CGIAR NEWS

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FORUM

Toward Global Partnerships

by Alexander von der Osten

A major event of International Centers Week 1996 (Oct. 28-Nov. 2) will be a gathering of stakeholders in agricultural research in a *Global Forum*, a two-day (Oct. 30-31) conference whose purpose it is to advance collaboration within the global agricultural research system. The Forum will be a milestone in the CGIAR's continuing pursuit of its efforts to open the System to its stakeholders and solicit their participation in the strategy and priority setting processes, thus integrating the CGIAR more fully by strengthening its linkages with its partners in the global agricultural research system.

The days when food and agriculture were domestic concerns central to the idea of national *autarchy* are long over; few sectors have since World War II experienced similarly rapid *globalization*. Grain from developed exporting countries is covering staple food deficits in the developing world; beverage crops, shellfish, fruit and vegetables from developing countries satisfy daily needs in the rich, industrial world. No country or region could feed itself on crops of domestic genetic origin; world food security is based on the principle of exchange.

Similarly, agricultural research has become a global concern. Modern food crop varieties contain germplasm from so many regions and countries that it is sometimes difficult to unravel their origins. The original green revolution drew heavily on technologies and processes originally developed for the agriculture of the industrialized temperate zone countries; the progress more recently achieved in developing country agriculture is producing novel technologies and processes that are increasingly of interest to the developed world. The exchange of knowledge and the degree of North-South and South-South collaboration are quickly intensifying.

Back in 1987, Vernon W. Ruttan wrote: "The 'global agricultural research system'...should be understood to comprise the systems organized and supported by national and provincial (or state) governments, as well as the International Agricultural Research Centers (IARCs). It includes the agricultural research conducted or supported by private organizations as well as public institutions. It should include national research institutions in the developed market economies and the centrally planned economies as well as in the developing countries. Clearly, the need is growing for more effective articulation among the several institutional levels in the system and between the suppliers and users of the new knowledge and new technology."

The Forum will be held at the technical level. Its participants will not be ministers and politicians but top scientists and research managers from national agricultural research systems (NARS) in developing countries, advanced research institutions (ARIS) in developed and developing countries, the private sector, academia, civil society, international re-

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FORUM

Global Program to Develop Late Blight Resistant Potato Cultivars

by Peter Gregory

A coordinated global research effort to combat new and extremely aggressive forms of late blight disease is being spearheaded by the International Potato Center (CIP).

The 10-year, $25.5 million Global Initiative on Late Blight (GILB) to develop potato cultivars with durable resistance to all forms of the disease was launched this year followed urgent calls for action by farmers and the global research commu-

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CIP

Potato late blight

In this issue

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EDITORIAL

The World Food Summit

FAO will host the World Food Summit in November, and a first glimpse of the documentation confirms that the Organization, once again, is harnessing all available resources to provide the world with benchmarks for the debate on world food issues that will remain valid for years to come. Already once, in 1974, FAO had organized a major food summit, the United Nations World Food Conference. That event spawned a host of innovations including the establishment of the International Fund for Agricultural Development (IFAD), and the strengthening of FAO's Global Information and Early Warning System (GIEWS).

One of the most valuable aspects of the World Food Conference proved to be its documentation, which served the international community for many years as a basis for analysis and policymaking. An even more powerful platform is being prepared for November.

Included in the documentation is a technical paper on agricultural research co-authored by Uma Lele of the World Bank, on behalf of the CGIAR, and Stein Bie, Director of FAO's Research, Extension and Training Division.

Another technical paper "Food Requirements and Population Growth" (WFS 96/TECH/12) offers fresh insights into the magnitude of the changes in food demand anticipated in the coming decades. A provisional version is available for review and comments.

(Dietary) "Energy requirements of developing countries will increase towards 2050 due to the growth of their population numbers and also, to a lesser degree, as a consequence of change in their structure," says FAO. "The aging of the population and the increase in its physical height as a consequence of better nutrition, are factors of increasing energy requirements, whereas declining fertility and increasing urbanization are factors reducing energy requirements. As a result, by 2050, energy requirements would be multiplied by 2 in developing countries as a group (by more than 3 in inter-tropical Africa)".

The report observes that to eliminate chronic undernutrition - taking differences in food distribution inside countries into account - Africa would have to increase its energy supplies by an additional 30 percent (40 percent for tropical populations). Asia would have to increase its energy supplies by 15 percent and Latin America by less than 10 per cent. To provide diets that are well balanced in terms of amino acids, vitamins and nutrients, Africa would have to increase its plant-derived energy by another 25 percent (46 percent for countries consuming mainly roots and tubers), and Asia by 21 percent.

"All included, developing countries would have to increase their plant-derived energy by 174 per cent. This means that while countries of Latin America and Asia would have to roughly double their plant-derived energy, Africa would have to multiply it by five (multiply by seven for the root- and tuber-consuming countries)."

These are daunting prospects by any measure, particularly when considering that demography-based projections are usually quite reliable compared with those based on socio-economic parameters such as income or price elasticities.

The paper hints at some implications for Africa by concluding..."the current level of development of economic infrastructure and of human resources will constitute a serious handicap in the case of Africa. Africa would thus be faced with the obstacle of improving its human and infrastructure resources while facing a very difficult food situation. In doing so, Africa would also prepare the base for solving its food security problem in the long term, after 2025."

World media are expected to give broad coverage to the Summit, but those who wish to follow events in greater detail are advised to consult the FAO home page on the Internet (http://www.fao.org), and especially the Summit information line (http://www.fao.org/wfs/homepage.htm or gopher.fao.org). The e-mail address of the World Food Summit is: food-summit@fao.org.

CORRIGENDUM

Reference was made in an article: "Broader Partnerships: The CGIAR and NGOs" (vol. 3, number 2) to a limited survey of center-level interactions with NGOs (p.15). The survey was conducted by the International Service for National Agricultural Research (ISNAR).

(Continued from page 1)

Late Blight

nity. Their concern: the appearance of new forms of the fungus that within the past five years have spread to many of the world's major potato producing regions.

The disease, which was responsible for the Irish potato famine in the 1840s, causes estimated annual crop losses of nearly 14 million tons annually, equivalent to nearly $3 billion. Spread by infected potatoes and aloft by strong winds, the disease can destroy a healthy potato field in just a matter of days.

CIP Director General Hubert Zandstra says late blight has reached epidemic proportions in many areas. He notes that the disease is poised to strike hardest at millions of poor people in developing countries who rely on potatoes, but can least afford to buy expensive chemicals to keep the fungus in check.

"The late blight threat questions the ability of the potato crop to continue its unprecedented growth," Zandstra says, "especially in developing countries where production has soared by nearly 200 percent in the past 30 years and is expected to rise about another 3 percent a year by the turn of the century." CIP and FAO economists predict that developing countries will produce more than a third of the world's potato crop by the year 2000.

Expansion of Potato Production

Ironically, the new late blight threat comes at a time when developing country potato production is expanding. According to a recent FAO-CIP publication, annual potato production in developing countries grew from 30 million tons in the early 1960's to 85 million tons in 1993. Output is expected to rise further by nearly 3 percent per year for the foreseeable future. By 2000, economists predict that developing countries will produce more than a third of the world's potato crop.

Origins of the Disease

Late blight, also known as *Phytophthora infestans*, began as a local disease of wild relatives of potato and tomato in Mexico's Toluca Valley. In the early 1950s, John Niederhauser, a World Food Prize laureate and a founding member of the CIP Board of Trustees, pinpointed the valley as the location now widely accepted as late blight's center of genetic diversity. There he discovered two mating types, called A1 and A2.

The A2 form of the fungus is believed to have spread from Mexico to Europe in the late 1970s. Many experts believe that it was then re-exported unintentionally through the sale of infected potatoes. This form of the disease can be more damaging and powerful than the A1 type, which escaped from Mexico in the 19th century and was responsible for the Irish famine of the 1840s. Both strains reproduce asexually, but when they occur in the same location, they combine sexually.

CIP scientists say losses from newer strains of late blight are likely to rise. Hard-hulled Oospores produced by sexual recombination of different late blight mating types are genetically more diverse than older strains of the disease. Their ability to survive in the soil over longer periods poses new threats to developing-country potato farmers. The A2 is known to be present on all continents except Australia and Antarctica.

GILB

The GILB initiative will draw on worldwide public and private research sources in its efforts to develop higher levels of durable host plant resistance and to use resistant varieties in integrated pest management programs. A meeting at CIP's headquarters in the Lima suburbs last March established project priorities and developed work plans.

During the first three-year phase of the project, 1998-2000, researchers expect to expand the genetic base for durable resistance of cultivated potatoes through the transfer of resistance genes from wild species, primitive cultivars, and to a limited extent from other organisms. This work is expected to both broaden and strengthen late blight resistance. Rapid progress is expected as CIP and national program scientists have already overcome most incompatibility barriers between wild species and cultivated potatoes. GILB research will also focus on efforts to promote the use of integrated pest management practices, including simple, but practical field sanitation practices that are frequently ignored by farmers who once relied solely on fungicides to control the disease.

From 2001 through 2003, the initiative will advance the transfer of broader-based durable resistance to locally adapted potato varieties and advanced breeding lines. During the project's final phase, years 2004-2007, emphasis will be directed to promoting widespread use of new late blight resistant varieties—an effort that will help farmers to control late blight through integrated pest management systems in which resistant varieties, rather than chemical fungicides, play the key role.

Projected Impact

CIP believes that there is a high chance of payoff from such investment because past CGIAR investments in late blight research have been highly profitable. Rates of return from CIP's collaborative research with East African NARS conducted over the past 15 years, for instance, have been estimated at 91 percent annually. Net benefits to the African farmers totaled $10 million in 1993 and more than $60 million over the past decade. Most of this impact was due to investment of only $5.6 million in the deployment of late blight resistant varieties and improved availability of planting materials.

But in the face of the new disease problems, similar progress in the future will not be possible without additional resources. For this reason, CIP has already increased its commitment to late blight research from $1.2 million per year to $1.5 million. To expedite the launching of this global project, CIP plans to reallocate an additional $500,000 in 1997 from its existing resources. These funds will be used to stimulate full-scale planning, improve communications, and expedite a small number of priority research projects. Assuming that additional funding needed to finance the project will become available, the Center predicts that payoffs in developing countries could eventually exceed $3 billion per year.

Peter Gregory is the Deputy Director General for Research, International Potato Center.

