CGIAR NEWS

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

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Agricultural Science Forum Strengthens Global Agricultural Research System

Science leaders from industrialized and developing countries, international and national research centers, and representatives from agro-industry, advanced research institutions, universities, non-governmental organizations (NGOs) and farmers' associations, agreed to jointly launch a global agricultural research system based on a common global framework for research and close collaboration.

A two-day Global Forum on agricultural research was hosted by CGIAR during its week-long annual International Centers Week meeting (Oct. 28-Nov. 2) in Washington, DC. The Global Forum in which a broad spectrum of research leaders participated marked the first time that the various components of agricultural research for development met to explore the needs and opportunities for collaboration, and practical measures to strengthen partnerships. The gathering had been preceded by a series of regional fora promoting agricultural research collaboration. Among the themes on the agenda were biotechnology, genetic resources conservation and utilization, ecoregional research, and public policy and institutional strengthening.

The Global Forum, which was chaired by the President of IFAD, Fawzi Al-Sultan, adopted a Declaration of Global Partnership in Agricultural Research and agreed on a related Plan of Action that was subsequently finalized.

In addressing the Forum, CGIAR Chairman Ismail Serageldin said: "Agricultural research, if it is to be relevant and realistic, must be built in collaboration with farmers and farmers' organizations, and must be sensitive to the economic, social and conceptual framework in which farming communities make decisions. The era of research which produces technological innovations without reference to the needs of the producers is behind us. The revolution in molecular biology, and in information technology, offer us unprecedented opportunities for harnessing new resources on behalf of the poor. This cannot be achieved by any organization single-handedly. We must pull together to win together."

CGIAR Honors Six World Food Prize Laureates

Six out of the twelve eminent international scientists who were awarded the World Food Prize since it was created ten years ago were selected for their successful work at and with research centers of the Consultative Group on International Agricultural Research (CGIAR).

"The World Food Prize is the foremost international award recognizing outstanding individual achievements in improving the quality, quantity, or availability of food in the world," according to former U.S. President Jimmy Carter, a member of the Prize's Council of Advisors.

At a special ceremony during International Centers Week, the Group honored the six CGIAR prize winners. "We are extremely proud that half of all World Food Prize laureates have been selected from among CGIAR researchers. This means an international recognition of the excellence of the scientific work of the 16 international agricultural research centers supported by the Group," said CGIAR Chairman Ismail Serageldin.

"We are happy that four of our six laureates can be with us here today. They represent not only the best of 25 years of CGIAR work: they stand for the world's best agricultural science, for many small and big research successes that started with the spectacular breakthroughs of the Green Revolution of the 1970s and 1980s and continue today with cutting-edge biological pest control and super

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EDITORIAL

The Global Forum: An Agricultural Science Summit

International Centers Week 1996 vastly differed from any of the 23 that preceded it. For the first time, the CGIAR had opened its doors to all actors in agricultural research—and they came: the national agricultural research systems, the international agricultural research centers outside the CGIAR, the universities and other advanced research institutions, the private sector, the NGOs, the farmers' associations and, last but not least, the donors' organizations.

Two days in the middle of the week-long meeting were dominated by the leaders of the wide, colorful and different agricultural research world outside the CGIAR who had come to attend what has been dubbed an "agricultural research summit," the Global Forum chaired by Fawzi Al-Sultan and Abdelmajid Slama (IFAD).

"...there were also representatives of the grassroots workers close to the "indigenous knowledge" that was so often mentioned during the discussions of the Global Forum..."

Not only was the range of participants wide: some of them represented national research systems several times the size of the CGIAR with, say, 26,000 scientists and technicians, or the private sector with companies employing 10,000 scientists in their R&D departments. But there were also representatives of the grassroots workers close to the "indigenous knowledge" that was so often mentioned during the discussions of the Global Forum.

Surprising was the unanimity prevailing among these research leaders that steps needed to be taken to firm up the somewhat vague global agricultural research system that had de facto existed for quite some time. There was agreement that the challenges of the future—food security, better natural resource management, and elimination of poverty—required much closer collaboration among the various actors. But the participants went beyond that: they created basic elements for future coordination of work of the Global System. They agreed to hold global forums at regular intervals based on national, subregional and regional forums. These forums will serve primarily as an important mechanism to facilitate the forging of partnerships and collaboration.

Adopting the theme, "Toward Global Partnership in Agricultural Research", the Global Forum marked the culmination of a deliberative process involving a series of meetings and consultations on global partnerships in agricultural research. This was initiated with a NARS Consultation convened in Rome in December, 1994 by IFAD in partnership with the Food and Agriculture Organization (FAO), the International Service for National Agricultural Research (ISNAR), Swiss Development Cooperation (SDC) and with support from Denmark, Japan and the Netherlands.

Other agencies like the World Bank and the European Union joined and facilitated the process. In convening the Global Forum, ISNAR helped bringing from the different regions to Washington DC key NARS leaders and representatives of universities, NGOs and the private sector.

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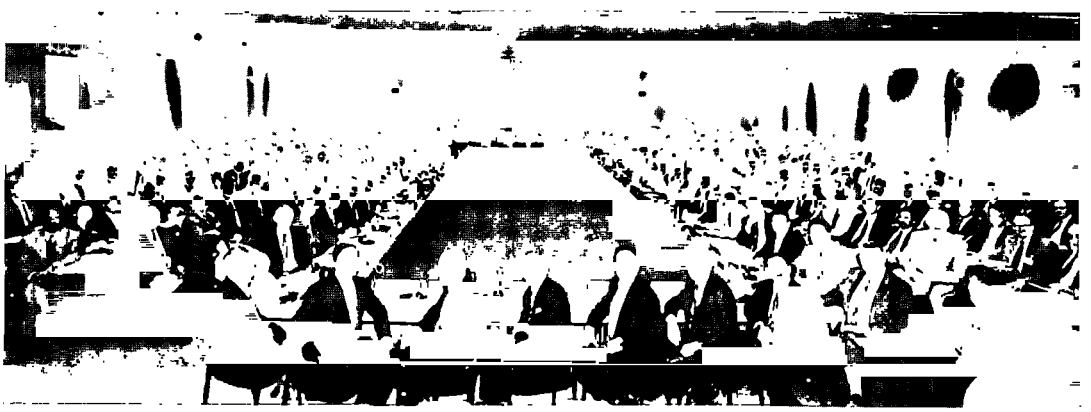

Global Challenges Require Global Efforts

by Ismail Serageldin[1]

The Consultative Group on International Agricultural Research (CGIAR) is privileged to be associated with the World Food Summit. As Chairman of the CGIAR, I want to assure you that the Group, which now includes almost as many developing countries as industrialized countries among the donors, is motivated by a vision in which the world's deprived are liberated from the grip of hunger and poverty. The scientists of the CGIAR who were the artisans of the first green revolution, are fully engaged, with others, in creating the new, doubly green revolution. From policy to technology to environmental management to poverty reduction, we are committed to a holistic approach to promote, through research, sustainable agriculture for food security in the developing countries.

Let me state a basic proposition. The world's core objectives of poverty reduction, food security and sustainable natural resource management cannot be met unless rural well-being in general, and a prosperous private agriculture for small and medium size holders in particular, are nurtured and improved. Central to improving the productivity and profitability of agriculture are improved technology, appropriate policies and supportive institutions. At the core of technological improvement is agricultural research, the area in which the CGIAR functions.

We need to intensify complex agricultural production systems sustainably while preventing damage to natural resources and biodiversity and contributing to the improved welfare of farmers and consumers. We must focus especially on small holders and the landless and particularly the women, who remain the primary agents of positive social change in the world, and who are, sadly, discriminated against in most societies.

These are formidable challenges especially as we also address the needs of the fragile ecosystems and marginal areas. I am convinced, however, that research can help if it follows the advice of CGIAR pioneer M. S. Swaminathan, namely that it must be "pro-poor, pro-women, and pro-environment."

Global challenges require global efforts. The CGIAR is one of many actors in agricultural research. Bringing together all the actors in a manner that the whole is more than the sum of the parts was at the heart of a Global Forum organized by the CGIAR in October. Its objective was to engage scientists and decision-makers in both national and international organizations to work with all other actors in an emerging global system of agricultural research: NGOs, farmer's groups, the private sector, local and national governments, each of whom have something important to contribute. This Forum, whose core will be the National Agricultural Research Systems (NARS) of the developing world and their regional fora, should help to lay the basis for enhanced cooperation. It is the beginning of a global agricultural research system that should reach all the laboratories and research stations and the farthest flung research workers.... and indeed the whole of the agricultural community, farmers, particularly women farmers, included. The declaration and action plan that emanated from this group are available here for the delegates.

The CGIAR centers have a special role in this global effort. They can, while conducting cutting-edge science for the benefit of the world's poor, serve as platforms for the exchange of ideas and the development of new technologies. Past successes challenge us to mobilize again to meet new challenges, to chart new courses, to undertake renewed agricultural transformation — in concert with the international community.

The CGIAR has an established track record of international collaboration. It was the first and so far the only group to have, through agreements signed in 1994, put their collections of genetic materials, numbering 600,000 samples, under the inter-governmental auspices of the FAO Commission on Genetic Resources for Food and Agriculture. The CGIAR is committed to the continued stewardship of these resources, ensuring that they remain available for the world community.

The CGIAR is also very pleased to have been very closely associated with the FAO in the International Conference on Plant Genetic Resources held in Leipzig last June. Throughout the preparatory period the CGIAR centers worked with FAO and many national programs to help prepare country studies and regional synthesis reports. The Global Plan of Action for Plant Genetic Resources adopted by the 150 nations represented at the conference, will guide the future work of the CGIAR in the conservation and use of the genetic resources maintained by the centers.

