. В сельском хозяйстве он обычно связывается с появлением генетически измененных организмов, таких как трансгенные культуры.

Опыт ИСНАР свидетельствует о том, что все эффективные программы биобезопасности характеризуются четырьмя особенностями. Во-первых, эти программы основываются на письменных инструкциях, которые четко определяют структуру системы, функции и обязанности участников и порядок проведения экспертизы. Во-вторых, ими руководят хорошо подготовленные люди, имеющие поддержку стоящих за ними организаций. В-третьих, экспертиза основывается на современной научной информации. В-четвертых, используются механизмы обратной связи в целях включения новой информации и пересмотра системы по мере необходимости.

В экспертизах на предмет биобезопасности наиболее активное участие принимают ученые государственных и частных организаций, стремящихся провести испытания генетически измененных организмов, а также члены комитетов, принимающих решение об утверждении или неутверждении предложения о выпуске генетически измененного организма в окружающую среду в лабораторных или полевых условиях. Лица, принимающие участие в решении этих задач, должны быть знакомы с вопросами охраны окружающей среды, связанными с продуктами биотехнологии. Они также должны уметь распознать потенциальную опасность и определить применимые стратегии управления рисками. Развитие этих навыков у специалистов-практиков поэтому является основным направлением деятельности ИСНАР, связанным с биотехнологией.

Права интеллектуальной собственности

Большинство сельскохозяйственных исследовательских институтов вскоре ощутят последствия увеличения числа авторских прав, выданных на изобретения в области сельскохозяйственной биотехнологии, если они уже не почувствовали их. Число одних только патентовросло примерно на 250 в год с 1989 года, согласно анализу, опубликованному в 1996 году. Имеются и другие факторы, указывающие исследовательским организациям на изменение международных условий в области прав интеллектуальной собственности (ПИС).

Например, защита технологии или генетического материала может быть условием для участия института развивающейся страны в международном проекте на основе сотрудничества. Кроме того, национальная политика в отношении ПИС может измениться в результате международных переговоров, примерами которых служат Генеральное соглашение по тарифам и торговле (ГАТТ) или Конвенция о биологическом разнообразии. Наконец, в развитых в научном отношении странах исследовательские группы, возможно, уже разрабатывают материалы или технологии, в отношении которых имеются основания для подачи заявок на авторские права в целях защиты доступа или потенциального дохода от гонораров.

Развивающиеся страны традиционно с неохотой признавали или вводили в действие ПИС какого-либо типа, особенно патентные права. Они зачастую придерживались той позиции, что патентная система лишает их выгод, получаемых от новых технологий. Однако сдвиг в сторону большей либерализации глобальных рынков сегодня вызывает сомнения относительно того, способствует ли разрешительная политика в отношении ПИС социально-экономическому развитию в третьем мире.

В первую очередь в области сельскохозяйственной биотехнологии сегодня утверждается, что более жесткие стандарты в области ПИС на практике помогут расширить доступ развивающихся стран к защищенным технологиям. Они могут расширить возможности для участия в национальных и международных инициативах на основе сотрудничества и помочь привлечь иностранные инвестиции в сельскохозяйственные отрасли.

В 1998 году ИСНАР провел обследование международных центров сельскохозяйственных исследований на предмет тех проблем, с которыми они сталкиваются при использовании генетических материалов или иных результатов исследований, защищенных ПИС, в своей научной деятельности. Обследование показало, что частный контракт, именуемый соглашением о передаче материалов, или “СПМ”, примерно в 75 процентах случаев использовался для получения разрешения на использование конкретной технологии. Лицензии использовались в течение почти 30 процентов времени. Широкое использование СПМ ставит перед государственными институтами множество юридических и этических вопросов. Один из них связан с тем, как согласовать исключительность патентов с результатами финансируемых обществом сельскохозяйственных исследований, которые по традиции являются “общественным благом”. Другой вопрос связан с тем, как оплатить консультативные услуги, необходимые для решения возникающих юридических вопросов.

Сегодня ИСНАР распространяет это обследование на 20 исследовательских групп в государственных организациях сельскохозяйственных исследований в пяти странах Латинской Америки. Результаты, которые должны быть получены в середине 1999 года, покажут, встают ли перед развивающимися странами аналогичные проблемы, связанные с их использованием технологий, защищенных авторским правом.