A Regional Fund for Agricultural Technology Established in Latin America and the Caribbean

by Ruben Echeverria

Sixteen Latin American and Caribbean (LAC) countries, with the support of the Rockefeller Foundation, IDRC, the Inter-American Institute for Agricultural Cooperation (IICA), and the Inter-American Development Bank, have established a Regional Fund for Agricultural Technology. The Fund's Board of Directors held its first meeting in Cartagena de Indias, Colombia, on July 2 and 3, 1996.

The mission of the Fund is to increase the competitiveness of the food and agriculture sectors, ensuring sustainable management of natural resources and reduction of poverty in the LAC region. The main objectives of the Fund are to:

- support strategic research for the development of agricultural technologies with characteristics of regional public goods; and
- constitute a forum for critical food and agriculture technology issues,
- facilitate the access and exchange of scientific knowledge and
- minimize the duplication of research efforts among members.

The Fund aims to create an endowment of approximately US$200 million to generate an annual resource flow of at least US$10 million. These resources will be competitively allocated to finance high priority research projects at regional and subregional levels. The executing agencies would be international, regional, and national agricultural research entities; some research activities may include participation of the private sector in funding and/or executing projects.

The Fund will begin operations when it has received at least US$50 million in contributions. This goal is expected to be reached very soon. The Fund is being established and consolidated over a period of three years during which the IADB finances the administrative, financial, and technical services necessary for its operations. The Fund's main sources of financing are the countries of the region, and other organizations. Approximately US$150 million will come from LAC countries, and the remainder from countries and organizations based outside LAC. The 16 current member countries are jointly formulating a scale and timetable of contributions based, among other criteria, on the size of the economy and the relative significance of the agricultural sector. As the regional support consolidates, the process of obtaining contributions from outside the region is beginning.

All contributors to the Fund are members of the Board of Directors which is responsible for setting policies, establishing priorities, allocating resources to research projects, and defining the Fund's operating procedures. Members have voting rights in proportion to their contribution. Additionally, each LAC country has an equal number of "basic votes" to guarantee a balance of importance in favor of small countries.

The research activities would focus on

- increasing productivity in food crops,
- address issues related to the management of natural resources, and
- strengthening the institutional capacity on agricultural research policy and management.

The specific priority areas of research to be financed by the Fund are currently being defined in the course of preparation of the Fund's first Medium Term Plan, which will cover the period 1997-99.

The primary beneficiaries of the Fund will be the countries of the region through

- increased food production,
- improved consumer as well as farm income,
- better management of renewable natural resources, and
- alleviation of poverty.

It is expected that the Fund will reduce the currently felt gap in the availability of sustainable medium- and long-term financing for strategic regional agricultural research activities, and increasingly shift the responsibility for financing and decision-making on regional research priorities to the countries of the region.

By focusing on funding strategic research, the Fund will complement the applied and adaptive research conducted by national institutes and strengthen the region's participation in the international research system. The Fund further seeks to increase competition between several research organizations in implementing priority research projects. In this sense it will increase the efficiency and productivity of existing national and international funding mechanisms.

The establishment of the Regional Fund for Agricultural Technology in Latin America and the Caribbean is an example of an innovative mechanism for increased and sustained funding of agricultural research. The Fund is but one of several new funding mechanisms being developed in the region that can be replicated, improved, and adapted to other regions of the world.

The long-term nature of agricultural research, and the diversity of institutions that are part of the world's agricultural technology system, create a need to develop alternative financing mechanisms—such as the LAC Fund—aimed at consolidating a truly global agricultural research system.

While increased funding for research is an important priority, the existing resources allocated to agricultural science and technology must also be better managed. New alternatives for financing agricultural research should not only add resources but also serve as mechanisms to improve focus and accountability of research programs, to promote the effective use of scarce resources, and to foster collaboration at national, regional and international levels.

More information on the Regional Fund for Agricultural Technology is available from the Technical-Administrative Secretariat at the Inter-American Development Bank, 1300 New York Avenue, NW, Stop W0500. Washington, DC 20577. Tel.: (202) 623-3876. Fax: (202) 623-3968. E-mail: FONDOREG@IADB.ORG.

The Kakamega Bean Revival

A couple of years ago, Eunice Changirwa never thought she'd see another bean crop in her half-hectare field. But today, at her farm near Kakamega in western Kenya, she offers guests a steaming plate of plump, multicolored beans, mixed with kernels of white maize in a thick, rich broth.

In the early 1990s, Eunice and most other farmers in this area practically lost their local bean races, when crops mysteriously began to turn yellow and fail season after season. "I had no choice but to stop growing beans," she says. "Any seed I planted was just wasted, it didn't produce anything."

After that, beans became a rare treat in her household. "Once in a while, I would buy beans in the market from other parts of the country, but they were expensive," she recalls. In the absence of this vital protein source, the family's diet was reduced to a monotonous dependence on maize and banana, their main starchy staples.

It also hurts to lose the income from sales of surplus bean production. In fact, Eunice's finances still haven't recovered from the blow. Only recently, her daughter had to drop out of school, because the family couldn't come up with the fees.

But Kenyan bean scientists refused to accept the finality of the farmers' loss. One of them, Reuben Otsyula, a bean breeder with the Kenyan Agricultural Research Institute (KARI), obtained a grant through the Eastern and Central Africa Bean Research Network (ECABREN) to seek solutions. He and colleagues determined that the problem was a complex of diseases referred to collectively as root rot. "Serious outbreaks occur mainly in areas where high population density makes land extremely scarce and forces farmers to cultivate their plots intensively, thus exhausting the soil," explains CIAT plant pathologist Robin Buruchara.

In search of a genetic remedy, Otsyula first screened all the samples in KARI's bean germplasm bank for their reaction to root rot. About 90 percent proved highly susceptible, and under heavy disease pressure the rest succumbed as well.

Next, Otsyula began to look outside the nation's borders. In 1993 he joined scientists from Uganda and other countries for a "traveling workshop" organized in Rwanda by the CIAT-supported bean network. "I was really impressed with farmers' widespread adoption of climbing beans in highland areas similar to ours in western Kenya," Otsyula says. Many of the varieties he saw, introduced in Rwanda during the 1980s, are of Mexican highland origin and are resistant to root rots.

CIAT

Eunice Changirwa with KARI bean breeder Reuben Otsyula

Otsyula arranged to import the 10 best varieties from Rwanda into Kenya. "I began to test them with farmers right away, because root rot is not a problem in the well-fertilized soils of our experiment station," he explains.

At about that time, Otsyula attended a field day organized by Patrick Nekesa of the Association for Better Land Husbandry (ABLH). A nongovernment organization supported by the UK's Overseas Development Administration (ODA), ABLH seeks solutions to the problem of declining soil fertility in Kakamega through its Organic Matter Management Network (OMMN). By enabling farmers to derive an adequate income from the land they already occupy, the network hopes to relieve pressure on the area's sole remaining tropical forest.

"Without new opportunities to produce, farmers have no motive to conserve," Nekesa says. "That's why climbing beans were the right technology at the right place and at the right time. Their good yields of a highly marketable product justify the farmers' use of organic material to maintain soil fertility."

At an OMMN meeting, farmers discuss the problem of finding stakes to support climbing beans. One of the few male farmers in the room describes how he lets part of his Napier grass, which provides fodder for cattle, grow to maturity and then uses the tall bamboo-like shoots to support his climbing beans.

Later, the conversation shifts to the new, root rot resistant bush bean varieties with which some of the farmers have been experimenting. Otsyula obtained these too through ECABREN and has tested them jointly with Eunice Changirwa and other farmers. Participants in the meeting talk excitedly about the prospect of intercropping beans with maize once again, in addition to growing high yielding climbers on the raised beds where they apply organic matter.

Early next year, Otsyula hopes to release the new bush bean varieties officially. "If the farmers have five to chose from, they will be better able to protect their bean crops from root rot," he says.

With the revival of bean production in Kakamega, farmers are also gaining new confidence in their own ability and that of local institutions to solve urgent problems. *(CIAT)*

Research on Sustainable Production Systems in sub-Saharan Africa

IITA Launches Cooperative Effort with CIRAD

IITA and the Center for International Cooperation in Agricultural Research for Development (CIRAD) have agreed to undertake joint research on sustainable agricultural production systems in the humid tropics of Sub-Saharan Africa. The aim is to improve agricultural productivity while conserving natural resources, thereby contributing to better nutrition and living standards for poor rural populations. CIRAD will cooperate with IITA in facilitating and implementing research and development activities linked to the Humid Forest Consortium, one of three consortia of IITA's Ecoregional Program for the Humid and Subhumid Tropics. The program aims to solve the biophysical and socio-economic constraints to agricultural production in Africa's humid and subhumid tropics.

The two organizations will share scientific expertise and information, and will be jointly responsible for project preparation and the search for funding. This agreement breaks new ground by associating, in the framework of an ecoregional research and development program, an advanced research institution in a developed country with an international center of the CGIAR. The agreement was signed in Paris on July 2 by CIRAD Director General Michel de Nucé de Lamothe and IITA Director General Lukas Brader.

CIRAD is a renowned French scientific institution specializing in agriculture in the humid and subhumid tropics. It was created in 1984 as a public industrial and commercial establishment by merging France's tropical research institutes for agronomy, veterinary, forestry, and agribusiness sciences. CIRAD's mission is to contribute to development in these regions through research, experimentation, and the exchange of scientific and technical information.

At the close of a week-long task force meeting at IITA in April, 50 representatives of 11 African countries, CIRAD, FAO and IITA, signed a Memorandum of Understanding describing their commitments to the Ecoregional Program for the Humid and Subhumid Tropics of Sub-Saharan Africa.

(IITA)

Overuse of Insecticide Sprays

Research by experts in several Asian countries has shown that a large proportion of insecticide sprays used by rice farmers is unnecessary. About 80 percent of farmers' insecticide sprays in the Philippines are estimated to be used for the wrong pests and applied at the wrong time. "Production will remain the same if farmers do not use these inputs," says K. L. Heong, an IRRI entomologist.

Farmers often believe that highly visible insects are responsible for large yield losses in rice, and direct much of their attention to leaf-feeding insects such as leaf folders. However, these insects usually do not reduce yields.

"Rice crops with leaf damage generally recover," says Heong. "Pest management is more than technology development. A huge gap currently exists between what farmers know and what they need to know to make good decisions in pest management."

Research in Chainat and Lop Buri provinces in Thailand indicated that 76 percent of the farmers surveyed, spray in the first four weeks after planting, but according to Khun Lakchai Meenakanit, an agricultural extension specialist with the Thai Department of Agricultural Extension: "These applications are unnecessary." Several years ago, rice farmers in Thailand experienced problems from a pest called the brown planthopper. Scientists now discovered that this pest is a secondary problem stimulated by insecticides.