The agenda I have outlined is challenging. It will require not only excellent scientific research, but also changes in policies, institutions and new ways of collaborating with many different actors. We and others have to rise to these challenges. But the longest journey starts with a single step. So let us start. Let us start together; and let us start without delay. If not us, who? If not now, when?

[1] Statement of the CGIAR delegation at the FAO World Food Summit, delivered by Per Pinstrup-Andersen on behalf of Chairman Serageldin, November 14, 1996

(Continued from page 1)

World Food Prize

high yielding cereal varieties," said Mr. Serageldin, who is also The World Bank Vice President for Environmentally Sustainable Development.

"When honoring our six laureates I should also mention Dr. Norman Borlaug, the eminent U.S. wheat breeder whose high yielding wheat varieties, developed at the International Center for the Improvement of Maize and Wheat (CIMMYT) in Mexico, brought him the Nobel peace prize in 1970. I dare say that the achievements of these seven current and former colleagues are but the tip of the iceberg of CGIAR research, and that there are many other excellent scientists among the 880 international researchers currently working at the CGIAR centers whose contributions to sustainable food security and poverty alleviation will never become known outside their peer groups — unless they become laureates themselves," the CGIAR Chairman said.

Dr. Gurdev S. Khush

The U.S. $200,000 World Food Prize was awarded to:

1996: Dr. Henry M. Beachall and Dr. Gurdev S. Khush, rice breeders whose work has revolutionized Asian agriculture, improving the diets and the environment for literally hundreds or millions of people.

Dr. Beachall is a U.S. rice breeder whose most significant achievement was his role in the development in the 1960s of IR8, a semi-dwarf rice developed at the International Rice Research Institute (IRRI) in the Philippines that far surpassed the yields of traditional Asian rices.

Dr. Khush, an Indian national who now heads IRRI's breeding program, introduced IR36, one of the most widely grown food crop varieties in the world. He is now developing another set of rice varieties dubbed "super rice" which have the potential of increasing yields by an additional 25 percent.

1995: Dr. Hans Herren, a Swiss na-

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Declaration and Plan of Action for Global Partnership in Agricultural Research[1]

Declaration

We, the representatives of the national agricultural research systems (NARS), regional and subregional organizations, universities and advanced research institutions, non-governmental organizations (NGOs), farmers' organizations, private sector, and international agricultural research centers (IARCs), gathered in a Global Forum on Agricultural Research at CGIAR International Centers Week,

- **Cognizant** of the formidable challenges of the future, in particular the need

  —to alleviate poverty

  —to increase productivity and resource use efficiency to feed an expanding population

  —to address environmental degradation, sustainably manage the natural resource base, and develop and implement more appropriate agricultural policies and sustainable technologies;
- **Aware** that the world leaders are holding a summit to address the global challenge of ensuring food security;
- **Convinced** that scientific and technological responses and socio-cultural factors are essential elements in improving food and nutritional security as well as more sustainable use of cropland, rangeland, aquatic, and forest resources;
- **Realizing** that the national agricultural research systems are the cornerstone of the emerging global research system,
- **Recognizing** that current cooperative research arrangements need to be adjusted to meet challenges of unprecedented nature and magnitude;

hereby affirm our strong commitment to contribute to the development of productive, sustainable, and equitable agriculture. We recognize the crucial role played by farmers, especially women, in agriculture and natural resource management. We agree to work in partnership with them towards their empowerment, building on their indigenous knowledge systems.

We fully recognize the immense value of collaboration and research partnership and urge that such collaboration be governed by the principles of subsidiarity, participatory decision making, complementarity of efforts, adaptability, openness, and, above all, a deep sense of commitment to the common purpose. We agree to meet the challenges of the present and the future through an efficient, effective and coherent global agricultural research system.

Plan of Action

In the pursuit of our common objectives and the foregoing Declaration, we commit ourselves to undertake the following actions:

- **Mobilize** the world scientific community in support of a global framework for agricultural research aiming at:

  —alleviating poverty

  —achieving food security, and

  —assuring sustainable use of natural resources;
- **Contribute** to the strengthening of NARS and the subregional and regional fora;
- **Foster** the participation in research collaboration by national agricultural research institutes (NARIs), regional and subregional research organisations, international agricultural research centers (IARCs), advanced research institutes (ARIs), universities, private sector, NGOs, farmers and farmers' organizations;
- **Encourage** the identification of concrete collaborative projects through suitable mechanisms including sub-regional and regional fora;
- **Convene** a Global Forum on Agricultural Research every three years to exchange information in order to identify common challenges, confirm principles of collaboration, and propose alternative means of implementing collaborative programs with the purpose of facilitating partnerships.

By committing ourselves to this task and establishing the necessary enabling mechanisms, based on a bottom-up approach and strong national, subregional and regional fora, we strongly believe that the global agricultural research system will be capable of addressing the agricultural research priorities required to meet the challenges and opportunities that humanity is facing today and in the foreseeable future.

In order to implement this Plan of Action, we propose to increase efficiency in research management and collaboration through pooling of resources, and call on the development assistance community, the governments of developing countries, and all stakeholders in agricultural and rural development to increase their support to agricultural research.

We hereby mandate the Global Forum Steering Committee, consulting as necessary, to translate this Plan into a detailed program of activities.

Washington, D.C.,
October 31, 1996

[1] adopted by the Global Forum at International Centers Week 1996

A Research Culture is Born

Brazilian Farmers Take an Active Role in Cassava Research

In Northeast Brazil, one of the country's most important cassava-producing region, rural communities must contend with unpredictable rainfall, a wide range of damaging pests, poor soils, and low prices for their staple crop. Not surprisingly, these farmers are among the poorest of the nation's rural poor.

Against this bleak background, the Sustainable Cassava Plant Protection (PROFISMA) project has given growers a new faith in agricultural research and in their own problem-solving abilities.

CIAT

Upstream, Downstream

The project is jointly managed by CIAT and the National Center for Research on Cassava and Tropical Fruits (CNPMF) of the Brazilian Agricultural Research Enterprise (EMBRAPA). Research and agricultural extension agencies in four northeastern states also take part. The project is financed by the United Nations Development Programme (UNDP), which also supports a parallel project in Africa, carried out by the Nigeria-based International Institute of Tropical Agriculture (IITA).

"Project activities range from more basic research in the laboratory to participatory research with the farmers," says CIAT entomologist Stephen Lapointe. The results of this integrated approach are already becoming evident. For example, the project has introduced natural enemies of the cassava mealybug from Colombia, Venezuela, and Ecuador and is studying their ability to control this major pest.

The project has also formed a network of local agricultural research committees (COPALs), which give the farmers an active role in shaping the research agenda and finding solutions to problems. "The scientists no longer have the last word on research priorities," Lapointe says.

The Same Language

So far, 20 committees have been set up in the states of Bahía, Ceará, Pernambuco, and Paraiba. Each group, involving 30 to 100 farmers, applies a method developed by CIAT in Colombia and applied successfully in more than half a dozen other Latin American countries.

The work begins with a community diagnosis of production problems, coordinated by the COPALs, with assistance from scientists and extension workers. More than 2,500 farmers from 75 communities participated in the initial diagnosis. First, they identified a wide range of problems and then pinpointed the most important ones. After identifying the main problems, their causes, and probable consequences, the groups went on to identify possible solutions.

Currently, the farmer committees are taking part in the planning, implementation, and evaluation of field experiments with the technology options available. They also help analyze the results and communicate them to other committees and communities. "We already had a wide range of technologies, but they just weren't reaching the farmers," says Brazilian entomologist Ítalo Delalibera. "The situation is changing rapidly, now that rural communities are directly involved in the research. They're excited about their new role in solving problems."

"Now, we're speaking the same language," says Sandra Lucía de Carvalho, an agricultural engineer from Bahía and one of the 60 extension workers trained by the project in participatory methods. That is an important step toward consolidating the emerging research culture of farming communities in Northeast Brazil.

(CIAT)

In the next issue...

- Integrated Pest Management: The System-Wide Program
- Triticale—A Reappraisal

Steppe or Desert?

ICARDA Warns of Global Rangeland Crisis

Steppe, when used as rangeland, provides essential feed resources for millions of sheep and goats, as well as firewood for pastoralists. However, throughout the world's drier areas, steppe is being damaged at a catastrophic rate, according to ICARDA.

"Recent estimates show that the steppe area is being reduced by as much as 1 percent annually by a combination of desertification and improper cereal cropping," says Gustave Gintzburger, Leader of ICARDA's Pasture, Forage and Rangeland Program. The West Asia and North Africa (WANA) region, in which ICARDA is situated, has about 272 million hectares of such land; the newly-independent republics of Central Asia, 260 million hectares. This gives a total of over half a billion hectares.

But it is a finite resource. "About nine million square kilometers of the world's drylands have been rendered unproductive in the last fifty years," says Gintzburger. "Ordinary farmland wrecked by unwise irrigation accounts for much of this, but rangeland losses are also significant. The rangeland can no longer cope with the demands upon it; whereas forty years ago it provided about 60-80 percent of the small ruminants' diet, it can now barely meet 5-10 percent in the WANA region."

A further threat to this fragile environment is firewood gathering. Research in Iraq and North Africa in the late 1960s suggested that a nomad tent of 10 persons would consume 3.5-4 tons of dry wood a year. This compares with a current aboveground biomass in the rangelands of 200 to 500 kilograms per hectare. In addition to a resulting shortage of fuel and feed, the vegetation cover and soil composition of the rangelands are affected, which in turn is likely to cause a reduction in convective rainfall and thus cause local drought. The loss in rangeland biomass raises atmospheric carbon dioxide concentrations, with potentially global climatic implications.

"At the moment, the drought-and-dioxide threat is a matter of informed speculation," says Gintzburger. "Certainly there is a need for strong action in rangeland protection and rehabilitation. We cannot afford to wait any longer."