Заключение

В этом ежегодном докладе затронут ряд основных биотехнологических вопросов и задач, встающих перед учеными, руководителями и директивными органами в развивающихся странах. Опыт ИСНАР показывает, что наиболее неотложной задачей, которую должны решать сегодня развивающиеся страны в вопросах, связанных с биотехнологией, является развитие людских ресурсов. Вот почему, продолжая свою работу в этой области, ИСНАР уделяет много внимания развитию знаний и возможностей людей. В конечном итоге, разработка и осуществление программ биотехнологических исследований, которые были бы продуктивными и актуальными с точки зрения потребностей беднейших слоев населения и обеспечивали бы разумное обращение с окружающей средой, зависят от навыков и специальных знаний людей, решающих эти задачи.

أضواء على

أنشطة المركز الدولي لخدمات البحوث الزراعية في مجال التكنولوجيا الحيوية

- ١- كشفت دراسة متعمقة للمؤسسات العامة والخاصة العاملة في التكنولوجيا الحيوية الزراعية في خمسة بلدان نامية عن زيادة مضطردة في عدد الباحثين في مجال التكنولوجيا الحيوية. غير أن هذه الزيادة نادراً ما يوازيها زيادة مماثلة في الموارد المالية المتاحة. وبالنظر لمحدودية هذه الموارد، فإنه يتعين تحديد أولويات البحوث في مجال التكنولوجيا الحيوية بكثير من الدقة وضرورة تكاملها مع الجهود العامة في مجال البحوث الزراعية.
- ٢- يعتبر منتدى الحوار الإلكتروني على الشبكة الدولية (الانترنت) وسيلة فعالة لتيسير الاتصال والمشاركة والتعاون بين المشرفين على البحوث في مجال التكنولوجيا الحيوية في البلدان النامية. ويوسع المهتمين بالموضوع أن يشاركوا في هذا المنتدى من خلال موقع المركز الدولي لخدمات البحوث الزراعية (الاسنار) على الشبكة الدولية (الانترنت) في العنوان التالي: <http://www.cgiar.org/isnar/fora/biotech/index.htm>.
- ٣- وفي حين يتركز النقاش الدائر حالياً على الصعيد الدولي بشأن التكنولوجيا الحيوية على صياغة الأطر القانونية الوطنية والدولية وأسس العمل التي يجب اعتمادها في هذا المجال، فإن دراسات وأبحاث المركز تشير إلى أن النقص في القوى البشرية المدربة ما يزال العائق الرئيسي الذي تواجهه البلدان النامية اليوم في مجال التكنولوجيا الحيوية. لذا فقد أعطى المركز الأولوية خلال العام ١٩٩٨ لبناء قدرات ومهارات العاملين في هذا المجال عن طريق تنظيم حلقات دراسية وورشات عمل.
- ٤- والآن وبعد أن أخذت نتائج البحوث في مجال التكنولوجيا الحيوية تتوالى في الظهور من مختبرات البحوث المتقدمة في البلدان الصناعية، فقد أضحى القلق بشأن السلامة البيولوجية مسألة دولية تتسم بأهمية بالغة. وتشمل بحوث المركز في مجال السلامة البيولوجية مشروعاً تعاونياً، مدته سنتان، لتقييم أثر استعمال المحاصيل المحورة جينياً التي تم طرحها تجارياً في البلدان النامية. كما يقوم المركز في الوقت ذاته بمراجعة السياسات والإجراءات المتصلة بالسلامة البيولوجية التي رافقت إدخال هذه المحاصيل.
- ٥- إن المركز، بتقديمه المشورة والمساعدة للمعنيين في البحوث الزراعية في البلدان النامية والمتقدمة قد بدأ يقطف ثمار الجهود التي بذلها في الماضي. ففي عام ١٩٩٨، شملت الخدمات الاستشارية التي أنجزها المركز دراسة لحساب مؤسسة روكفلر لخمس محاصيل أفريقية كان الهدف منها تحديد أي من المحاصيل موضوع الدراسة يشكل أفضل الفرص لتحسين الإنتاج من خلال استعمال التكنولوجيا الحيوية. وشدد التقرير ضمن توصياته على أنه يتعين على أي مبادرة لتقديم منح في مجال التكنولوجيا الحيوية ضرورة تغطيتها للجوانب الخاصة بسياسة البحوث وإدارتها وكذلك السلامة البيولوجية.