Experts have also found that rice farmers in the region continue to use highly toxic chemicals such as methyl parathion and monocrotophos. The World Health Organization classifies both as highly hazardous to human health, causing heart conditions, nervous system disorders, and even death after continued exposure. Both chemicals are banned in the United States, Europe, and Japan.

Recently, forty scientists from Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Philippines, Sri Lanka, Thailand, and Vietnam met in Bangkok for an IRRI workshop to discuss the pest management perceptions and practices of farmers in Asia. Khun Peecharat Wannapee, director general of the Department of Agricultural Extension appealed to participants to find ways to help farmers reduce the unnecessary use

IRRI

of insecticides. Khun Mechai Viravaidya, Chairman of the Population Community Development Association (PDA), emphasized the need to communicate scientific knowledge to farmers, and to explore the use of media, community development organizations, and other means, to reach as many farmers as possible. IRRI will publish a book on research findings from the ten countries.

IRRI has adopted integrated pest management (IPM) as its guiding concept for research to develop better pest management tools and strategies. The objective of IRRI's IPM research is to derive, evaluate, and develop principles, techniques, tools, and knowledge that enhance the decision making skills of farmers, extension specialists, researchers, and public administrators. Intensive studies in the different rice ecosystems on the interactions among plants and their pests and predators have been carried out by IRRI researchers.

In addition, research on the economic and health impacts of various control tactics has been done. Based on these findings, IRRI strongly endorses IPM, based on ecological principles in which natural mechanisms and processes, including host plant resistance, are fully exploited to reduce economic losses to farmers.

IRRI is working closely with national and international organizations to promote and implement IPM by generating the knowledge needed including an understanding of the decision-making processes of farmers.

(IRRI)

Widening Partnerships

The Jakarta Preparatory Meeting for the Global Forum

A preparatory meeting for the Global Forum on the NARS-CGIAR Partnership Initiative was held in Jakarta (May 17-18) prior to the CGIAR Mid-Term Meeting. It was attended by regional NARS organizations to follow-up on a spate of regional NARS-CGIAR meetings held since Fall 1995. Regional and subregional research organizations presented their respective reports on the outcome of those fora.

"The spirit in which the preparatory meeting for the Global Forum was conducted, and the substance of the discussion at the meeting, demonstrated creative interaction between the CGIAR and other segments of the global agricultural research system," said Ismail Serageldin in his post-MTM letter to heads of delegation.

Much of the praise for the outcome of the meeting goes to the main players, in particular to William Dar who was selected chair as a last-minute replacement for Cyrus Ndiritu (Kenya) who was unable to attend. William Dar represented the Philippine NARS and is Chairman of the Asia-Pacific Association of Agricultural Research Institutions (APAARI). The meeting's keynote was struck by Abdelmajid Slama, the Director of IFAD's Technical Division, who gave the opening remarks. IFAD has been catalytic in facilitating a series of meetings and consultations on how to strengthen NARS-CGIAR partnerships. The participation of TAC chair Donald Winkelmann gave rise to a lively discussion of the CGIAR's future priorities and strategies.

The Jakarta preparatory meeting was, in a way, an unusual and exciting event. NARS from the four regions, NGOs and private sector representatives freely exchanged views, compared priorities and problems, discovered how much they had in common and where their principal differences exist.

A pattern of global agricultural research cooperation emerged from the meeting and with it the prospect for joint formulation and sharing of a future common agenda based on the relative strength of each actor. At the end of the meeting, the emergence of a truly global system which Chairman Serageldin had urged, seemed closer to practical reality. It was obvious that the Jakarta meeting had not only strengthened interaction between NARS and CGIAR but had also catalyzed consultation among NARS, with NGOs and with the private sector. The role of regional and subregional groupings was emphasized, and—perhaps for the first time—broad contacts were established among regions.

Latin America and the Caribbean (LAC) and Africa which have strong subregional organizations (SROs) are setting up consultative mechanisms at the regional level. The Near East (WANA) and Asia-Pacific which already have regional organizations, are in the process of enlarging their membership and strengthening their mandates.

The NARS concurred with the goals of the CGIAR and stressed the priority on increasing productivity and agricultural production. They also emphasized the continuing need for more training, particularly in advanced research technologies, and access to databanks, in cooperation with universities. A need was felt for closing the growing gap in electronic communications between NARS and the centers.

The regional fora drafted an Operation Framework for NARS-CGIAR partnerships for presentation at the Global Forum, including a first set of specific research activities for implementation during 1998 and 2000. In this first phase, activities are likely to focus on upgrading and strengthening existing collaborative programs, but new programs could also be initiated. Case studies on best practices will be conducted as part of the partnership activities and are expected to raise the level of collaborative experience.

ANNOUNCEMENTS

• **James Ingram**, well known as former Director General of Australia's aid program and Executive Director of the World Food Program, has become the Crawford Fund's Chairman as of July 1, 1996. He succeeds the **Rt. Hon Doug Anthony**. **Alex Buchanan** became the Fund's Executive Director, replacing the retiring **Derek Tribe.**

• **Margreet Zwarteveen** (IIMI) has won the triennial N. D. Gulhati Memorial Award 1996 given at the conference of the International Commission on Irrigation and Drainage for "the best paper by a young professional." The title of her paper: "A plot of one's own: Gender relations and irrigated land allocation policies in Burkina Faso."

• **Hans-Juergen von Maydell** (Germany) is chairing the Board of ICRISAT as of April 1.

ANNOUNCEMENTS

• **Lucia de Vaccaro** (Venezuela) and **Hanumantha Rao** (India) have become TAC members; Hans Gregersen, Eugenia Muchnik de Rubinstein and Saydil-Moukhtar K. Touré have left TAC. Lucia de Vaccaro was previously the Board chair of CIAT. Hanumantha Rao is Chairman, Center for Economic and Social Studies, Begumpet, Hyderabad.

• **Shellemiah Okoth Keya** (Kenya) has been appointed Executive Secretary of the Technical Advisory Committee (TAC), effective April 1996. He is a soil scientist with degrees from Makarere and Cornell Universities and was previously Professor of Soil Science at the University of Nairobi and Vice Chancellor of Moi University in Eldoret. He replaces John H. Monyo, now Director of FAO's Agricultural Support Systems Division (AGS).

• **Roberto Lenton**, the Director of UNDP's Sustainable Energy and Environment Division, has replaced Timothy Rothermel as UNDP Cosponsor Representative. Roberto Lenton was previously Director General of the International Irrigation Management Institute (IIMI) in Colombo, Sri Lanka.

• **Ian Bevege** has replaced Eric Craswell as CGIAR representative of the Australian Centre for International Agricultural Research (ACIAR). Eric Craswell is currently Director General of IBSRAM. Ian Bevege is widely known for his role as ACIAR's point person when the Centre acted as the CGIAR's executing agency in establishing CIFOR.

• **Ahmed Thabit** passed away on August 16 in Cairo, Egypt of a heart attack. Dr. Thabit's association with the CGIAR System dates to 1978. He joined the International Livestock Center for Africa (ILCA) as its Financial Controller and Treasurer, after a very successful career in the oil industry. Ahmed Thabit brought his formidable expertise in accounting and financial controls to Washington in 1986 when he joined the World Bank as a Senior Disbursement Officer, subsequently serving as a Senior Investment Officer in the World Bank's affiliate, the International Finance Corporation. Since 1991, Ahmed Thabit had advised the CGIAR Secretariat on accounting policy issues while continuing his work as Financial Consultant with the Bank's Asia and Central Asia departments. His unexpected death is a blow to his colleagues in the CGIAR Secretariat and friends in the CGIAR family. Our heartfelt condolences to his wife Fatma and his two sons Ibrahim and Ehab.

• **Stein Bie** (Norway) has been selected Director General of ISNAR. He will succeed Christian Bonte-Friedheim in March, 1997. Stein W. Bie, is a soil scientist and former Director of NORAGRIC, board member of ICRISAT and chair of the CGIAR Working Group on Follow-up Action to Agenda 21. He is currently Director of FAO's Research, Extension and Training Division.

• **Kanayo F. Nwanze**, a Nigerian national, has been selected Director General of the West Africa Rice Development Association (WARDA). He is currently Project Team Leader of ICRISAT's Sorghum Medium Rainfall project in Andhra Pradesh. He will take up his new position on 1 December, replacing Eugene R. Terry, who has headed WARDA since 1987.

CIAT's fax number has changed. It is now (57-2)445-0073.

A New Generation of Pearl Millet on the Horizon

ICRISAT scientists in India are testing a new generation of pearl millet that could expand the horizons for this poor man's crop in Asia and Africa. It is hoped that evaluations starting in the 1996 rainy season will confirm the readiness of new hybrids that have more durable heterogeneous resistance and visual uniformity acceptable to both farmers and seed companies. If the trials are successful the new hybrids could reach farmers as early as 1998, crowning 24 years of efforts to improve what is already a miracle performed under environmental extremes.

Reliability

Pearl millet is the only cereal that reliably provides grain and fodder under dryland conditions, on shallow or sandy soils with low fertility and low water holding capacity. In drier parts of Africa and Asia, pearl millet is the staple food grain. In more hospitable areas, it is fed to bullocks, milch animals and poultry.

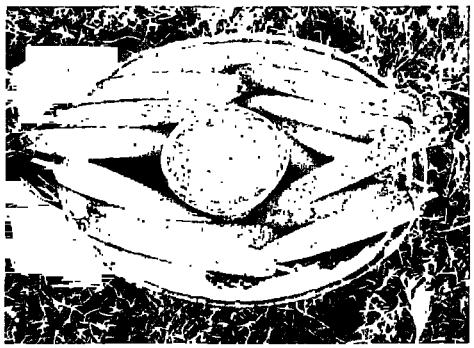
While pearl millet farmers have managed to feed their families under harsh conditions for centuries, population growth is outstripping their capacity to meet new demand with ancient practices and landraces. Scientists need to know more about the crop's tolerances in order to boost yields and expand the land under cultivation in harsh environments where other crops are unsustainable.

India, which produces more than half the world's pearl millet, has been the center of research efforts to meet this challenge since the 1960s when the availability of cytoplasmic-genic male-sterile lines brought a succession of hybrids.

Before ICRISAT was founded in 1972, most of the research was done by the Indian Council of Agricultural Research (ICAR) and other Indian organizations which raised yields to new highs. Since the mid-1960s, when hybrid pearl millets were first introduced in India, average grain yields have nearly doubled despite a considerable shift to more marginal production environments.