ICARDA has taken a number of measures to combat the desertification menace. A first step is to find out more about the way people actually use the rangeland and develop models based on this information which can help predict the effect of policy changes, for example in land-tenure patterns. Range-users need to be closely involved in the conservation, rehabilitation and development process. ICARDA is working on this; the research includes finding out more about the role of women in the pastoralists' decision-making processes.

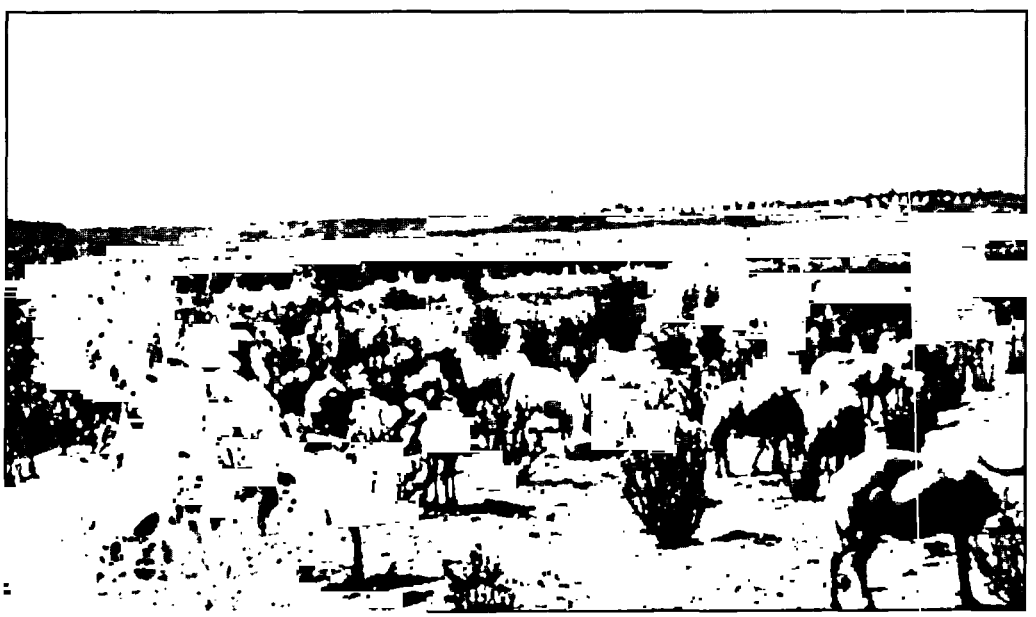
Areas at risk can be identified by surveys using aerial photography and Geographic Information Systems (GIS). Japanese scientists have collaborated with ICARDA in the execution of this project.

Conservation and rehabilitation efforts can use a variety of simple technologies, such as reseeding of damaged land with native pasture legumes on marginal cropping land, or using drought-resistant fodder shrubs such as *Atriplex* sp., or *Salsola* sp., to establish grazing reserves on the steppe to feed livestock at critical times of the year. This work is being restricted to reserves because of the cost, and because the shrubs compete with barley cropping in the steppe - not always popular with range users.

"We believe that this crisis can only be dealt with by looking at all the factors involved," says Gintzburger. "For decades, overgrazing has been blamed on the presence of too many animals, but that's too simple an answer. The animals are providing our food! If there is a way to stop and reverse rangeland damage, we'll find it by looking at all the factors in context.

"Certainly we have to do something. Every time I go to work in the steppe, I look around me and think: what will this be in five years' time? Productive rangeland? Or man-made desert?"

(ICARDA)



ICARDA

One Woman's Sesbania Story

by Joan Baxter

Sesbania sesban is a leguminous tree that has become famous for its capability to enrich soils when used as fallow in crop rotations.

Agroforestry researchers from the Zambia-ICRAF research project in Chipata, Eastern Province, are delighted by the widespread enthusiasm among farmers over improved fallows with Sesbania sesban. This year they estimate that over 1000 farmers in the region are experimenting with the fallows. And, as Donald Phiri and Steve Franzel report, they are also looking at individual farmers to find out more about how the technology is spreading and how it is faring in farmers' fields. Phiri and Franzel, who are researchers with ICRAF, recently visited Zelina Mwanza, a small-scale farmer of Kalichero Camp, near Chipata, and asked her to share her story on fallows—to tell them why she decided to try out the technology and how it has fared on her fields.

Mwanza says that she came to know about improved fallows through her camp officer in the 1993-94 season, shortly after the officer had attended a field day at Msekera Research Station. In January 1994, project staff planted a researcher designed- and -managed trial in Kalichero and Mwanza was able to collect 620 excess sesbania seedlings. She removed the seedlings from the polythene bags and carried them in a washbasin on her head to her field, 6 km away. It took her two trips to complete the task. She then used the seedlings to establish a trial she designed and managed herself, with an improved fallow of 528 m^2. Shortly thereafter, Mwanza herself attended a field day at Msekera and visited other farmers who had planted improved fallows. At the start of the 1994-95 season, she used naturally regenerated seedlings to fill gaps in her field and to establish a second, smaller improved fallow. She also tried to plant an improved fallow of Cajanus cajan (pigeonpea) but failed, due to drought in the early part of the season.

In late 1995, Zelina Mwanza cut down her 2-year-old sesbania trees and incorporated the leafy biomass into the soil. She used the firewood for preparing lunches in the field—firewood that she says she would have had to collect from about 5 km away had she not had the sesbania firewood. She planted maize, and during the course of the season, she noted that land preparation required about 25 percent less time, weeding 50 percent less time than it did on adjacent fields that had been continuously cropped or planted after a bush fallow. She was very pleased with her maize yield following the fallows, she harvested about 3 bags (270 kg or roughly 3 t/ha). She estimates that if she had used fertilizer at the recommended level and continuously cropped her field, she would have harvested 6 bags (roughly 6 t/ha); without fertilizer she would probably have had less than 1 bag from her field (1 t/ha).

"She was very pleased with her maize yield following the fallows..."

Sesbania sesban and maize.
(ICRAF)

Asked what she saw as the biggest problem associated with the fallows, she told Phiri and Franzel that this was the work involved in cutting the trees. She is a household head and her oldest child is only 14 years. The two of them cut the trees using axes. Still, apparently Mwanza isn't going to let this stand in her way of using improved fallows. She says that in the 1996-97 cropping season she plans to plant a sesbania improved fallow of 2500 m^2!
(ICRAF)

Technical Advisory Committee: The CGIAR Cosponsors appointed six new members of the Technical Advisory Committee (TAC): Jacques Faye (Senegal); Cyrus Ndiritu (Kenya); Justin Lin (China), Magdy Madkour (Egypt); Malin Falkenmark (Sweden); and Richard Harwood (USA). Richard S. Musangi, Ammar Siamwalla, and Bram E.A. Huisman complete their terms at year's end. TAC will now count a total of fourteen eminent scientists, seven of which come from the North and seven from the South. TAC's focus is on issues of long term strategic importance rather than on detailed operational matters.

System Review: ICW96 decided to carry out a third, comprehensive CGIAR System Review. Currently, the search process for review panel members of high visibility and standing is underway: see Selcuk Ozgediz' note in this issue, page 19.

Oversight Committee: Andrew Bennett (UK) will succeed Paul Egger (Switzerland) as chairman of the Oversight Committee. Fernando Chaparro (Colombia) has been elected Vice-Chairman. Mervat Badawi (Arab Fund) and William Dar (Philippines) are new members, replacing the departing Paul Egger and Cyrus Ndiritu.

Finance Committee: The European Community and Sweden were appointed new members, replacing The Netherlands and the United Kingdom as of MTM97.

Private Sector Committee: The CGIAR Private Sector Committee is planning to hold a top level global private sector research meeting to be held in August 1997.

MTM97: The CGIAR Mid-Term Meeting 1997 will take place in Cairo, Egypt, May 26-30.

External Reviews: The following external reviews will be completed in 1997: ICRISAT, ISNAR and IPGRI.

Public Awareness: ICW 96 adopted a scaled-down proposal for a Public Awareness Campaign (PAC), also known as the Cribb proposal: see Julian Cribb's note in this issue, page 10.

FAO: A New Green Revolution

A new Green Revolution is needed that takes a wider approach in terms of its practitioners, crops and natural resources. It should combine the original "high-input, high-output" methods, where appropriate, with those suited to sustainable production, and concentrate on extending the productive range of maize, rice and wheat, the foci of the original Green Revolution, while including a wider variety of crops, among them sorghum and millet, on which many food-insecure people depend.

One aim is to narrow the gap in yield between research stations and what farmers obtain. Typically, farmers in rain-fed areas achieve yields between 10 and 70 percent of research stations, and most are less than 50 percent. Thus the potential exists in theory for rapid yield increases. The International Rice Research Institute (IRRI), for example, is working to raise average yields from 3.5 tons per hectare per year to 10-15 tons in the tropics and sub-tropics.

Limits exist to increasing yields, and in the irrigated rice and wheat areas of Asia they already appear to have reached a plateau. Indeed, yields have been static for a decade or more. The challenge to break through this barrier is a major one. IRRI and other research institutions are concentrating on the production of crop varieties with enhanced tolerance or resistance to moisture stress and soil nutrient constraints; overcoming micronutrient deficiencies; and improving soil conditions under intensive crop production.

In Latin America, the International Center of Tropical Agriculture (CIAT) has selected forage legume, grass and browse species that are suited to pasture management and fallow systems for poor acid soils. Farmers are achieving increases in stocking rates and animal weight gains of 100 percent or more. In Latin America so far only a small proportion of the total area that could benefit from these improvements has been reached. It is even less in Asia and Africa.