لقد أجرى المركز في العام ١٩٩٨ مسحاً لمراكز البحوث الزراعية الدولية للتعرف إلى المسائل التي تواجهها في إطار أعمالها عند استخدام المواد الوراثية المحمية بحقوق الملكية الفكرية وغيرها من المدخلات العلمية الأخرى. وكشفت نتائج المسح أن هنالك اتفاقية خاصة تدعى "اتفاقية نقل مواد" قد تم استعمالها في ٧٥ في المائة من الحالات للسماح باستخدام تقنية معينة؛ في حين استخدمت التراخيص في ٣٠ في المائة من الحالات تقريباً. وتواجه مؤسسات القطاع العام حالياً مشكلات قانونية وأخلاقية نتيجة الاستخدام المفرط لاتفاقيات نقل المواد. ومن بين هذه المشكلات كيفية التوفيق بين الملكية الخاصة المطلقة لبراءات الاختراع والملكية العامة التقليدية لمخرجات مراكز البحوث الزراعية الممولة من القطاع العام. والمشكلة الأخرى هي كيفية تغطية نفقات الاستشارات اللازمة للبت في القضايا القانونية المرتبطة بهذا الموضوع.

ويوسع المركز حالياً نطاق المسح المشار إليه أعلاه ليشمل ٢٠ "مجموعة أبحاث" تابعة لمؤسسات البحوث الزراعية العامة في خمسة بلدان في أمريكا اللاتينية. وستبين نتائج هذا المسح المتوقعة في أواسط عام ١٩٩٩ ما إذا كانت الدول النامية تواجه المشكلات ذاتها في استخدامهم التقنيات المحمية بحقوق الملكية.

خلاصة

تطرق هذا التقرير السنوي إلى بعض المسائل الرئيسة المرتبطة بالتكنولوجيا الحيوية والتحديات التي تواجه العلماء والمشرفين وأصحاب القرارات في العالم النامي في هذا المجال. وتشير خبرة المركز إلى أن تنمية الموارد البشرية هو التحدي الرئيسي الذي يواجه البلدان النامية في مجال التكنولوجيا الحيوية في الوقت الحاضر. لذا فإن نشاطات المركز ستتركز على تطوير المعرفة لدى العاملين وتعزيز قدراتهم في هذا المجال. ففي نهاية المطاف فإن وضع وتنفيذ برامج منتجة للبحوث في مجال التكنولوجيا الحيوية وذات علاقة مباشرة بحاجات السكان الأكثر فقراً وتحافظ على البيئة ستعتمد على مهارات وخبرات الأشخاص الذين يضطلعون بهذه المهام.

السلامة البيولوجية

تعتبر السلامة البيولوجية من أكثر الموضوعات التي تثير جدلاً حاداً في مجال التكنولوجيا الحيوية. ويعني هذا المصطلح السياسات والإجراءات التي يعتمد عليها بلد ما لضمان سلامة تطبيقات التكنولوجيا الحيوية فيما يتعلق بالصحة العامة والبيئة والتنوع الحيوي. وعادة ما ترتبط السلامة البيولوجية في المجال الزراعي بإنتاج كائنات حية محوره جينياً مثل المحاصيل المعدلة وراثياً.

وتبين تجربة المركز أن برامج السلامة البيولوجية الفعالة تشترك في أربع خصائص أساسية: أولها أن تستند هذه البرامج إلى دليل مكتوب يحدد بوضوح بنية النظام ودور ومسؤوليات الجهات ذات العلاقة والطريقة التي ستنفذ في عملية المراجعة. ثانيها أن تدار البرامج من قبل أشخاص مدربين تدريباً جيداً يحظون بدعم مؤسساتهم. ثالثها أن تستند إلى المعلومات العلمية الأكثر حداثة. ورابعها استعمالها للتغذية الراجعة للحصول على معلومات جديدة وتنقيح النظام كلما اقتضى الأمر ذلك.

والأشخاص الأكثر ارتباطاً بالإجراءات الخاصة بالسلامة البيولوجية هم العلماء في القطاعين الخاص والعام الذين يسعون إلى اختبار الكائنات الحية المحورة جينياً وأعضاء اللجان التي تقرر الموافقة أو عدم الموافقة على اعتماد تقرير مخبري أو ميداني يتعلق بالسماح باستعمال كائن محور وراثياً. والأشخاص المكلفين بهذه المهام يجب أن يكونوا على إلمام تام بالمسائل البيئية المرتبطة بمنتجات التكنولوجيا الحيوية. وعليهم كذلك أن يكونوا قادرين على إدراك ما يمكن أن يشكل مخاطر محتملة وتحديد استراتيجية قابلة للتطبيق لإدارة هذه المخاطر. ويمثل تعزيز قدرات ومهارات العاملين في هذا المجال أحد أهم المحاور الرئيسية لعمل المركز في مجال التكنولوجيا الحيوية.