Limitations Exposed

However, downy mildew of epidemic proportions soon exposed the limitations of the hybrids. While landraces with inherent genetic diversity survived the epidemic, genetically uniform hybrids failed. One of them (HB3) had been adopted widely in India but was devastated by downy mildew and had to be withdrawn



R. Gutman

from cultivation. Downy mildew (Sclerospora graminicola) is a fungus that can persist in the soil from one season to the next and spread rapidly from one plant to another by means of asexual spores.

Tens of millions of poor people depend on pearl millet and ICRISAT turned to west and central Africa, the primary source of genetic diversity, for reinforcement. Open-pollinated cultivars, including WC-C75 and ICTP 8203, provided new resistance to downy mildew, increased grain yields and gave scientists time to develop new materials with even better yields and quality. Ten years after their introduction the reinforced crops remain resistant. More recently, new materials have been introduced that show grain and stover yields which are at least 10 percent higher than those of the first generation of ICRISAT-bred earl millets, often combined with even shorter growth season requirements.

At the same time, the first open-pollinated ICRISAT cultivars were introduced, single-cross hybrid cultivars including ICMH 451, ICMH 423, and ICMH 356 were bred using at least one African parent. Many other materials of Indian origin were crossed with African germplasm. F3 and F4 materials were used to derive hybrid pollen parents and parents of synthetic varieties. Screening techniques were developed at the ICRISAT Asia Center and other hotspot locations. Among the products generated and released are ICMS 7703, ICMV 155 and ICMV 221. Indian farmers experienced two further downy mildew epidemics during the 1980s and ICRISAT-bred materials withstood both.

Consolidation

Consolidating these gains, ICRISAT scientists have identified:

- sources of two new classes of resistance: *recovery resistance* by which pathogen and host coexist without affecting yield (i.e., the plants outgrow the pathogen to produce symptomless grain heads); and *complete resistance* to virulent strains (i.e., resistance that remains effective regardless of how much inoculum is used in attempts to initiate infection)
- a method to select for resistance from the residual variability normally present within susceptible cultivars;
- top-cross pollinators and hybrids with extremely good yield potential;
- a systemic fungicide, metalaxyl, which can control the disease for short periods when certain resistances become ineffective and alternative resistant cultivars are unavailable.

Molecular mapping has also expanded knowledge of downy mildew resistance. It has shown that:

- many genes contribute to downy mildew resistance;
- these genes are scattered throughout the host genome;
- pathogen-strain specificity is the rule for each of these genes, and
- a large portion of resistance to a given pathogen population can be accounted for by relatively few genes.

Two decades of focused research with national agricultural research systems have also yielded screening techniques and cultivars resistant to the pearl millet grain-replacement diseases, ergot (Claviceps fusiformis) and smut (Tolyposporium penicillariae).

Sharing New Materials

Another major accomplishment of ICRISAT's pearl millet team has been the global diffusion of new materials. Efforts to incorporate drought tolerance led ICRISAT to a west African landrace called Iniadi which matures in 70-85 days, is well adapted to low soil fertility, resists diseases, and is especially tolerant of drought. Yields range from 0.8 to 2.5 t ha.

At Kansas State University in the United States, Iniadi has become a principal exotic germplasm source because of its earliness even at latitude 39 degrees N. Two male-sterile lines developed from Iniadi materials—843A (ICMA 2) and 842A (ICMA 3)—were recommended by the Indian national program for general

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(Continued from page 8)

Pearl Millet

use as seed parents. Today, at least half of all hybrids marketed by India's private sector, are produced from these lines.

Investment Repaid

It has been conservatively estimated that the annual returns to India's farmers from pearl millet varieties developed by ICRISAT total $50 million—more than 12 times the cost of its investment in pearl millet research.

Collaboration

A virtuous cycle of collaboration has been completed which started in Burkina Faso in 1979, when Iniadi, a local landrace, was taken to India. Okashana 1, a variety based on Iniadi germplasm but not identical to the landrace from Burkina Faso, grown on a demonstration plot at the ICRISAT Asia Center, was selected for trials in Zimbabwe. From there it was taken to Namibia where it was released in 1990 and enthusiastically adopted by farmers. Okashana 1 is now the most popular variety in Namibia, the only non-Sahelian country where pearl millet is the cereal of choice for consumers. In 1991, Okashana 1 was introduced to Chad for trials and is likely to be planted on more than 100,000 ha within two years. It is also being widely grown in Mauritania and Benin.

ICRISAT's long range goal is to explore the potential of pearl millet in chronic drought-prone areas of southern Africa and non-traditional environments such as South America. Maize is preferred by consumers in both places, but in southern Africa in particular, the hardy pearl millet could dramatically improve farmers' prospects for food security.

- Annual millet yield losses from abiotic and biotic stresses that could be overcome by research total more than $1.3 billion.
- Asia is the world's leading millet producer, but Africa's millet harvest rose 28 percent between the early 1970s and 1990s and the percentage of Africans who grow millet for domestic food consumption is rising.

(25 Years of Food and Agriculture Improvement. CGIAR 1971-1996)

RESEARCH HIGHLIGHTS

Modern Molecular Tool Used to Improve Rice Breeding Efficiency

New breeding lines showing higher levels of tolerance or new forms of resistance to biotic stresses, and some with multiple-resistance genes, have been developed by IRRI scientists with the aid of a modern molecular tool—DNA marker-aided selection.

DNA marker-aided selection was first applied to the rice breeding program during 1994 in order to combine disease resistance genes of similar effect in one cultivar and then to ascertain whether this gene grouping showed more durable resistance to bacterial blight and blast, two very damaging diseases of rice. In the past, it has been difficult for a breeder to know whether two or more genes of similar effect have been successfully combined. DNA marker technology now allows breeders to follow the inheritance of these genes through examination of unique DNA markers located adjacent to each gene.

DNA markers are fragments of rice genetic materials called DNA which can be used to identify position of disease resistance genes. Deoxyribonucleic acid or DNA is a genetic protein-like nucleic acid in plant and animal chromosomes that carries genetic information which controls heredity or genetic potential. Most genetic characteristics can be predicted but some cannot. Because DNA markers are stable and are not subject to environmental effect, they can be analyzed at any growth stage of rice.

One of the limiting factors in using marker-aided selection is its high cost. IRRI scientists have, however, streamlined the procedure and have made many technical improvements to simplify it. "Cost was reduced from $20 per sample to less than $2.00 per sample," said N. Huang, molecular geneticist in IRRI's Plant Breeding, Genetics, and Biochemistry Division. With such a reduced cost, marker-aided selection can now be used routinely in IRRI's breeding program.

(IRRI news release)

NEWS

As is well known, agriculture was millennia ago independently invented in several world regions: In the Near East (wheat and barley), in East Asia (rice), and in Mesoamerica (maize). Recent research showed that agriculture was also invented in Southeast Asia/Pacific with the cultivation of the root crop taro.

Conserving and Using Taro

Taro originated in Indochina where the greatest genetic diversity is to be found. Today, the edible root and leaves of the taro plant are widely used in Africa, the West Indies and South America. Some types have special significance as crops for difficult lands, as they can produce large yields under flooded or swampy conditions.

However, as the crop moved into the Pacific much of its variability was lost, leaving the crop genetically vulnerable. In recent years, an outbreak of taro blight disease devastated the crop in many Pacific countries which depend on the crop both as a food and as an export crop. Susceptibility to a virus complex and the taro beetle also plague production.

IPGRI, in partnership with FAO and IDRC, has assisted in the collection and improvement of taro in several countries in the region, for example Vietnam, Papua New Guinea, and the Philippines. However, very little germplasm or information exchange between Southeast Asia and the Pacific countries has taken place.

One of the plans, supported by IPGRI, is a collaborative action to ensure that taro seeds and pathogen-tested tissue cultured plantlets which possess the necessary variability can be made available to Pacific countries and that collections of taro can continue to be conserved in the countries of Southeast Asia.

(IFPRI)

Vetch – An Alternative to Cereals Monoculture

Growing cereals year after year in the same field drains the soil of essential nutrients and erodes productivity when nutrients are not replenished. And, like monoculture of any sort, it can encourage persistent pests and diseases.

Cereal monoculture in the West Asia and North Africa (WANA) region has encouraged a particularly sinister crop disease. It is caused by a microscopic parasitic worm, or nematode, that infests the plants and is particularly prevalent in North-West Syria, in areas with 250-300mm annual rainfall. Syrians call the disease Abou Alouwei, after the farmer in whose fields ICARDA researcher Mustafa Bellar first identified it. Abou Alouwei is such a tall man that it is said he waves in the breeze, like the infested stalks of barley. Abou Alouwei and his wife were childless for so many years that his neighbors, with grim humor, reasoned that he also shared another characteristic with the affected barley—the heads of which are sterile.

Nematodes are not the farmers' only problem in WANA. A small insect pest called "ground pearl" has also affected the region, but fortunately it can be eliminated by fallow or crop rotation and the use of clean seed for the next cereal planting. One solution is to rotate cereals with forage legumes such as vetches, something that ICARDA scientists had developed as a means of fixing nitrogen in the soil and boosting yields.

The use of vetch is not new. Traditionally, farmers grew it in rotation with cereals as feed for livestock and draft animals. It could be grazed green in late winter and early spring, when feed was short; it could be harvested early to make hay; or it could be left to mature, to provide grain and straw for winter feeding.

References to rotation with legumes date from Roman times, but the practice probably faded because farmers became less dependent on draft animals and population growth pushed up demand for cereals, tempting growers into monoculture. Until the 1950s, forage legumes accounted for 10-15 percent of the rainfed farming area in one Syrian province, but by 1988 it had plunged to just 2 percent.

Yet the system made good sense. In 1978, a report commissioned by ICARDA indicated that there were about 30 million hectares of fallow land in the WANA region suitable for pasture and forage legumes, and that if 70 percent of this were sown with vetches, it would produce enough feed for 80 million ewes. Some of the pressure caused by the overgrazing of sheep and goats on marginal semi-arid lands in the WANA region could possibly be eased by exploiting this potential.

ICARDA

ICARDA also estimated that vetches would return an additional 1.4 million tons of nitrogen to the soil each year-a figure equal to 165 percent of the nitrogen then applied as fertilizer in Afghanistan, Algeria, Iran, Jordan, Libya, Syria, Tunisia, and Turkey combined. These figures should be treated with caution however, because much depends on land management, environment and species, as subsequent research has confirmed. But even in situations where the effect of rotation with cereals is disappointing, the system can be beneficial.