In Africa, the most needy of the developing regions, the range of species, breeds and varieties involved in any new Green Revolution will have to be broadened beyond those that formed the basis of the original one. One clear example here would be cassava. It will also be necessary to broaden the overall concept to consider the place of livestock, which over large areas of the continent represent the most practical means of tapping natural productivity as well as being firmly placed in social and cultural systems. Technologies will also have to be adapted to a greater number of local conditions and needs than in the previous revolution.

On the irrigation front key priorities to promote a new Green Revolution are raising the efficiency of surface irrigation; better land preparation; conjunctive use of surface water and groundwater; and the use of alternate wet and dry regimes. In some cases, surge irrigation can improve efficiency by 70 percent or more by intermittent variable on and off periods of irrigation in place of a continuous application of water to furrows or borders. Simple, efficient and economical waste water treatments would enable agriculture to reuse part of the water that is increasingly reallocated from agriculture to urban users.

Progress is going to depend on research that may have a time frame of 10 to 15 years. A major priority will be research into renewable energy resources, mainly biomass, solar and wind energy, and how to integrate the management of energy with other inputs: water, fertilizer, pesticides and mechanization. Marginal areas will need to be safeguarded, improving some for high-potential agriculture and conserving others where conditions are simply too adverse, for example, by introducing the minimal tillage techniques of the kind that have transformed dryland crop production in parts of Brazil.

More research is needed, too, on how to reduce the cost of external inputs or else reduce the need for them. Rather than import expensive phosphate fertilizers, some countries might be able to use local deposits of low-grade phosphate rock if ways can be found of processing it cheaply. Alternatively, it may be possible, for example, to transfer to other crops the ability of pigeon peas to release phosphates from the soil.

Continued on page 16

IITA in Sub-Saharan Africa

by Lukas Brader

The overall goal of the International Institute for Tropical Agriculture (IITA) is still as it was described at its creation, to increase the productivity of key food crops and to develop sustainable agricultural systems that can replace bush fallow, or slash-and-burn, cultivation in the humid and sub-humid tropics.

From the beginning, IITA combined its research with an active training program. The major strength of the Institute has always resided in its staff and its national and international collaborators. From the outset, it was recognized that the Institute faced a daunting task, but as the results presented in this and other fora have illustrated, considerable progress has been made.

In Sub-Saharan Africa, food production has increased and improved technologies are now available for more sustainable production systems. However, we all know that population growth in the continent has outpaced agricultural growth. We should also keep in mind that in the past, much of the agricultural research and development efforts were devoted to industrial export crops. Greater attention has been paid to increasing productivity of food crops mainly in the last 30 years. Food security continues to be of importance, particularly in areas devastated by political problems and chronic drought, but the real challenge in Sub-Saharan Africa is poverty alleviation.

What has changed in Sub-Saharan Africa as a result of increased research efforts on food crops? In West and Central Africa, maize has replaced coarse grains as the major cereal crop in the moist savannas. This change, a green revolution in its own way, has been under-published and began in the 1970s, and since then maize production has doubled.

Main driving forces were the availability of improved germplasm and a plethora of agricultural development projects, mostly World Bank- and USAID-funded, that introduced the crop to farmers, including provision of seeds and technical messages on cultural practices.

Maize is now a major cash crop and income-earner. It is now extensively used in local industries. The new varieties are more productive and much less susceptible to major pests and diseases. In some countries, cassava production has also increased significantly, not to say spectacularly. Taking account of the slow multiplication rate of the crop, this is a major achievement. Nigeria is now the world's number one producer.

In Sub-Saharan Africa, cassava, in contrast to other continents, is still predominately used as a food crop, although diversification in end uses is beginning to take off. However, it is no longer the simple, traditional subsistence crop of bygone days. Some 60 percent of total production is now sold and allows farmers to increase their income. This change is now demanding earlier maturing varieties with particular quality characteristics.

"The major strength of the Institute has always resided in its staff and its national and international collaborators. From the outset, it was recognized that the Institute faced a daunting task, but as the results presented in this and other fora have illustrated, considerable progress has been made."

Improved cowpea varieties have resulted in more feed and fodder being available to small-scale farmers in the drier agroecological zones. Soybean cultivation is spreading rapidly, mainly driven by increased demand from local industries for a wide range of end uses. In the evolving societies of Sub-Saharan Africa, there remains a strong demand for yam which, with improved varieties and production practices, can provide valuable income to farmers. For plantain, another increasingly commercialized food crop, the possibilities of overcoming major production constraints and increasing sustainable productivity are already proven, as illustrated by the development of black sigatoka-resistant hybrids.

In all these crops, the improved varieties have in-built resistance for many of the major pests and diseases. Research has also shown that it can solve new problems. The most spectacular of these is the biological control of the cassava mealybug, and this will soon be followed by the biological control of the cassava green mite and the availability of an integrated pest management package to control the devastating parasitic weed, Striga.

There is now a much better understanding of the soils and their management opportunities in support of sustainable production systems. IITA is building on more than 15 years of experience with alley farming to develop and introduce innovative short-fallow systems involving both agroforestry and cover crops. There is promising evidence from several locations that earlier hesitation by farmers to take on intensive resource management systems is giving way to interest in the multiple benefits, which include weed control, firewood, and livestock feed.

Agricultural development in Sub-Saharan Africa is often hampered by civil strife or unexpected drought. In that respect, IITA's involvement in disaster mitigation efforts should be mentioned. These efforts are carried out in close cooperation with NARS and NGOs. These include the provision of improved cowpea and maize varieties to Mozambique; participation in the Seeds of Hope initiative for Rwanda; the introduction of improved varieties of maize, cassava and cowpea in southern Sudan; the introduction of improved cassava clones and maize varieties into Angola, and similar efforts have been made in Liberia where

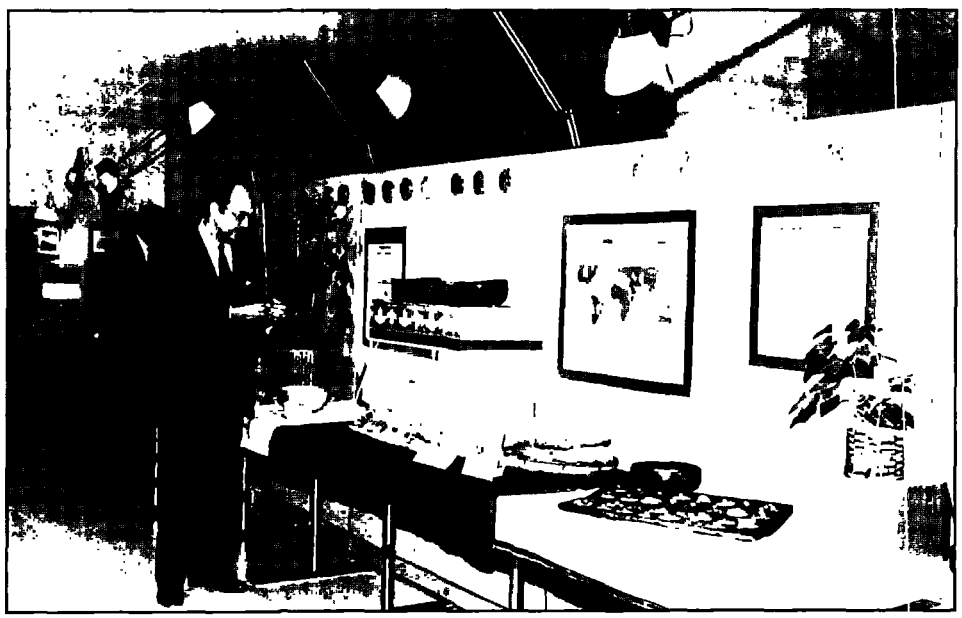
Continued on page 15

Sharing the World's Best-Kept Secret

by Julian Cribb

Four years ago, at Lucerne, CGIAR Chairman Ismail Serageldin described the scientific work of the CG system as "one of the world's best-kept secrets".

At International Centers Week '96 the system took a collective decision to mount a global awareness campaign to explain the importance of international agricultural research, and the reasons why it must be strengthened.



The Chairman, Ismail Serageldin, visiting a CGIAR Technology Exhibit at ICW96 showing recent agricultural advances.

Championed by the former chair of the Public Awareness and Resources Committee (PARC), Per Pinstrup-Andersen, and the CG's Public Awareness Association, the plan aims to link the world's most influential people and its most respected academic institutions in a high-profile case for enhanced public and private support for the international agricultural research (IAR) effort.

Its goals are:

- to raise global awareness of the importance of IAR and of the necessity to increase it
- to persuade the world's most influential individuals to lend their personal support to IAR
- to increase world media attention on food and natural resource issues and the role of IAR in resolving them
- to expand the circle of IAR investors.

The key to the strategy is not to promote research for its own sake—but rather to link it with the things it delivers and raise awareness of these ties in the eyes of ordinary citizens and their political representatives the world over. Things such as peace and political stability, economic growth and employment, sustainable use of the earth's resources, better health and, especially, the abolition of poverty as a way to address the population problem.

Five of the world's most respected academic institutions will be commissioned to prepare detailed studies of the importance of IAR to each of the above issues.

Their studies will demonstrate that IAR is in *everybody's* interest, that it is key to future global security, stable growth, the environment, health and limiting population. They will also spell out the dangers which face the world community if we neglect the issue—threats to which agricultural research offers practical solutions.

Personal approaches will also be made to 100 of the world's best-known and most influential figures, seeking from each a public expression of support for the goals of IAR. These "Ambassadors" will include heads of state, religious, scientific and business leaders, media identities—whoever commands public attention and leads opinion.

Their views will be used to influence the opinions of government, the media, business leaders and potential new investors in favor of enhanced support for IAR.

The plan also calls for a coordinated public awareness effort across the CG system which capitalizes on our scientific expertise—recognising that the system houses some of the most gifted individuals in the world in terms of devising solutions to global food and resource challenges.