حقوق الملكية الفكرية

سيواجه معظم معاهد البحوث الزراعية في المستقبل القريب آثار تزايد حقوق الملكية الممنوحة للابتكارات الزراعية في مجال التكنولوجيا الحيوية، إن لم يكونوا قد واجهوها فعلاً. فعدد براءات الاختراع قد ازداد منذ عام ١٩٨٩ بحوالي ٢٥٠ براءة سنوياً حسب دراسة نشرت عام ١٩٩٦. وهناك دلائل ومؤشرات واضحة حول التغير الملحوظ على الصعيد الدولي فيما يتعلق بحماية حقوق الملكية الفكرية. فعلى سبيل المثال قد تشكل حماية تقنية من التقنيات أو مادة وراثية شرطاً من الشروط التي يتعين على معهد من معاهد الدول النامية تلبية للمشاركة في مشروع تعاوني للبحوث على الصعيد الدولي. ولابد من الإشارة في هذا المجال إلى أن السياسات الوطنية المتعلقة بحقوق الملكية الفكرية قد تتغير نتيجة المفاوضات الدولية كالاتفاقية العامة للتعريفات الجمركية والتجارة (الجات) واتفاقية التنوع البيولوجي على سبيل المثال. ومن المحتمل أيضاً أن يكون الباحثون في البلدان المتقدمة علمياً قد استحدثوا مواد أو تكنولوجيات تستدعي فرض حقوق الملكية لمنع الآخرين من الوصول إليها أو حماية العوائد المادية التي يتوقعونها من حقوق الامتياز. وفي العادة تتردد الدول النامية من الاعتراف بحقوق الملكية الفكرية أو تنفيذها ولا سيما فيما يتعلق بالحقوق المتصلة ببراءات الاختراع حيث ترى هذه البلدان أن براءات الاختراع تحرمها من الاستفادة من التكنولوجيا الجديدة. غير أن الانتقال إلى سوق دولية حرة يثير التساؤلات حول ما إذا كان التهاون في احترام حقوق الملكية الفكرية سيؤدي إلى تنمية اجتماعية واقتصادية في العالم الثالث. ففي مجال التكنولوجيا الحيوية الزراعية على الخصوص يسود الاعتقاد بأن تعزيز معايير حماية حقوق الملكية الفكرية سيؤدي إلى تيسير حصول الدول النامية على التكنولوجيا المحمية. ومن شأن هذه المعايير أن تزيد من فرص المشاركة في المبادرات الوطنية والدولية الجماعية وأن تيسر اجتذاب الاستثمارات الأجنبية في الصناعات الزراعية.

الثورة العلمية

ألقت الوتيرة السريعة للتقدم العلمي على عاتق مديري البحوث والباحثين مسؤولية مواكبة التطورات في مجال التكنولوجيا الحيوية، غير أن هنالك مناطق كثيرة في العالم النامي ما تزال تقتقر إلى المعلومات حيث يواجه العاملون صعوبات في الحصول على المعلومات والوثائق العلمية التي تفيدهم في مجال تطبيق نتائج البحوث المتعلقة بالتكنولوجيا الحيوية. وتزداد مهمتهم صعوبة بفعل ما يروج أحيانا من ادعاءات مبالغ فيها بشأن المنافع أو المخاطر المحتملة المرتبطة بالتكنولوجيا الحيوية.

علاوة على ذلك فقد أصبحت السمات "الثورية" المرتبطة بالتكنولوجيا الحيوية الحديثة تكتسي طابعا إداريا وتقنيا. ففي التكنولوجيا الحيوية، على سبيل المثال، تزداد الحاجة إلى العمل الجماعي وإلى قيام تعاون فيما بين المؤسسات، إذ يصعب على الفرد أو المؤسسة الواحدة حشد المعارف والخبرات والموارد اللازمة لإنجاز مشاريع التكنولوجيا الحيوية بنجاح نظرا لتعقد العمليات والتكاليف المرتبطة بها.