Testing

In 1985, Jordanian researchers began a 10-year trial to compare the yield from barley sown after fallow, with that of barley rotated with forage legumes. Although the nitrogen-fixing effect of legumes is thought to be most effective with reasonable rainfall, the Jordanian trials were held at Ramtha where it rarely exceeds 250mm. The best yields were obtained after a barley/fallow rotation-but once livestock feed and meat prices were taken into consideration, the best net returns to farmers were from the barley/forage legume rotation, accompanied by sheep grazing during the legume year.

Trials by ICARDA at Tel Hadya and at Breda during the 1980s tended to support this conclusion while other trials suggested that, by producing a greater biomass overall, the barley/vetch rotation also provided better water-use efficiency-an important factor in an area of scarce water supply. Both the barley/fallow and the barley/legume options provided better yields than barley monoculture.

Adapting the technology

Since the mid-1980s, ICARDA has therefore encouraged the use of vetches to replace the fallow in cereal production. Evidence indicates that common vetch is the best species to use in areas with rainfall of around 300mm, but there are many different vetch species, and many different breeding lines within those species, that prefer lower or higher rainfall.

Increasing vetch yields

The shattering of pods can make seed harvesting difficult with vetch, but with careful selection and breeding, ICARDA scientists have been able to develop higher-yielding varieties with non-shattering pods.

A major difficulty common to any crop meant to rehabilitate degraded land is that it might be eaten before reaching maturity, but ICARDA was able to draw on a germplasm collection of more than 5,000 lines to identify a vetch that forms pods

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Vetch

underground as well as above ground. Most of the seed held in ICARDA's bank has been collected within WANA, so they incorporate a wide range of locally-adapted characteristics.

Convincing farmers

Developing a technology off-farm is often just a beginning, however. For ICARDA's work to be useful, researchers must collaborate with farmers to ensure that there will be interest in adopting the end product.

One attraction of vetch is its versatility. It can be grazed green, cut for hay, or harvested at maturity for grain and straw. If mature harvesting is to be an inducement however, the cost of harvesting itself becomes an issue. Labor, in real terms, is not cheap in WANA, and this has been a factor in farmers' willingness, or otherwise, to adoption rates of other crops as well.

To complement production gains with vetch, ICARDA needed a low-cost method of mechanized harvesting. Working with local industry, it developed a roller to prepare the ground and a double-knife cutterbar for harvesting. The roller costs the equivalent of about US$3500 but it can be easily transported between fields so that farmers can share the investment. Hand harvesting of legumes costs Syrian farmers 2000-3000 lira (about US$50-75) per hectare.

An additional benefit of the new harvester is that farmers at El Bab in Northern Syria have found that it works well for barley as well. The roller allows them to increase their straw yields by cutting lower. They have also found that the new equipment makes it easier to harvest lodged barley.

Livestock gains

The economics of sheep grazing on forage legumes also look good. Grazing can eliminate the need for weeding, and this is important in areas such as El Bab where selective herbicides are not available. The daily weight gain at 30 lambs per hectare has been about 200 grams without supplementary feeding. The average weight of a five-month-old lamb raised on a vetch field is about 35 kg-the best weight at which to sell.

Transferring ideas

Explaining the interrelated benefits of vetch to farmers has been especially important. Any new idea can be difficult to transfer and when the technology offered is an update of something that they have themselves abandoned, farmers may be especially skeptical. On the El Bab project, many do not believe that forage legumes are especially productive and there is economic pressure for continuous cereal cropping. At El Bab however, the farmers are key players in the project and ICARDA is working with them to develop the most acceptable approach.

The vetch story illustrates another key point about agricultural research. There must be a systems approach. Cereals, vetches, livestock, soil conditions and market forces are all components of a complex pattern that we call agriculture. Any new effort must be slotted into that pattern, or farmers will not adopt it. Even worse, the change might ultimately prove to be harmful.

(ICARDA)

RESEARCH HIGHLIGHTS

Development of a Live Vaccine Delivery System for East Coast Fever

Researchers at ILRI are developing a new vaccine against East Coast fever, a deadly disease of cattle caused by a single-celled organism, *Theileria parva*. This parasite, transmitted by ticks, costs farmers in Africa more than US$170 million a year in direct losses. To keep their animals free of disease, farmers regularly spray or dip livestock in tick-killing chemicals that are both expensive to purchase and damaging to the environment.

ILRI's Animal Health Improvement Program in Nairobi is working to develop a novel vaccination strategy that will not only offer better protection against East Coast fever but will do so cheaply and without polluting the environment. Scientists in this program are developing the vaccine potential of a protein found on the surface of the *Theileria parva* sporozoite-the form of the parasite that ticks pass to cattle.

The scientists have inserted the gene for this parasite protein, named p67 because it has a molecular mass of 67 kilodaltons, into *Salmonella* bacteria and vaccinia viruses, which produce the foreign protein. Inoculating these harmless recombinant organisms into laboratory animals and cattle has been shown to protect most animals from disease when they are subsequently infected with lethal doses of live parasites.

The success of the p67-based immunisation strategy will depend on how effectively it prevents sporozoite invasion of lymphocytes. Within minutes of entering an animal host, the parasite sporozoites invade lymphocyte cells, where-no longer vulnerable to attack by antibodies-they differentiate into schizont forms. By causing the lymphocytes they invade to multiply uncontrollably, these schizonts quickly kill the animal. Thus, sporozoites that manage to evade initial antibody attack and to enter lymphocytes, can still give rise to fatal disease. To circumvent this parasite survival stratagem, ILRI scientists began looking for a schizont parasite antigen that would augment their sporozoite-antigen vaccine by arming a second branch of the bovine immune system.

Previous ILRI research had shown that animals that recover from East Coast fever possess specialised cells that kill lymphocytes infected with *Theileria parva* schizonts. These cytotoxic T cells have evolved to recognise and destroy body cells that display 'foreign' proteins, including cancerous cells and cells infected with viruses and parasites.

Employing a series of pioneering molecular and immunological techniques, ILRI scientists have identified two proteins expressed by schizonts that stimulate cytotoxic T-cell responses. The genes encoding these schizont antigens have been cloned, sequenced and inserted into vaccinia viruses, which are now being tested for their vaccine potential. The first experiments have produced exciting results: cattle infected with these recombinant viruses have developed cytotoxic T-cells that kill parasite-infected lymphocytes.

To perfect these live vaccination strategies, ILRI scientists need to enlarge their experimental data. Construction of a new Biologically Secure Animal Disease Research Facility allows them to do this. As the scientific knowledge generated by these more informative experiments grows, so does the prospect of a safe, reliable and cheap vaccine that will keep African cattle-and by extension the farms and households that raise them-healthy and productive.

(ILRI)

Helping to Shape the Farming Future of New Nations

The five newly-independent re publics of Central Asia face heavy challenges as they adapt to a decentralized economy. In addition to its own regionally-oriented efforts, ICARDA is supporting the work of a CGIAR Task Force to explore the potential for CGIAR collaboration in Eastern Europe and the former Soviet Union. The initiative in Central Asia began with two workshops in Tashkent.

Assisting Central Asia's Agricultural Research Needs

There is some cause for optimism in Central Asia. The five newly-independent republics don't lack energy and commitment to their future agricultural development. Uzbekistan has increased its wheat area by 25 percent in the last five years. A similar expansion of the wheat area is reported from Kazakstan. But there are also frightening problems: monocropping, salinity and rangeland degradation. To help the newly-independent republics address these and other problems, ICARDA and its partners from within and outside the CGIAR System, with assistance from German bilateral aid (BMZ/GTZ), held a major workshop in Tashkent in December 1995.

Central Asia's scientists can base themselves on long experience. The workshop participants visited institutions which had been active in research for 60 years and more. The problems they are facing are, in any case, not confined to Central Asia but they have been compounded by a major transition from one philosophy of economic and social organization to another which, among other things, has cut supply lines for essential inputs such as fertilizer.

The objective of the ICARDA delegation was to research needs and priorities, and help draft a plan of action. The workshop closed with the signing of an agreement for future cooperation in agricultural research and development.

The participating nations were Kazakstan, Tajikistan, Turkmenistan and Uzbekistan; the Kyrgyz Republic was also involved. Also attending were representatives from the West Asian republics of Armenia, Azerbaijan and Georgia-from a different agroecological zone that has much in common with parts of Turkey and Iran where the Highland Regional Program of ICARDA is active. CIMMYT, ISNAR and the Aga Khan Foundation were represented.

The total surface of the five Central Asian Republics is 400 million hectares, of which some 80 percent is farm land, equal to 30 percent of the former USSR's total. Wheat and cotton are important crops, as are livestock. About 70 percent of the farm land is permanent pasture and 51 percent of the population is rural. The environment is familiar to ICARDA-low rainfall, extremes of temperature and a mixture of mountain, desert and steppe. It is a natural continuation of the West Asia and North Africa (WANA) region.

Food production in the republics is no longer supplemented by food imports from elsewhere in the former USSR, and this has spurred a drive for food security and a concentration on cereal production. Raising cereal output can be achieved either by intensification, the expansion of area sown, or both. Intensification has led to monoculture systems operating with a lack of fertilizer that has damaged soil fertility, while the latter has tended to reduce crop diversity. There are feed and fodder supply problems, and livestock numbers are declining in places.

The seed sector is not always able to meet demand. Seed supply was thus the important focus of discussion. This is an area where ICARDA has done much work in collaboration with national programs in countries farther South, with significant cooperation from Germany and the Netherlands.

Problems specific to the seed sector that had earlier been identified include, antiquated processing and testing equipment, weak variety maintenance, lack of marketing and the need to better understand the complexity of a seed program in which the essential components are strongly interrelated. The governments, as a consequence of a state monopoly culture that prevailed in the sector, have yet to fully appreciate the leading role that the private sector could play in the seed sector in future. In order to broaden understanding of these last two issues, it had been recommended to hold a regional workshop on the seed sector.

The Needs

Since 1991 ICARDA had conducted germplasm collection missions in both Central Asia and the Caucasus, and three scientists from CIS countries have made long-term visits to ICARDA, Aleppo, to do collaborative work on cereals. There have also been other contacts.

At the end of the Tashkent meeting, ICARDA and its collaborators signed an agreement with the five republics for a plan of action that envisages:

- *Establishment of national research strategies and program plans.* ISNAR would play the key role.
- *Producing recommendations for structural adjustments and policy amendments.* This falls into IFPRI's province.
- *The identification and testing of the right technologies for diversifying the agricultural system and improving both crop and livestock productivity.* ICARDA, CIMMYT and IPGRI will be involved in these aspects.
- *Strengthening of national seed programs.* The plans include a regional coordination unit and a variety testing system.
- *Strengthening human resources.* This means training, but for ICARDA it has also always meant exchange of scientific visits and travelling workshops. Other CGIAR centers will be involved.
- *Establishing cooperation* between the research and educational institutions in the region.