Our five major studies will be released at approximately six-monthly intervals, the intention being to orchestrate a rising tide of public awareness over three years as the basis for an enhanced fund-raising effort from both the public and private sectors. Each study will be backed by messages from our "Ambassadors" and reports of Centers' scientific achievements.

Albert Schweitzer once said, sombrely: *"Man has lost the ability to foresee and to forestall. He will end by destroying the earth."*

Through science *and* awareness we can do a great deal to prevent that.

Julian Cribb is an Australian journalist. He pioneered the idea of a CGIAR global public awareness campaign and developed the related strategy.

ICRISAT Wins King Baudouin Award

Three New Science Awards Presented; Former ILRAD Board Member Wins Nobel Prize

At International Centers Week 1996, outstanding scientific achievement was recognized and commended through the presentation of the biennial CGIAR King Baudouin Award and the launching of three Chairman's Excellence in Science Awards. The King Baudouin Award was presented on behalf of the CGIAR Chairman by TAC Chair Donald Winkelmann to ICRISAT to recognize outstanding achievement in the development of disease-resistant, yield-increasing pearl millet in collaboration with advanced institutions and national programs (See Research Highlight "A new Generation of Pearl Millet on the Horizon", CGIAR News 3/3, October 1996).

The Chairman's new Excellence in Science Awards were presented for the first time and honored special achievement in the following three categories: Promising Young Scientist; Outstanding Local Professional; and Outstanding Scientific Partnership.

Shaobing Peng was presented with the Promising Young Scientist Award to recognize outstanding achievement in research on the physiological processes underlying yield potential in rice at IRRI.

Thelma Paris and Shashi Sharma were the co-recipients of the Outstanding Local Professional Award. Ms. Paris was recognized for outstanding achievement in research to link human nutrition and agriculture and for studies on gender issues in rice-based farming at IRRI. Shashi Sharma was recognized for outstanding achievement in research to increase knowledge, awareness, and understanding of nematode parasites of pigeonpea, chickpea, and groundnut at ICRISAT.

IITA and the Institute of Agricultural Research (IAR), Njala, Sierra Leone, were presented with the Outstanding Scientific Partnership Award to recognize outstanding achievement in collaborative research on the improvement of root and tuber crops in West Africa. Lukas Brader, Director General of IITA, and Mohamed T. Dahniya, Director of IAR, accepted the award on behalf of the partner institutions.

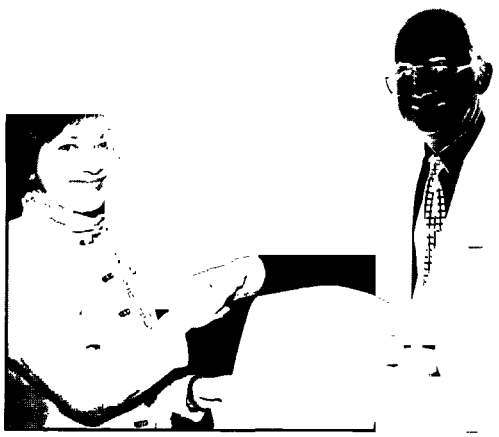
Peter C. Doherty, Ph.D., chairman of the immunology department at St. Jude's Children's Research Hospital in Memphis, Tennessee (USA), won the 1996 Nobel Prize for Science for experiments that first brought to light the fundamental requirements of T-cell initiation of an immune response.

Dr. Doherty, an Australian national, was from 1986 to 1992 member of the Board of Directors of the International Laboratory for Research on Animal Diseases (ILRAD) in Nairobi, a predecessor of the International Livestock Research Institute (ILRI). Doherty shares the prize with Rolf M. Zinkernagel of the University of Zurich, Switzerland.

Mohamed T. Dahniya and Lukas Brader with the Chairman.

Working with very competent people and back up by good management are the ingredients for success.
—Shaobing Peng

Management is a very important factor. When my Director General gave me free hand, I gave him results.
—Sashi Sharma



Determination and a sense of mission are very important. I encountered resistance by male scientists in the beginning, but now, we have more male allies than in the past.
—Thelma Paris

More Food from Barley

Barley, in today's world, has two main uses: malting barley for the brewing industry, and subsistence barley as food and feed in the poorer areas. That could be changing: a partnership between ICARDA, the Ecuadorean national research program, farmers, private industry and television is helping to bring about the change.

ICARDA's Latin America Regional Program (LARP) has been breeding and supplying new barley lines, which are high-yielding and resistant to pests and diseases, to the Ecuadorean national program, INIAP (Instituto Nacional de Investigación Agropecuaria). Through LARP, ICARDA is working with national programs to implement suitable agronomic packages for the lines. ICARDA has a global mandate for barley. LARP's barley-breeding program is run in collaboration with CIMMYT.

"INIAP's researchers and extensionists told me that they wanted white-kernelled aleurone barley, instead of blue," says Hugo Vivar, Coordinator of LARP. "I was surprised, because it makes little difference in subsistence farming. Who wanted white barley?" "Industry," they said. "What industry?" I wondered.

Vivar was invited to visit two small industries. One was La Pradera, a company with perhaps 10 employees but very modern equipment, based at Salcedo in Cotopaxi province. The company explained that blue barley made barley flour look moldy when seen in a plastic bag in a supermarket.

"In the past, barley as food was associated with remote mountains and poverty," says Vivar. "You'd never have found it in a supermarket in the capital. But with rural-urban migration, people who have come to the cities do want these products. They're familiar, and they're cheaper than, say, white bread or Quaker Oats.

"The change is a good thing for several reasons. Large areas have been driven out of wheat production because of the challenge from cheap imported wheat, but the rising urban demand for barley means it's economic to bring them back into production—for barley. This means putting cash into the pockets of farmers without wrecking their subsistence base. After all, they still depend heavily on barley themselves. This is also happening in Peru. It helps improve the balance of payments. And it has nutritional benefits."

This last factor, especially, caught Hugo Vivar's attention. His profession, besides running LARP, is breeding barley. His hobby is collecting barley recipes. When La Pradera heard this, it at once asked him for some. He supplied them; and put La Pradera in touch with INIAP, whose nutritionist was interested. She decided to run a workshop for women on cooking barley products, taking recipes Vivar had collected from a number of regions, including Northern Europe and Japan, to see if they would be suitable for local tastes.

It was not just women from the high mountains, or Cordillera, who would benefit; in coastal cities like Guayaquil, people eat a lot of barley 'rice'; the barley is pearled, chopped into small pieces and cooked. So the idea of barley products isn't new. (Neither was the idea of compiling barley recipes; INIAP's own Elena Villacres had already started this work.)

The three-day course, which was financed by the German aid organization GTZ, took place at Santa Catalina research station, near the Ecuadorean capital, Quito, in early 1996. The 25 participants were respected figures in small rural communities and workers from the social services, for example orphanages.

During the course, the women had fun with the barley recipes. New dishes were created. Ecuadorean television was intrigued, and ran a number of programs on a popular daytime cookery show. And La Pradera, pleased with the implications for their products, paid for part of the printing of a booklet of recipes.

Hugo Vivar is pleased too. "I am used to raising barley production to grow food, rather than making food increase barley production. But we'll get more land back into production, raise nutritional levels in the city, bring cash to the countryside and perhaps even see a growing labor market in food processing. Moreover, if farmers have cash income from the crop, they can start using fertilizer.

"It's also a story of partnership. There is the international research organization, ICARDA; the national program, INIAP; the people testing novel recipes; the media giving instruction through entertainment; and last but not least, industry, in this case La Pradera, which is playing a key role. I think this development is going to continue."

(ICARDA)

Mysterious Disappearance of Irrigation Systems

During the past several decades billions of dollars have been spent to construct new irrigation systems. Hundreds of millions continue to be spent annually on their rehabilitation, and on forming "water users associations" and promoting "management transfers," not to mention the modest sums spent on "irrigation management" research.

Hardly anyone seems to have noticed, however, that nearly all these 'irrigation' systems have become multiple-use 'water supply systems.' That is, these systems have become major sources of domestic drinking water, water for washing dishes and clothes, water for livestock to drink, water for human beings and animals to bathe in, sewers and drainage systems for domestic, agricultural, and even industrial wastes, homes for breeding and raising fish, and even dumping grounds for domestic garbage. Homes and shops are being built along canals, and reservoir beds are used for agriculture. These changes are a natural consequence of rising population densities in closed water basins.

Nevertheless, 'irrigation' agencies administer these systems as if they were only for irrigation, donors finance rehabilitation as if they remain single-purpose irrigation systems, and 'reformers transfer' management responsibilities to (male) irrigators. Training courses continue to be offered for design in modernizing, and managing irrigation systems. Researchers design their studies as if irrigation were their sole use.

It is time to wake up to the fact that 'irrigation' is only one—and often no longer the most important—use made by people of irrigation systems. This has profound implications for irrigation management agencies, donor-funded projects, policymakers, and researchers. Of course, the implications are greatest for the users—who have diversified from 'irrigation' (assumed always to be male) to a wide set of people with incompatible interests.

Douglas Merrey
Consultant

(IIMI News)

IRRI: Progress with New Plant Type

The rice world eagerly awaits delivery of the new plant type (NPT) varieties—dubbed by the media as "super rice"—to farmers' fields, which will take place soon after the turn of the century. The wait should be worth it, as IRRI and national program breeders continue to incorporate desired traits so that the new varieties will thrive in a host of environments and be accepted by consumers.

In 1955-96, numerous advanced generation breeding lines of the NPT were evaluated for desired traits in observational trials and many new crosses were made to improve grain quality and resistance to diseases and insects. Prototype lines of the NPT had short round grains, but now a number of new lines have the long, slender grains that are preferred by consumers in the tropics and subtropics. In addition, new NPT lines are now exhibiting resistance to bacterial blight and blast.