ولا يزال النقاش كذلك دائرا حول إمكانيات التكنولوجيا الحيوية وقدرتها على حل المشكلات المرتبطة بالإنتاج الزراعي وحماية البيئة في البلدان النامية. ولما كانت منتجات التكنولوجيا الحيوية لا تزال قليلة وفي بدايتها فإن هنالك نقصاً في البيانات الميدانية والموثقة فيما يتعلق بأدائها في حقول المزارعين. بالإضافة لذلك فإنه يمكن القول - من ناحية جدلية - بإمكانية زيادة الغلة بصورة مباشرة باستخدام التقنيات البسيطة المتاحة حالياً كنظم مكافحة المتكاملة للأوبئة ولاسيما في المناطق الأقل نمواً في العالم.

إن حداثة بعض هذه التقنيات يجعل من الصعب أيضاً تقدير تكاليف البحوث الخاصة بها أو المنافع التي يمكن جنيها منها. فبرامج البحوث في التكنولوجيا الحيوية تنتج عادة منتجات بسيطة تستخدم بدورها في بحوث أخرى ونادراً ما تكون على شكل منتج نهائي كبذور يمكن بيعها للمزارعين مباشرة. وأخيراً فإن هنالك حالة من عدم التيقن من أن منتجات التكنولوجيا الحيوية النهائية ستحظى بقبول المزارعين أو المستهلكين.

تحديد الأولويات بالرغم من الصعوبات

قام المركز الدولي لخدمات البحوث الزراعية والمعهد الوطني الشيلي للبحوث الزراعية بتبني واختبار طريقة جديدة لوضع الأولويات لبرنامج البحوث في التكنولوجيا الحيوية. وتسمى هذه الطريقة "عملية التحليل الهرمي". وتساعد هذه الطريقة فريق واضعي الأولويات على تجزئة مشكلة أو قضية معقدة إلى مشكلات أو قضايا بسيطة يسهل بحثها ومناقشتها من قبل أشخاص ذوي مؤهلات وخبرات مختلفة.

ولئن كانت الطريقة ما تزال بحاجة إلى مزيد من التنقيح، فقد حققت نتائج مشجعة في الشيلي حيث مكنت الفريق الشيلي من تناول مسألة "عدم التيقن"، فيما يتعلق بإمكانيات التكنولوجيا الحيوية، من خلال تحليل تفصيلي لمتغير "قرص نجاح البحوث". وقد عالج الفريق النقص في البيانات بشأن المنافع المحتملة من خلال نهج جماعي لاتخاذ القرارات، استفاد من خبرات وأفكار عدد كبير من الأشخاص الملمين بالموضوع. وقد أدى اعتماد معايير واضحة ووصفية إلى تيسير اتخاذ القرارات. كما ساهمت الجلسات الجماعية في استبعاد التحيز للآراء الشخصية وفسي تبني الجميع للقرارات التي تم التوصل إليها، وزودت الباحثين بالمعلومات والتصورات فيما يتعلق بالآثار المحتملة لمشاريعهم. ويقوم المركز حالياً باختبار ونشر طريقة التحليل الهرمي هذه في عدد من البلدان.

إدارة التكنولوجيا الحيوية في الدول النامية

القضايا المستجدة

في آذار/مارس من العام ١٩٩٨ منحت الولايات المتحدة الأمريكية براءة اختراع لابتكار يتيح للعلماء إضافة مورث إلى نبات ما بقصد وقف إنتاجه لبذور حيه، وبذا يصبح النبات عقيماً وتكون البذور الناتجة غير قابلة للإنبات. وهذا المورث المشهور الآن باسم "المورث القاتل" يمكن استخدامه في العديد من بذور المحاصيل المتاحة على نطاق تجاري كالأرز والقمح والخضراوات. ومن الواضح أن جني الفوائد من هذا الابتكار يقتصر على منتجي البذور على النطاق التجاري. ومن شأن استخدام هذا المورث أن ينهي الممارسة المعتادة للمزارعين في الاحتفاظ ببعض البذور من إنتاجهم لإعادة زراعتها في الموسم التالي، حيث سيتوجب عليهم شراء بذور جديدة كل سنة. وبما أن ممارسة الاحتفاظ بالبذور لإعادة زراعتها لا تزال منتشرة، خاصة لدى الفقراء من مزارعي البلدان النامية، فستكون لتكنولوجيا المورثات القاتلة آثاراً واسعة النطاق على هذا البلدان.