As a result of the workshop, a joint project proposal was drawn up by ICARDA in collaboration with CIMMYT, IPGRI, ISNAR and IFPRI so that funding could be sought for the activities. This was submitted to BMZ/GTZ.

In the meantime, international nurseries of wheat have been supplied from the Turkey/CIMMYT/ICARDA International Wheat Program based in Turkey; and of barley from ICARDA in Aleppo. ICARDA also organized a Wheat Rusts Workshop for West and Central Asia in Karaj, Iran, from May 19-31, 1996, in collaboration with the Iran national program and CIMMYT, to initiate activities on yellow rust in wheat for the countries of West and Central Asia. Scientists from Uzbekistan, Turkmenistan and Azerbaijan, where yellow rust is important, were invited to this workshop.

Scientists from the region obtained the opportunity for interaction, through visits by ICARDA scientists to the national programs during the crop season, and by

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New Nations

inviting three key wheat scientists from Uzbekistan, Kyrgyzstan and Georgia to attend the Fifth International Wheat Conference held in Ankara from June 10-14, 1996. The Central Asian scientists have also received necessary assistance in attending other international conferences.

Livestock: a key to the future

The December workshop was followed in February 1996 by another meeting, also in Tashkent, on Central Asian animal production organized by ICARDA and USAID-the latter through its Small Ruminant Collaborative Research Program (SR-CRSP, University of California, Davis).

The objective of the ICARDA/USAID workshop was to identify constraints to sustainable animal production-with an eye to environmental and desertification issues. There is real concern about these problems; and ICARDA scientists travelling through the region noticed that some steppe had been planted to cereals. Such cultivation in low-rainfall areas can be disastrous because the crop will often fail and the land won't easily revert to its former state, either to provide grain or grazing.

Other issues raised in the meeting included:

- Land tenure policies in transition;
- The fragmentation of flocks and changing nature of sheep diseases caused by privatization;
- The advice to concentrate on production of milk and meat rather than wool because world demand for local pelts is falling;
- The need to conserve indigenous breeds;
- The need to improve the processing and quality control of products.

ICARDA is participating in the work and deliberations of the Task Force on Central/Eastern Europe and the former Soviet Union. At the request of the task force, ICARDA organized a CGIAR/NARS workshop in Tashkent in September 1996. This workshop requested support for regional cooperation and for projects with centers.

Much work and funding will be involved in all this but ICARDA thinks the investment opportunities represent good value. At stake is a fresh start in agriculture for five nations totaling 51 million people and 400 million hectares of land. These dimensions have major implications for environmental protection and regional stability—all for the price of a second-hand jet fighter.

International Centers Week 1996

Monday, October 28-Saturday, November 2,1996
Washington, DC, USA

International Centers Week 1996 (ICW96) will cover five and a-half days, and will consist of the following four connected components:

- commemoration of the 25th anniversary of the CGIAR (one day);
- a Centers Forum on the substance of current and future research (one day);
- a Global Forum that will bring together the various components of the global agricultural research system (one and a-half days); and
- the CGIAR Business Meeting (two days).

25th Anniversary Day of Commemoration
Monday, October 28,1996

A program to honor CGIAR stalwarts of the past and present, celebrate twenty-five years of effort and achievement, strengthen partnerships, and look to the future. Excellence in Science Awards will be presented to Center scientists and their partners. A major event of the commemoration will be the Sir John Crawford Memorial Lecture, to be delivered by Mr. Maurice F. Strong, a founding member of the CGIAR. Other special guests will include participants in the key initial events of the CGIAR, such as the Bellagio meetings and the first formal meeting of the CGIAR on May 19,1971.

Centers Forum
Tuesday, October 29,1996

A Centers Forum, at which Center Directors will present the highlights of current research, assess future research needs, and outline what they have in the pipeline for meeting these needs. The Forum will build on last year's widely welcomed innovation of a day dedicated to Centers at ICW. It will approach research challenges from a regional perspective, thus leading into the next day's svnthesis of global research issues.

Global Forum
Wednesday, October 30-Thursday, October 31,1996

A Global Forum, at which representatives of the various components that form the evolving global agricultural research system (NARS, NGOs, the private sector, advanced research institutions, international centers) will explore the needs and opportunities for agricultural research, the scope for collaboration, and practical measures to strengthen partnerships. The Forum is expected to culminate in the adoption of a *Declaration and Action Plan for Global Partnerships in Agricultural Research*, which will be presented to the World Food Summit in November by CGIAR Chairman Ismail Serageldin.

CGIAR Business Meeting
Thursday, October 31-Saturday, November 2,1996

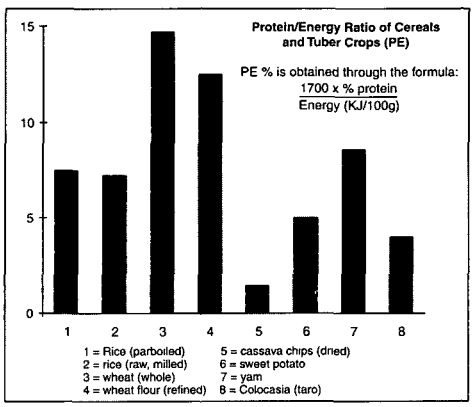
A two-day CGIAR Business Meeting, which will focus on research directions and the financing plan for the 1997 Research Agenda, as well as on action requirements based on the *Declaration and Action Plan* to be adopted at the Global Forum.

The Culprit in Cassava Toxicity: Cyanogens or Low Protein?

G. Padmaja

The starchy roots of cassava (Manihot esculenta Crantz) are already a staple for about 500 million people of tropical Africa, Asia, and Latin America, but countless others might also benefit from this food if it were not for the sensationalism that sometimes surrounds the crop's potential toxicity.

The cassava plant carries two cyanogenic glucosides, linamarin and lotaustralin, in its edible roots and leaves. The amounts of these potentially toxic compounds vary considerably, according to cultivar and growing conditions. "Sweet" varieties usually have such small amounts as to be innocuous, whereas "bitter" varieties have sufficiently high levels to require domestic processing to remove most of the toxins.



In situations where famine or extreme poverty may force a population to eat poorly processed cassava in a diet that is also deficient in nutrients such as protein, the plant's cyanogenic glucosides can lead to poisoning. A classic case was the infantile kwashiorkor epidemic in famine-stricken Biafra in 1968, but there have also been recent examples of spastic paraparesis, or konzo, in drought-stricken regions of Mozambique and Tanzania.

Detoxifying cassava

Farming populations who cultivate cassava have developed many methods of detoxifying cassava. Boiling and drying are sufficient to make low-cyanogen cultivars safe for consumption, but more rigorous procedures such as grating, fermenting, and sun-drying, are necessary to effectively remove cyanogens from cultivars of higher toxicity (see Table).

The protein link

Whenever a chronic disease has been linked to cassava consumption, the victims have also been found to suffer from protein deficiency, suggesting a relationship between the two.

CIAT

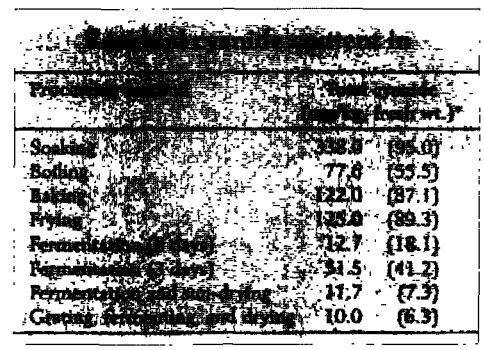
Protein is essential for all the body's vital functions, and for eliminating certain dietary toxins. With the help of the enzyme rhodanese, the human body detoxifies cyanide by forming thiocyanate. When the body is regularly exposed to cassava cyanogens, the increased synthesis of rhodanese makes extra demands on the body's reserves of amino acids, the building blocks of proteins. To detoxify 1.0 mg hydrocyanic acid (HCN), the body also needs a daily supply of about 1.2 mg of dietary sulfur (S) from S- containing amino acids (SAA). If the demand for rhodanese and SAA is prolonged, as in the regular consumption of cassava, and the diet is inadequate, the synthesis of many proteins vital for bodily functions may be impaired, leading to the development of protein deficiency diseases.

Cassava – low protein source

Cyanogens alone cannot be blamed for toxicity because other cyanogenic crops, such as sorghum and Lathyrus bean, which are widely used as food, cause few toxicity problems. But the protein contents of these two crops (11.0% and 18.7%, respectively) are higher.

Many cassava products contain very low amounts of cyanogens, which can be efficiently eliminated by the body, if the protein intake is adequate. Cassava roots, being bulky and rich in carbohydrates, free dietary proteins from having to meet the body's energy needs, thus allowing them to be used more efficiently. However, the level of protein in cassava lags far behind the levels found in rice, wheat, and tuber crops (Figure 1). An adult consuming 1 kg of cassava has to ingest 52 g of protein from other sources to obtain the U.S. recommended daily allowance (RDA) of 65 g protein per adult. In contrast, 1 kg of wheat supplies 121 g of protein and rice, 61 to 64 g of protein.

If protein intake is more than adequate for both general metabolic requirements and cyanide elimination, toxic effects are lessened or even eliminated, even if cassava is improperly processed. (Fatal poi-



[illegible]	[illegible]	[illegible]
Soaking	[illegible]	[illegible]
Boiling	77.8	(55.5)
Baking	122.0	(87.1)
Frying	125.0	(89.3)
Fermentation [illegible]	12.7	(18.1)
Fermentation [illegible]	31.5	(41.2)
Fermentation and sun-drying	11.7	(7.5)
Grating, fermenting, and drying	10.0	(6.3)

soning can result from ingestion of large amounts of unprocessed or poorly processed high-cyanogen cassava.) Hence, the lack of protein in cassava roots is probably responsible for most non-fatal cases of cyanide poisoning associated with cassava.

Developing new cassava varieties

To help resolve the cassava toxicity-protein deficiency problem, biotechnology can contribute to the breeding of cassava varieties that are acyanogenic and/or have protein-rich roots.