On the abiotic front, research is showing that NPT lines may have a higher crop-level water use efficiency than indica varieties.

According to Dr. Gurdev Khush, principal plant breeder at IRRI, when made available to farmers and coupled with promising fertilizer management technology, the NPT varieties will likely produce 25 percent more grains—under ideal conditions—than current high-yielding varieties.
(IRRI)

Factoid

CGIAR center genebanks are holding the world's largest *ex situ* germplasm collections of 15 CGIAR mandate crops. Only in the case of two CGIAR mandate crops, country genebanks are maintaining larger collections than the CGIAR centers. The largest collections of barley germplasm are held by Canada, the USA, and the UK. In the case of maize, Mexico, India, the USA, and Russia are holding larger collections than CIMMYT.

Source: Report on the State of the World's Plant Genetic Resources. FAO 1996

Peru's Ministry of Agriculture Moves to Restructure its Agricultural Technology System

Peru's Ministry of Agriculture has signaled that considerable changes may be in the near future for the country's agricultural research and technology transfer system. Changes would aim to reverse the more than 15 years of decline that the system has faced, first due to poor public-sector management and then to the effects of structural adjustment and the political necessity to give priority to problems of social unrest and terrorism. Proponents of change want to make the system more market-oriented, bring it closer to the demands of producers, and increase its accountability, especially in the use of resources.

As a preliminary step, Peru invited a mission from the International Service for National Agricultural Research (ISNAR) in early July to assess the present status of the agricultural technology system and outline key issues and options for the system's future development. Through an exhaustive schedule that included interviews, the review of numerous documents, and brainstorming sessions, the mission and its national counterparts produced a provocative proposal for the future organization of the agricultural technology system.

The proposal outlines a system organized around three main entities: a National Agricultural Technology Council, a National Institute for Agricultural Technology, and regional technology centers. The National Council would serve as the system's highest-level authority. It would oversee the technology generation and transfer program and allocate resources competitively among the system's component institutes, including universities, nongovernmental organizations, and other private-sector and parastatal entities. The National Institute for Agricultural Technology would be responsible for creating scientific conditions conducive to agricultural development in the country. As reflected in its name, the emphasis would be on technology rather than on experimentation. Most of the actual experimentation would be done at the regional centers, which would also provide facilities for a range of services and technology transfer. Peru's current infrastructure of nine experiment stations would remain in the public sector, however, producers would have greater say in their management.

A demand-responsive structure

As proposed, the structure builds on widely felt needs for a demand-responsive agricultural research system that integrates private and public sources of technology, stimulates quality research, builds on partnerships with producers, actively searches for farmer funding, and contributes to strengthening the export position of the country. At the same time the proposed organization recognizes that at the present time, farmers in many rural areas are not able to contribute financially to agricultural research. The major responsibility will thus be left to the public sector.

Implementation of the plan will not be easy. At least three types of changes in the legal framework of the agricultural technology system will be needed before any restructuring can take place. First, the law that governs the structure of INIA, Peru's official national agricultural research organization, and the Ministry of Agriculture would have to be revised. Second, revision in the public labor law will be necessary. Third, a law would be needed to create the national agricultural technology council.

In the coming months the report will go through further rounds of consideration and revision within the Ministry of Agriculture. A version will then be presented to Peru's Council of Ministers, presided over by the President.
(ISNAR)

Congratulating the CGIAR on its 25th anniversary

Excerpts from letters to Chairman Serageldin

"As they have repeatedly stated, the European donors and the Commission, which liaise since recently under the European Initiative for Agricultural Research for development, fully endorse this new strategy which will put the CGIAR network at the center of a global framework in the field of agricultural research, by creating close partnership relations between its Centers and the national and regional research systems of developing countries as well as with advanced research organizations. The Commission in particular welcomes this concept and intends to back it with the means of its various cooperation schemes and agreements.

"The Commission is aware that this needs long term commitment by both researchers and donors; it will therefore take this need even more into account when shaping its development strategies and programs.

"For many years now the European Commission has been a major and faithful donor to the CGIAR Centers, both through core financing and the funding of specific research programs. In the face of growing budget problems in the European Union it has consistently maintained its overall contribution to CGIAR."

Manuel Marín Gonzalez
Vice-President of the Commission of the European Communities

"The European Union has for a long time been aware of the crucial role of research in fighting hunger and poverty and has therefore stepped up its support quite considerably in recent years, through bilateral research projects and through CGIAR. With 40% of its total core and program funding, Europe as a whole is the biggest donor to the CGIAR system.

"The importance the European Union attaches to agricultural research has been reflected for many years in its long term cooperation agreement, the Lomé Convention, with 70 developing countries. This agreement considers research and technology development amongst the priority objectives, especially with a view to enhancing rural development and food security. Many specific research programs of CGIAR institutes are thus funded under the Lomé Convention, in addition to support for agricultural research undertaken by national and regional institutions.

"To further emphasize the European commitment in this field, the 15 member States of the European Union and the European Commission, together with Norway and Switzerland, have recently launched the European Initiative for Agricultural Research for Development (EIARD). The Initiative and its flexible structures are aimed at becoming a forum for the exchange of information on policies and programs, for coordination and cooperation where suitable, and for reflection on the further development of Europe's contribution to agricultural research for and in developing countries. It is planned that part of its functions and facilities will be extended to other partners, in particular those from developing countries.

"As the final goal of development cooperation is to strengthen the autonomous development process in the partner countries, research for development has to envisage as a necessary priority the enhancement of research in those countries' national and regional research institutions. The members of EIARD therefore very strongly welcome the CGIAR's new strategy of creating intensive partnership relations with national and regional research systems as well as with advanced research organizations within a future global framework. This seems urgent and necessary as many of them have in recent years been victims of economic and political crises in their countries and no longer possess the human and financial resources indispensable for the pursuit of their research activities.

"Agricultural research needs long-term commitment by those who do it and those who fund it. The CGIAR has proved to be an efficient forum to secure both successful research and appropriate finance. Together with other donors, in particular the Member States of the European Union, the European Commission will continue to be an active member of the Group and a reliable and important donor to its research agenda."

Prof. João de Deus Pinheiro
Member of the European Commission

Nyle C. Brady Award

At International Centers Week 1996, the cosponsors of the CGIAR—FAO, UNDP, UNEP and the World Bank—selected Christian Bonte-Friedheim, the outgoing Director General of the International Service for National Agricultural Research (ISNAR), to receive the second Nyle C. Brady Award for his pioneering and life-long efforts to champion the cause of the NARS and to forge strong partnerships between the international and national agricultural research communities. The award had been created by the cosponsors in 1995 to recognize individuals who have enriched the CGIAR system.

Other ICW Highlights...

At International Centers Week 1996, which celebrated the Group's 25th anniversary, Maurice Strong, Senior Adviser to the President of the World Bank, delivered the Sir John Crawford Memorial Lecture. He reviewed the origins, development, and strengths of the CGIAR, and urged it to continue its renewed emphasis on the environment in its future research programs.

At the Centers Forum, Center Directors presented highlights of current research, assessed future research needs, and outlined research in the pipeline for meeting those needs from a regional perspective. The Forum was divided into four regional sessions. The presentations showed that centers are diversifying their research strategies to address the multiple challenges of increasing agricultural productivity on a sustainable basis (see Lukas Brader's presentation about IITA in Sub-Saharan Africa on page 9).

The Republic of South Africa was admitted as the Group's 53rd member. CGIAR stated that its research program for 1996 budgeted at US$300 million had been fully funded, and that prospects for 1997 would permit to fund a slightly expanded program.

(Continued from page 9)

IITA in Sub-Saharan Africa

Sierra Leonean colleagues have been key players. And Dr. Dahniya having received the prize for cooperation is an excellent example of that. An example of drought mitigation initiatives is the work undertaken by IITA and CIP in collaboration with countries in southern Africa for the rapid multiplication of improved cassava and sweet potato.

What has changed in research and what new changes can we anticipate? There has been a marked shift from single-commodity and single-component research to an integrated systems approach through multidisciplinary research teams. Virtually all IITA research projects are now systems-based. For example, the project on maize-grain legume systems combines the efforts of breeders, microbiologists, agronomists, social scientists, soils and cropping system specialists, as well as plant health researchers. In addition, it receives input from animal scientists.

The aim is to increase both productivity and profitability of the total system in a sustainable way, and these activities are now undertaken within the framework of ecoregional programs. Extended consultation with NARS partners has led to unprecedented joint priority-setting and memoranda of understanding in which all organizations pledge resources to work together on common goals. Establishment of a limited number of ecoregional benchmark areas promises new opportunity for efficiency in research and development, bringing together all partners and clients.

As a consequence, many of the research activities have both on-farm and on-station components, following a participatory approach with an expanding group of farmers. In Africa, there is the constant need for assistance in generating, and particularly in launching new and modified technologies, and considerable time must be spent on collaborative efforts to ensure that both the low-income producers and consumers really benefit from these efforts.

The future will require yet further shifts in the agricultural research agenda, and some of these have already been anticipated and initiated. For example, in plant breeding at IITA, increases in productivity in individual crops now takes second priority compared with breeding for the crop's contribution to the total system. As such, improved nitrogen use efficiency is actively pursued for certain crops, as is research for quality traits for food consumption and diverse industrial uses to stimulate increased demand. The strong need and demand for post-harvest technologies, as highlighted in a recent TAC study, is already integrated into a food systems approach within IITA's research projects.

More recently, IITA has initiated collaboration on new aspects of African farming systems. Particularly in the humid zone, IITA scientists are hard at work on the integration of trees and crops in multi-strata production systems. Collaboration has been reinforced with CIRAD to ensure full benefits of linkages between food and industrial crops. IITA and ILRI scientists are working together on crop-livestock integration, just as IITA and CIFOR scientists are looking into production and marketing of non-timber forest products.