ويسعى حالياً "مبتكرو" المورث إلى توسيع نطاق حماية براءة الاختراع المتصلة بابتكارهم لتشمل نحو ٨٠ بلداً، من بينهم أكثر من ٤٠ بلداً من البلدان الأقل نمواً في العالم. وقد دفعت تطبيقات براءة الاختراع والمسائل العلمية والأخلاقية المتصلة بها بموضوع التكنولوجيا الحيوية إلى الواجهة فيما يتعلق بسياسة البحوث الزراعية وإدارتها.

الأغذية والبيئة والتكنولوجيا الحيوية

"التكنولوجيا الحيوية" هي مجموعة مترابطة من التقنيات الجزيئية التي يستخدمها العلماء لتحسين التركيب الوراثي للنباتات والحيوانات بغية الوصول مثلاً إلى نبات أكثر صلابة أو أكثر مقاومة للجفاف. وما ذكر أعلاه يبين بعضاً من الجدل الأخلاقي والعلمي الحاد الدائر حول التطبيقات الخاصة بالتكنولوجيا الحيوية في مجال الزراعة. وبالرغم من أن هنالك عدداً قليلاً جداً من تطبيقات التكنولوجيا الحيوية التي لا تثير الجدل، فإن استخدام التقنيات الحديثة ما زال يعتبر مدخلاً رئيساً لتحقيق إنجازات في مجال البحوث الزراعية ولا سيما في الدول النامية. ومع إدراكنا بأن الابتكارات العلمية وحدها لا تقضي على المجاعة والفقر في العالم، فإن تقنيات التكنولوجيا الحيوية تقدم وسائل لتخفيف آثار النقص في الغذاء الذي يواجهه اليوم ملايين الناس.

وبناءً على المعطيات المذكورة أعلاه فقد باشر المركز الدولي لخدمات البحوث الزراعية (المشار إليه فيما بعد باسم "المركز")، ومنذ عام ١٩٩٢، بتنفيذ برنامج للبحث وتقديم المشورة في مجال سياسة التكنولوجيا الحيوية وتنظيمها وإدارتها. وخلال السنوات الست الأولى من هذا البرنامج المسمى "خدمات التكنولوجيا الحيوية الوسيطة" (المشار إليها فيما بعد باسم "البرنامج")، تمت إقامة شراكات مع العلماء والمشرفين على برامج بحوث التكنولوجيا الحيوية في أكثر من ٢٥ بلداً من البلدان النامية وعلى المستوى الدولي. ويعتمد هذا البرنامج نهجاً شمولياً يتمحور حول السكان عند تحليل التحديات المرتبطة بالبحوث في مجال التكنولوجيا الحيوية وتقديم المشورة بشأنها. ويجري في إطار هذا البرنامج، وبالتعاون الوثيق مع شركاء في أفريقيا وآسيا وأمريكا اللاتينية والشرق الأدنى، التعرف إلى مختلف احتياجات البلدان التي تنوي إقامة برامج بحوث في مجال التكنولوجيا الحيوية.

ويركز هذا التقرير السنوي على العمل الذي أنجزه البرنامج، كما ويسلط الضوء على بعض السمات الخاصة بالتكنولوجيا الحيوية وتأثيرها على قدرة المشرفين على البحوث على اتخاذ القرارات في مجال سياسة البحوث وبرمجتها.

CGIAR-Supported International Centers



1. CIAT Centro Internacional de Agricultura Tropical, Cali, Colombia
2. CIFOR Center for International Forestry Research, Bogor, Indonesia
3. CIMMYT Centro Internacional de Mejoramiento de Maíz y Trigo, El Batán, Mexico
4. CIP Centro Internacional de la Papa, Lima, Peru
5. ICARDA International Center for Agricultural Research in the Dry Areas, Aleppo, Syria
6. ICLARM International Center for Aquatic Resources Management, Manila, Philippines
7. ICRAF International Centre for Research in Agroforestry, Nairobi, Kenya
8. ICRISAT International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India
9. IFPRI International Food Policy Research Institute, Washington, DC, USA
10. IITA International Institute of Tropical Agriculture, Ibadan, Nigeria
11. ILRI International Livestock Research Institute, Addis Ababa, Ethiopia/Nairobi, Kenya
12. IPGRI International Plant Genetic Resources Institute, Rome, Italy
13. IRRI International Rice Research Institute, Los Baños, Philippines
14. ISNAR International Service for National Agricultural Research, The Hague, The Netherlands
15. IWMI International Water Management Institute, Colombo, Sri Lanka
16. WARDA West Africa Rice Development Association, Bouaké, Côte d'Ivoire