(CIAT: Cassava Newsletter 19/2)

Smallholder Soil Fertility Management in Southern Africa

The continued viability of smallholders in southern Africa is a major challenge for soil and crop scientists. Population pressure on available crop land has made shifting cultivation obsolete, with the result that maize, the dominant smallholder crop, is now planted year round in many areas. The fallows, which traditionally restored soil fertility and reduced the buildup of pests and diseases, are disappearing from the agricultural landscape. Soils are degrading and national increases in maize productivity have been disappointing despite the fact that smallholders have adopted high-yielding germplasm on 33-50 percent of the land under maize. The loss of mineral nutrients from the soils under cultivation generally exceeds nutrient inputs, challenging research and extension organizations to improve productivity without compromising sustainability.

Scientists must now combine the gains available from improved germplasm with complementary improvements in soil fertility management at a price smallholders can afford. Inorganic fertilizers are expensive and impractical for smallholders because blanket applications are recommended even in semi-arid areas. But the profitability of using fertilizer can be increased by developing fertilizer management techniques that are appropriate for smallholders and by ensuring that recommendations for fertilizer use are better targeted to their circumstances.

Fertilizer-use efficiency is often low because of the declining level of organic matter in tropical soils. For this reason, the proportion of locally produced organic materials must be increased to maintain soil organic matter and halt the downward spiral of soil fertility. Improving the efficiency of inorganic fertilizer use in various ways, including the addition of soil micronutrients and small amounts of high-quality organic matter, will consolidate and expand the base of fertilizer users.

In many households, where the cash needed to buy inorganic fertilizer far exceeds total annual income, the best strategy is to emphasize the use of organic nutrient sources, especially legumes, that capitalize on freely available nitrogen in the atmosphere. Legumes are not new to farming systems. Grain legumes, legume intercropping and rotation, green manures, improved fallows, agroforestry, cereal residues, and animal manures can all enhance soil fertility and sustain the soil resource base. However, the potential of legume technologies is rarely realized on farmers' fields because, in broad terms, the larger the fertility benefit expected from legume technology, the larger the initial investment in labor and land must be.

Although combinations of inorganic and organic fertilizers show promise, they do have a cash cost and innovative mechanisms are needed to help farmers access them. One promising approach is to provide start-up cash grants that can be paid into savings schemes from which farmers can obtain loans.

Basic, process-based research provides the foundation for extrapolating from site-specific trials to agronomic recommendations for specific agro-ecological zones and farmer groups. Previous crop husbandry research is often neglected because results are distilled into a few recommendations that ignore important interactions in the system and fail to address the diversity that exists among smallholders. Institutional memory should be maintained and disseminated more widely through computer databases and networks. And the emphasis in both research and extension should move away from rigid and prescriptive approaches to flexible problem-solving formats that lead to conditional recommendations. This would facilitate the evolution of a technology development process driven by smallholders' needs. Failure to develop such a process will result in the further weakening of the natural resource base and a continuing decline in the living standards of rural communities reliant on agriculture in southern Africa.

(CIMMYT Natural Resources Group paper 96-02: John D.T. Kumwenda, Stephen R. Waddington, Sieglinde S. Snapp, Richard B. Bones, and Malcolm J. Jackie: Soil Fertility Management for the Maize Cropping Systems of Smallholders in Southern Africa: A Review)

PAST & UPCOMING...

• The **M.S. Swaminathan Research Foundation** (India) has been chosen for the 1996 Blue Planet Prize for its research promoting sustainable agriculture and rural development. The Foundation, chaired by CGIAR pioneer M.S. Swaminathan, is the first Blue Planet Prize winner from Asia. The prize of 50 million yen is an international award recognizing noteworthy environmental research and related activities. It was established in 1991 by the Asahi Glass Foundation of Japan.

• **CIFOR**'s new headquarters buildings in Bogor, Indonesia, were inaugurated on May 20 by Indonesian Minister of Forestry Djamaludin Suryohadikusumo in the presence of CGIAR Chairman Ismail Serageldin, CIFOR Board Chairman Bo Bengtsson and Director General Jeffrey Sayer, at the time of the CGIAR Mid-Term Meeting. The spacious new headquarters buildings are located on 10 hectares of land surrounded by forested areas.

• **ICRAF** and Television Trust for the Environment (TVE), with support from the Swedish International Development Agency (SIDA), have jointly produced a two part agroforestry video consisting of: "Field of Trees," a 30 minute program for TV broadcasting, and "Farming with Trees," a 15 minute production mainly aimed at policy makers and members. The video was shot at four locations in Africa, Latin America and Southeast Asia, and is available in English, French and Spanish, in PAL and NTSC formats. Copies can be obtained from Michael Hailu, ICRAF.

Gender Issues: The CGIAR Gender Staffing Program led by Deborah Merrill-Sands has started issuing a newsletter, "CG Gender Lens," edited by Bonnie Folger McClafferty (Email: BKM7M@aol.consting). The lead article states that: "Addressing gender issues in the workplace will be critical for the centers' ability to retain high quality female staff, to ensure equal opportunities for career development, to foster effective collaboration between men and women, and to create a work environment that mobilizes the talents and skills of diverse staff groups." Copies of the July issue are available from the CGIAR Secretariat. The next issue is expected for ICW96.

Climate Change and Rice: Changes in climate and the implications for global food security and environmental sustainability, are highlighted in a book recently copublished by IRRI and Springer. Edited by S. Peng, K.T. Ingram, H.U. Neue, and L.H. Ziska, the 374-page study examines research on emissions of greenhouse gases from rice fields, ultraviolet-B radiation effects on rice, and the interactive effects of carbon dioxide and temperature on rice. Predictions on climate change using simulation models are also discussed. Copies are available from IRRI's Communication and Publication Services.

A Future Scenario for Agricultural Research

by R. S. Paroda

The estimated world population of 5.35 billion in 1991, with an average life expectancy of 66 years, signals projected world population totals of 6.17 and 8.35 billion by 2000 and 2025 A.D., respectively. This growth is believed to bring natural resources under further pressure. Presently, 800 million people in the developing countries, or 15 percent of the total world population, are insecure in their food supplies. Even optimistic projections for 2020 indicate that about 100 million pre-school children would remain protein-energy malnourished. More than half of the world's protein-energy malnutrition problem is in South Asia, and reasonably large numbers are estimated to remain malnourished even by 2020 despite expected increases in production, growth in income and reductions in the population growth rates.

The world production in the major staple food, cereals, has shown a compound growth rate of 3.9 percent during 1966-90. Although the developed economies initially produced the bulk of the world cereals, their share decreased from 54 percent in 1966 to 46 percent in 1990. But Asia's share increased from 33 percent in 1966 to 41 percent in 1990. An FAO study indicates that the trade in agricultural products would increase if there was 1.0 percent higher growth in incomes of the developing countries, and their cereal consumption would increase by 20 million tons, with net imports rising by 8 million tons in 2001. Raising food output in the developing countries is, therefore, a key priority issue which must be addressed appropriately in the future.

The development of agriculture in a given environment entails a skillful management of the basic production assets such as land, water, biodiversity, climate and sunshine. Manipulation of biodiversity involves domestication of plants and animals, selection of superior genotypes, crossbreeding for incorporation of alien genes and, finally, application of sophisticated biotechnological and genetic engineering techniques.

In this scenario, the contemplated eco-regional planning will have to aim at enhancing agricultural productivity and production on a sustainable basis. This would call for an effective collaborative mechanism with responsibility for a higher level of integration in research and development efforts. Thus, a lucid distinction of the collaborative mechanism and a clear distinction between priority setting at the eco-regional level and its effective execution at the local levels would be essential. The conceptual model of deriving the best out of the vast resources—scientific, technical, ecological and environmental—will have to be judiciously used and managed in a way that these resources are in harmony with the environment. The agricultural research institutions will be called upon to develop closer links with agri-business and with the private sector in general, and the National Agricultural Research Systems (NARS) would be required to assess ground realities for better functioning as a 'Switch On' and 'Switch Off' mechanism in response to changing needs.

Under the given circumstances, a well-thought-of research and development program in a matrix-mode with streamlined priorities, appropriate strategies and thoughtful approaches would be absolutely essential. Thus, the contemplated sustainability would hinge on productivity, profitability, equity, protection of environment and natural production base, efficiency, effectiveness, competitiveness, and a market-oriented and demand-driven production-to-consumption system. This would require synergies of action, reaction and interaction so that the desired results are in tune with the comprehensive policies, priorities, and resource allocation/deployment at the national, regional and international levels. Addressing the research agenda in future at the regional and international levels is likely to be more rewarding.

With reorientation of the national, regional and CGIAR system's agenda, research programs will have to be readjusted with appropriate financial arrangements, governance, implementation and monitoring mechanisms. For each of the missions, so identified, the principal strength of the participating NARS would determine the success of the program. Strong regional fora and networks cannot be thought of with weak NARS. Similarly, the eco-regional orientation, regional fora and regional networks would determine the regional strength and relevance of the Consultative Group on International Agricultural Research (CGIAR) in future. Hence, partnership and catalytic role of the CGIAR assumes far more importance than ever before. In fact, the essence of cooperation with removal of apprehensions would be mutually beneficial for the players as partners. Thus, effectiveness of the CGIAR would also depend on the simultaneous growth of the regional fora like the Asia-Pacific Association of Agricultural Research Institutions (APAARI) and the various NARS. Some of the recent initiatives in this regard are likely to be rewarding in future.

While moving 'up-stream', the system should not lose sight of resource-poor farmers. In this endeavor, the establishment of both the centers of excellence and required networks would be the priority areas in future, where sharing by all concerned will be the cardinal principle. In doing so, it must be realized that problem-oriented commodity centers and resource centers in research are not mutually exclusive. The commodity research must be based on appropriate resources and resources are to be effectively managed for enhancing farm productivity. Cutting across crops and commodities to enhance competitiveness and market access, researches on processing, product development and value addition should in future also receive much needed funding and policy support.

The Indian Council of Agricultural Research (ICAR) is an autonomous body responsible for the organization and management of research and education in agriculture, animal sciences and fisheries. The Council was established in 1929 and reorganized in 1965 and 1973. The Minister of Agriculture is the President of ICAR. Its principal executive officer is the Director-General who is also Secretary to the Government of India and Principal Adviser in all matters relating to agricultural research and education. ICAR's 1994/95 budget was about 5,000 million rupees. ICAR operates a network of 45 institutes, 4 national bureaux, 9 project directorates, 30 national research centres, a National Academy of Agricultural Research and Management, and 79 All-India Co-ordinated Research Projects spread over 1,400 Co-operating centres.