Whether speaking of IITA's traditional strengths in crop improvement or new, innovative systems development and diversification research being carried out with national or regional partners, IITA researchers are working in confidence that the gloom picture often painted of Africa is not the real story. Thirty years ago, when IITA was founded, Africa was an underpopulated continent just emerging from a turbulent colonial history. Africans were under-trained and development infrastructure was nonexistent.

Today, scientific personnel capacity is greater than ever before, regional structures are in place, and there is a true dedication to working together in an ecoregional mode, addressing farmer problems through participatory research. IITA, working with national systems partners and other CGIAR and international centers, is optimistic that opportunities for successfully introducing new farming methods and improved planting material are greater then ever.

Lukas Brader, Director General of IITA, gave this presentation during the Centers Forum at International Centers Week 1996

(Continued from page 8)

Green Revolution

Biotechnology

Biotechnology—the use of living organisms to make or modify products, to improve plants or animals, or to develop microorganisms for specific uses—has been used since people first saved the seed from the best of their crop to sow the following year, or added yeast to flour to create bread. Genetic engineering now makes it possible to introduce genes from one species to another, producing "transgenic" varieties, whereas in the past it was necessary to carry out selective breeding within species.

The potential for agriculture is vast, but we do not know when the developing countries will begin to benefit in a significant way. By the mid-1990s around 50 plant species had been biotechnically altered—among them rice, wheat, potato, soybean and alfalfa. Gene manipulation can produce quicker-growing, higher-yielding or disease-resistant varieties. The food product itself can also be altered, as with the Flavr Savr tomato, the first genetically-engineered food on the market. An extra gene helps it stay firm longer so it can be ripened on the vine, improving flavor.

On the downside, biotechnology may present some environmental risks. Cloned varieties could erode genetic variety; genes from transgenic crops might spread to wild relatives. No satisfactory international standards yet exist for biosafety or the patenting of living organisms and genetic materials.

"Modern science is a long way from capturing the full genetic potential to increase productivity, even though some recent advances have been remarkable."

Prospects of biotechnology

Biotechnology, including genetic engineering, offers considerable prospects for narrowing the yield gaps between farmer and research station without degrading the natural resource base. It is particularly promising, for example, in efforts to build genetic resistance to pests and disease into crop and animal breeds and boost yields.

Maize provides an example of the potential for building in greater disease resistance thereby reducing the need for pest control. In the late 1970s two wild ancestors of maize were found in Mexico that offer the prospects of conferring resistance to seven of the domestic crop's major diseases.

Another promising area is to improve the nitrogen-fixing ability of leguminous plants. Biotechnologists are also working on transferring the nitrogen-fixing characteristic of legumes to other crops including rice, for example by enabling the nitrogen-fixing bacteria in the soil to move into their root cells.

Today, much of the advanced work in biotechnology focuses on the needs of industrialized countries: it is of utmost importance that this work be broadened to cover the needs of developing countries. Modern science is a long way from capturing the full genetic potential to increase productivity, even though some recent advances have been remarkable.

For fish and some types of livestock current research appears to be at the beginning of a steep rise in productivity. In tropical aquaculture genetic improvements in carp and tilapia over the past decade have led to yield gains of between 33 and 50 percent. Mixed farming, including fish ponds, will enable farmers to avoid many of the problems of the earlier Green Revolution with its emphasis on monoculture.

In common with most technologies, biotechnology can be a double-edged sword, bringing potential hazards as well as benefits. Attention must be given, therefore, to questions of biosafety. One area of potential concern, for example, is the risk of gene flow to weeds from transgenic crop varieties resistant to herbicides. The resulting herbicide-tolerant weed could be difficult to control, harming future crop production as well as the surrounding ecosystem. The risks are particularly high in those areas where wild and weedy relatives of major food and industrial crops are found. Few developing countries have the capacity to monitor and assess such risks.

Continued on next page

NEWS

Hybrid Rice Now Commercialized in India

With the planting of about 10,000 hectares to rice hybrids in India in 1995, hybrid rice technology has now been finally commercialized in the country. The rice hybrids yield at least one ton/ha higher than farmers' inbred varieties. Some of the hybrids were bred at IRRI in collaboration with the national program while others developed by public and private institutions made use of male sterile parents developed at the institute. India initiated the commercial cultivation of hybrid rices about 3 years ago. It aims to cover 2 million hectares with hybrid rice by the start of the next century.

Research at IRRI and in other countries indicates that hybrid rice technology can increase rice varietal yields by 15 to 20% beyond those achievable with improved, semidwarf, inbred varieties. Hybrids take advantage of hybrid vigor, which is the tendency for the first generation offspring of a cross of diverse parents to perform better than their parents. The higher yield of rice hybrids is attributed to their larger total biomass and more grains produced per unit area.

"Because of the higher yield, hybrid rices have the potential to play a major role in increasing rice production to help meet the projected increase in global rice demand in the next century," says S.S. Virmani, IRRI's hybrid rice breeder. (IRRI)

(Continued from page 16)

Green Revolution

Involving the farmers

Genetic enhancement and biotechnology alone cannot solve the food deficit problem. Evidence from the recent drought in southern Africa showed that about two-thirds of the yield increases obtained from improved sorghum varieties based on genetic materials from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) could be traced back to better management at the farm level. Good extension work is at least as important as the genetic material itself; it is also a more reliable way of ensuring that poorer farmers benefit.

Agricultural extension, according to FAO, "assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living and lifting the social and educational standards of rural life." A 1992 report on World Bank support to agricultural extension services in 22 sub-Saharan African countries is encouraging: participants managed to increase yields on average by 40 percent in the first year.

Attention needs to be given to gender issues and broader popular participation so that both men and women farmers can adapt new techniques and tools to their traditional technological, social, cultural and economic settings. For example, a recent FAO regional workshop found that irrigation development in Africa had been held back by the failure of government to recognize traditional, common land and water rights often determined and administered at village level.

Towards sustainable agriculture

Since 1992 and the United Nations Conference on Environment and Development, there has been considerable progress in defining sustainable development in operational terms. To use natural resources in a sustainable way requires technological progress that is complemented by environmental and social elements. In all cases, natural resources must be used in accordance with their physical and biological potential, which can vary greatly depending on management practices and the technology applied.

National extension and research need to be sensitive to the needs of sustainable agriculture and its potential practitioners, and to cooperate closely with the international agricultural research systems, especially the CGIAR centers. These, in turn, must develop a clearer focus on poverty alleviation and on new scientific methods, in particular biotechnology, biological and weed control and integrated pest management.

Suitable socioeconomic and institutional environments are necessary, in particular making access to credit and markets possible for all, women and men alike. Developing countries need to pay due attention to gender questions in policies and programs. They need to revitalize their agricultural extension, training and research facilities, improving their capacity to reach women, the poor and the hungry.

For a new Green Revolution to take place, stability and sustainability need to be given the same importance as increased productivity. At the same time, a need exists to create favorable economic and institutional conditions that give farmers the necessary incentives to invest in sustainable methods of production.

Technology transfer

FAO encourages the transfer of technology between countries—not just high-tech solutions developed in research stations, but, increasingly, low-tech methods passed from one developing country to another.

- Rice growers in the Sahel have adopted Asian equipment, including push rotary hoes and weeders, for swift weeding, and the Lo-Trau stove developed in Viet Nam which burns rice husks. This reduces pressure on fuelwood supplies and the ash can be used as a fertilizer.
- A model biogas digester, developed in India by a local NGO, Action for Food Production (AFPRO), has been adapted for use in Cambodia, where it will help combat deforestation.
- Ghana has exchanged with other African countries the fish smoking technology of the chorkor oven which uses less fuelwood than other traditional systems and lightens the workload.
- Millions of hectares of land are being rehabilitated through the activities of the Latin American Conservation Tillage network involving countries in the region.

(FAO: Excerpts from *Food for All* spread, part 3)

NEWS

World's Largest Azolla Biofertilizer Collection

Everybody knows that IRRI has the world's largest single collection of rice accessions. What is less well-known is that the Institute also maintains the world's largest collection of azolla—an aquatic fern and effective biofertilizer. The collection contains 562 accessions distributed among seven species and a number of unique strains, and includes natural populations and sexual hybrids. Aside from being a good source of nitrogen for the rice plants, azolla improves the nitrogen and organic matter to soil.

IRRI continues to play a major role in the worldwide distribution of azolla. The germplasm is made freely and easily available to scientists, extension workers and nongovernment organizations worldwide for academic and practical purposes. Duplicates of several accessions of azolla collections have been sent to the University of the Philippines Los Baños and Panay State Agricultural College, both in the Philippines; National Azolla Research Center in China; Universite Catholique de Louvain in Belgium; and University of Guilan in Iran. Characteristics of the strains are stored in a database at IRRI. Information on the origin of the collections as well as new collections are available from IRRI on requests.
(IRRI)

(Continued from page 3)

World Food Prize

tional, developed the Africa-wide Cassava Mealybug Control Program — one of the largest of its kind — which not only saved Africa's staple crop but brought the use of biological pest control to the forefront of agricultural science. The program, developed at the International Institute for Tropical Agriculture (IITA) in Nigeria, rapidly brought the mealybug problem threatening 34 sub-Saharan countries under control, prevented the large-scale use of pesticides and safeguarded the basic calorie supply of 200 million Africans.

1990: Dr. John F. Niederhauser, a U.S. national, was honored for his innovative leadership in advancing the production and consumption of the potato. Under his guidance, Mexico increased its potato production sixfold between 1950 and 1980. He cooperated in the development of strong national potato programs in other developing countries. These activities led to the founding of the International Potato Center in Peru, in 1971. Dr. Niederhauser is best known for his research to control Potato Late Blight which first devastated Ireland in the 1840s.

1988: Dr. Robert F. Chandler, a U.S. national who was the founding director of the International Rice Research Institute. Under his leadership, IRRI's scientists developed rice varieties for the tropics that had double and triple the yield potential of traditional rices. The Indian Council of Agricultural Research said of him: "His contribution lies not only in the practical applications of science for human welfare but in the evolution of a pattern of research administration conducive to research becoming and instrument of progress in the developing nations."

1987: Dr. Monkombu S. Swaminathan, an Indian plant breeder, widely recognized as the architect of the Green Revolution in India which radically improved agricultural yields through the introduction of genetically superior grain varieties pioneered at CGIAR research centers. This work helped pull back India from the brink of famine and dependency on food aid and become an exporter of rice. Dr. Swaminathan was Director General of the International Rice Research Institute (IRRI).

(Continued from page 2)

The Global Forum

CGIAR Chairman Ismail Serageldin expressed the CGIAR's admiration for the achievements of the Forum and pledged his full support: "How could groups representing the full spectrum of global agricultural research, coming together for the first time to define priorities and agree on how to implement them, identify such a broad area of commonality in such a short time? The strong trend towards moving from outlining areas of agreement into entering arenas of action is most welcome. The momentum created must not falter."

Agricultural research had long time been a sector in which cooperation among players of all sorts—*globalization*—was more advanced than in most other sectors of science. Now, however, globalization is moving from a concept to a fact, and with it hopes are justifiably high that the challenges of the 21st century will be met by a single-minded, powerful and streamlined generator and transmitter of innovation empowering the farmer.

Also, the Forum recognized the need to expand this global research system and include, for the first time, many outside groups active in research, as Chairman Serageldin described it: "What is emerging is not simply a matter of consultation between the 4 percent"—the CGIAR—"and the 96 percent engaged in agricultural research"—all national and bilateral institutions performing agricultural research in and for developing countries—"but the beginning of the 100 percent, and expanding the boundaries of that 100 percent to include many important actors not previously recognized as part of the formal agricultural research system."

As an indispensable step in this direction, the NARS agreed that their national systems—traditionally based on the national agricultural research institutes (NARIs)—must be opened to include other important partners dealing with natural resource management, forestry, fisheries and environmental conservation agencies, agribusiness, foundations, extension services, NGOs and farmers' associations. The NARS Plan of Action for Strengthening Global Agricultural Research, presented by Fernando Chaparro (Colombia), recommends national coordinating bodies to review and improve research and extension programs and forge stronger research-extension-farmer linkages.

Many speakers stressed the value of regional and subregional collaboration based on agreed agendas; the NARS Plan of Action called for establishing service functions to enhance the effective work of these fora. The synergies developed through partnerships are expected to enhance the efficiency of the research of all partners involved. In this respect, the continuation of the dialogue among the non-CGIAR partners (the "96 percent") is becoming institutionalized while the dialogue between the non-CGIAR and the CGIAR (the "4 percent") appears increasingly indispensable to achieve better mutual knowledge and trust.

One of the strongest characteristics of the Global Forum was its explicit recognition that science must, if its is to meet the challenges and be useful to the farmer, mobilize and build on indigenous knowledge.

Some 300 generations of the world's farmers, through on-farm research, had gradually developed today's crops and farm animals, farming and ranching practices, horticulture and agroforestry, fishing methods and aquaculture. While modern science is much faster than the farmer in generating innovative technologies, it lacks the breadth of creativity inherent in billions of small steps of trial and improvement undertaken simultaneously by farmers all over the world.

This plethora of these innovative steps would remain restricted to local areas unless efforts are made to systematically tap and develop them as an integral part of global progress in agriculture, giving due recognition to the farmers' contributions as part of the "revolution of science in the service of those who cannot live without it," that Ismail Serageldin had called for.

For the CGIAR, the post-Global Forum world looks different. The CGIAR must become, more than ever, a strong partner in global collaboration, as Chairman Serageldin put it: "What remains for us is to prepare, through our decisions and our actions in 1997, the positioning of the CGIAR in the emerging Global Agricultural Research System."

In November, on behalf of the Global Forum, CGIAR Chairman Ismail Serageldin submitted to the FAO World Food Summit the *Declaration and Plan of Action for Global Partnership in Agricultural Research* which the Global Forum had adopted. This document constituted a strong message that the global agricultural research system was preparing itself to contribute to the global community's efforts in finding solutions for the problems on the Summit's agenda.

System Reviews in the CGIAR—A Note on Procedural Matters

by Selcuk Ozgediz

Systemwide Evaluation in the CGIAR

The CGIAR has had two System Reviews, conducted five and ten years after the establishment of the Group in 1971. These reviews focused on the strategic dimensions of the System (its mission, goals, and activities), its organization (governance of the System and roles of major actors), processes (budgeting and evaluation), and relationships (linkages with NARS and other partners in the North and the South).

A third review of the System was not commissioned because a major impact study was completed, followed by a new TAC priorities and strategies paper, and a major TAC-led study on the expansion of the System. CGIAR Chairmen Hopper and Rajagopalan preferred having internal, *ad hoc* examinations of aspects of the System in lieu of a comprehensive system review. Thus, Hopper established an internal panel to examine system governance questions, including roles of the Secretariats; Rajagopalan convened an internal think-tank to discuss strategic matters and established a Working Group on Deliberation and Decision-Making. He also formed the Oversight and Finance Committees which led to further examinations of aspects of the System.

In 1994, Chairman Ismail Serageldin initiated a reform effort, which included other major studies on the CGIAR (including a Study Panel on Governance and Finance, an Intellectual Property Rights Panel, and a Stakeholder Panel), and led to the formulation of a renewal program endorsed by the CGIAR at the Lucerne meeting in 1995. Serageldin suggested that a system review should be conducted, but not until the completion of the renewal process and initiation of the agreed reforms. This Third System Review is now scheduled for 1997.

The First Review of the CGIAR

In 1975 the Group decided to review the scope of its activities in order to plan its future role. To carry out the task, it established an *ad hoc* Review Committee. The Committee was made up of 15 members and was headed by the CGIAR Chairman. It included CGIAR members (about half the membership), the TAC Chairman, a center director, two former board chairmen, and a deputy minister of agriculture from a developing country. Members served in their personal capacity. A four-person Study Team was appointed to serve the Committee as staff.

The Study Team carried out its work mainly through interviews with the CGIAR constituency. All eight existing centers were visited and a background paper was commissioned on world food needs.

The Review Panel endorsed the Study Team's major recommendations, and the CGIAR supported the Review Team's conclusions and recommendations. Most of the review was devoted to discussion of system and center management questions, such as budgeting, reviews, center governance, and finance.

The Second Review of the CGIAR

At ICW80 the Group decided to undertake a second review of the System. Like in the first instance, a special Review Committee was established, supported by a study team. The Review Committee was composed of 18 members, headed by the CGIAR Chair. Like the previous Committee it was made up of representatives from various constituencies of the CGIAR. This time, the Cosponsors and the TAC Chairman served as "*Ex Officio* Observers," instead of members.

The Team began its intensive work in January 1981 and completed its draft report for the consideration of the Review Committee in July 1981. Over 280 persons were interviewed. Beneficiaries and potential beneficiaries were canvassed widely. In addition, two regional seminars were organized (in Africa and Asia). 10 of the 13 centers were visited, as were 22 donors.

Like the first review, the second review also focused mostly on governance and management of the CGIAR and the centers. It introduced useful typologies (such as on types of research) and principles (such as for inclusion of activities in the System.)

The Review Committee disagreed with one major recommendation of the Study Team (that of establishing a Management Advisory Committee—MAC—parallel to TAC, freeing TAC from budgetary and management considerations). The CGIAR endorsed the Review Committee's recommendation.

Draft Terms of Reference[1]

Third Systemwide Review of the CGIAR

The mission of the CGIAR is to contribute, through its research, to promoting sustainable agriculture for food security in developing countries. The review will examine the role of the CGIAR System in meeting the research needs and challenges required to accomplish this mission and recommend improvements. It will be conducted with a broad, forward-looking perspective, covering any aspect of the System the Review Panel considers important for its future effectiveness.

The Panel should take note of the rapidly changing nature of global science, communications, and institutional arrangements. It should pay particular attention to the evolving capacities of national agricultural research systems in developing countries, NGOs, and the private sector; the comparative advantages of various actors; organization and management of research; and the strengthening of research partnerships.

The review will focus, among others, on the following:

Science. The scientific challenges the System will need to address in the 21st century and how it might best meet these challenges, given its current scientific orientation and capacity, and the likely or desired positioning of the CGIAR System in the context of the evolving global system.

Strategy and structure. Gaps or redundancies in its current coverage of scientific activities, and efficiencies that could be achieved by better deployment of existing resources, taking into account opportunities for new institutional partnerships.

Governance and finance. How the CGIAR might be more effectively governed and financed, including the roles of Systemwide units, and the effectiveness of processes for priority setting, funding, resource allocation, and evaluation.

The review would be formally announced at the 1996 International Centers Week in Washington. The Review Panel would start its work early in 1997. It should have the occasion to hear the views of the various stakeholders and will have full cooperation in probing any part of the System it wishes to. The three Working Groups suggested should plan to be able to share some preliminary thinking by the middle of 1997, preferably at the Mid-Term Meeting in Cairo in May of 1997. The key findings of the Review Panel would be presented in November 1997 in Washington at International Centers Week.

[1] This preliminary draft was discussed at ICW96.

The CGIAR

CGIAR Chairman
Ismail Serageldin

Cosponsors

Food and Agriculture Organization of the United Nations (FAO)
United Nations Development Programme (UNDP)
United Nations Environment Programme (UNEP)
The World Bank

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Regional Representatives

Burkina Faso and Zimbabwe
Malaysia and Nepal
The Czech Republic and Estonia
Paraguay and El Salvador
Egypt and Iran

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