R.S. Paroda is Director-General of the Indian Council of Agricultural Research (ICAR)

(ICAR News 1/4)

Leipzig: A Difficult Milestone

by Geoffrey C. Hawtin

Delegates from 150 countries and 54 organizations, including the CGIAR, attended the FAO International Technical Conference on Plant Genetic Resources (Leipzig, June 17-23). The conference was the culmination of a process which started in 1991, to take stock of plant genetic resources for food and agriculture, generate agreement on priority action nationally and internationally, and address the most pressing needs and problems. The process involved more than 150 individual country studies and 11 sub-regional meetings, which together with inputs from a variety of technical meetings and electronic conferences, formed the basis of the two main documents tabled at Leipzig:

- The State of the World's Plant Genetic Resources for Food and Agriculture; and
- The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (GPA).

Immediately prior to the Conference, a group of NGOs held a separate meeting to coordinate their own input to the discussions, and they actively participated throughout the week.

The major part of the Conference was taken up with detailed negotiations over the wording of the Global Plan of Action. Particularly contentious issues included the provision of funds to implement the GPA and the recognition of Farmers' Rights. Other issues that surfaced included, terms and conditions for access to germplasm, intellectual property rights and seed legislation. While views on financing tended to be polarized between the South and North, the demarcation of positions on many other issues was not so clear-cut. In addition to discussions on the GPA, a considerable amount of time was devoted to negotiating the wording of the "Leipzig Declaration."

After a difficult and sometimes acrimonious week of negotiation, compromise wording was finally agreed, and the Conference adopted the GPA, the Leipzig Declaration and the Conference Report.

In spite of the difficulties encountered, Leipzig represents a significant step forward. It focused global attention on the importance of plant genetic resources and helped to increase awareness among a wide spectrum of policy makers. It demonstrated that there is global agreement on the nature and extent of the problems to be addressed and the steps that need to be taken nationally, regionally and internationally. It also showed that agreement on technical issues and strategies is possible, even among countries with widely different circumstances and views.

While delegates were generally relieved that a compromise had been achieved and that the Global Plan of Action had been adopted, there was also a realization that final resolution of the major political issues is still pending. Leipzig was seen as just one step in the evolution of a global system for plant genetic resources rather than the launching of a new system per se. The next step will be the negotiations in December, at an extraordinary meeting of the FAO Commission on Genetic Resources, to revise the International Undertaking on Plant Genetic Resources. These negotiations promise to be long and difficult.

The outcome of the Leipzig Conference will also be discussed by the Conference of the Parties to the Convention on Biological Diversity, both at the meeting of its technical advisory body (SBSTTA) in September and at COP3 in Buenos Aires in November. It will also be presented to the FAO World Food Summit in November.

Leipzig provided the CGIAR with an important opportunity to demonstrate the system's commitment to the resolution of global issues, and its strong partnerships with nations of the South and North. It also highlighted the actual and potential role of the CGIAR in providing scientific and technical support to international efforts to conserve and use plant genetic resources.

In spite of some criticism of the CGIAR by certain of the NGOs present, widespread appreciation for its work was expressed by national delegations in many interventions. The CGIAR also features prominently in the GPA as adopted by the Conference, and is widely seen as an international institution with a major role to play in the Plan's implementation.

Geoff Hawtin is Director General of the International Plant Genetic Resources Institute (IPGRI) in Rome, the CGIAR's lead center for plant genetic resources. He headed the CGIAR delegation at the Leipzig conference.

Space Wheat

The U.S. National Aeronautics and Space Administration (NASA) is interested in food crops suitable for bioregerative life support systems in space. The Utah Agricultural Experiment Station, Utah State University, jointly with NASA, recently announced the release of *USU-Apogee*, a full-dwarf hard red spring wheat cultivar developed for high yields in controlled environments.

USU-Apogee originated from the cross *Parula / Super Dwarf*, both obtained from the CIMMYT germplasm collection. *Super dwarf* was selected for its dwarf stature (25 cm tall).

USU-Apogee is resistant to the severe leaf tip necrosis that occurs in wheat under rapid growth conditions, particularly continuous light. *USU-Apogee* is shorter and higher yielding than *Yecora Rojo* and *Veery-10*, the short field cultivars previously selected for use in controlled environments.

(Utah Agriculture Experiment Station)

Japan's New International Agricultural Research Policy

by Kunio Nakamura

I would like to express on behalf of my Government its satisfaction with the renewed progress of CGIAR in the last two years. We hope these efforts will result in the beginning of a new era for CGIAR. On this occasion, I would like to briefly explain our newly-established position:

Firstly, we are delighted to announce that Japan and the United States agreed at the Summit held in Tokyo last month to cooperate in the promotion of international agricultural research. This initiative is to find solutions to global food supply problems within the framework of the common agenda for cooperation in a global perspective. Those projects included in the agenda have set the pace for exploring ways to tackle the challenges of the 21st century.

Secondly, regarding our contributions for 1997, I encourage the CGIAR's efforts to find new donors to stabilize its budgetary situation. I would even emphasize that it is not realistic to expect Japanese funding to replace reductions by other donors. We hope that all donors will continue to meet their commitments in the same manner as in the past. In this regard, taking into account the outcome of this meeting, we have carefully examined the following criteria for 1997:

We would like to continue to be one of the leading donors and try to contribute in a stable and predictable manner.

We would like to give priority to projects within the agreed research agenda. However, any special projects which Japan already funds will be supported until those activities are completed.

We intend to increase the number of earmarked projects so that Japan's contribution to the CGIAR are clearly visible.

We intend to play the role of financial balancer as one of the largest donors, as one of the CGIAR family, through consultations with relevant colleagues, and specifically including systemwide and ecoregional programs.

We have carefully studied ways of avoiding any overlapping of Japan's contributions with those of international organizations.

Finally, we intend to establish a monitoring system for projects to which we have contributed.

Excerpts from a statement by the head of Japan's delegation to the May 1996 CGIAR Mid-Term Meeting in Jakarta.

Found on the Internet:

Information Systems for the Future

"Let's assume that poor and rural people in developing countries are faced with similar, if not identical problems. After consulting with potential users, it is feasible that a set of generic information systems can be developed to accommodate a broad spectrum of high priority informational needs of poor and rural people in developing countries. These generic information systems can then be customized to accommodate local languages, country specific data, and other geographical and cultural variations when deployed to specific regions or countries. Agriculture, health, nutrition, education, and communication are important areas where the usefulness of such information systems can clearly be realized.

"Since the major income source of poor people is agriculture, information systems can provide poor people with a wealth of information that they lack in production techniques and strategies, marketing, and agricultural extension. New agricultural practices that have been researched and proven applicable to developing countries can be delivered through information systems. On-line access to local, national, and international volumes of agricultural production, prices, and weather, can empower poor farmers in marketing their harvest and planning next seasons' crops.

"I would like to suggest that a consortium be founded to coordinate the efforts of obtaining, integrating, transferring, developing, installing, customizing, shipping, distributing, utilizing, supporting, and maintaining computer software and hardware in rural areas of developing countries. Many NGOs, GOs, Volunteer, Not for Profit, international, and other organizations with interests in rural development and poverty alleviation can form such a consortium. They are expected to participate in such an effort because the objectives of these information systems coincide with their goals, and because they do have the necessary hardware and technical staff to implement these information systems in rural areas of developing countries, at least on testing phases.

"Once prototypes of these systems are successfully developed, implemented, and deployed, it will become "profitable" to "invest" in distributing such information systems (along with the trained staff) in all rural areas of developing countries. These systems will provide the seed of information that is absolutely necessary to ensure continual development and an ever brightening future."

Abubakr Y. Alkhalifa
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"The information age has provided tools such as the Internet and GIS mapping to promote a learning revolution in agriculture. Extension information should be disseminated through computer-aided information shops operated by village youth. Vocational polytechnic institutes may be established for the rural poor."

Madras Declaration of the Science Academies Summit (July 8-11, 1996)

The Land Quality Indicators Initiative

In many developing countries, fears that land degradation threatens food production capacity has stimulated projects and policies to encourage more sustainable land uses practices. However, setting priorities and taking action to improve natural resource management is hampered by a shortage of reliable, easily accessible information on the nature and extent of land degradation problems.

In recognition of this constraint, a coalition of international agencies-including the World Bank, FAO, UNEP, UNDP and CGIAR-initiated the Land Quality Indicators (LQIs) initiative in 1994. The LQI initiative seeks to develop a set of natural resources indicators, or statistics or measures, that help characterize the condition of natural resources related to land at national and sub-national scales. The LQI initiative is not a new program separate from the on-going efforts of many agencies, but an effort to coordinate the many existing and new initiatives on land resource management.

Following several workshops (at CIAT, ICRAF and UNEP) and coordination meetings (at the World Bank, and FAO) a detailed work plan for the LQI initiative has been jointly developed, focused on three main objectives:

- developing a set of harmonized LQIs for managed ecosystems (agriculture and forestry) in the major agroecological zones (AEZs) of tropical, sub-tropical and temperate environments,
- identifying sources of data and information and developing common methods for analysis, aggregation, and application of the results, and
- disseminating essential findings among major institutions responsible for the collection of LQI data and reinforcing institutional capacity building needed for setting and implementing land and natural resources priorities, policies and technologies at sub-national and national levels.

The expected outputs are:

- Harmonized LQIs to be used by decision-makers. LQI Source Tables will be prepared for each country and locally updated.
- Appropriate targets and thresholds for the state LQIs to provide guidance towards more sustainable land management for the different eco-regions.
- A comprehensive information system on land related issues (metadata and data sets) accessible on the World Wide Web and by Email, and to be available stand-alone as well (CD-ROM and diskettes). The system will document on what data are stored with which agencies, comment on quality and reliability of the data, and show how the data can be accessed. Emphasis will be on land suitable for cultivation and forestry, biological production potentials, current land management technologies, and other information necessary to monitor changes in land quality.
- Assessments of trends in land quality for various AEZs for use at sub-national and national levels, permitting a global assessment of the condition of land as a function of its use.

Some activities have been initiated:

- The development of the Land Quality Indicators Information System (LQI-IS) set up on line and on diskette for environmental and project monitoring and reporting: CIESIN, in close working relationships with UNEP-GRID and the LQI coalition, has been contracted to develop the system. This activity involves access to a first set of data bases, such as FAOSTAT, WRR etc. and the development of a meta-data (a catalogue describing data bases) on land related data currently being stored by CG Centers and various international and national agencies. LQI-IS will provide guidelines and documentation for use of the data to develop some national level LQIs, as well as analyses of data quality, compatibility, voids in information, and what additional data are needed. *A prototype of the system will soon be available, and a demo is planned for International Centers Week (October 28 - November 2).*
- Development of some sub-national and national level LQIs through case studies in representative AEZs. IFPRI and WRI have been contracted to construct indicators using only data that are already available in selected countries. *National LQIs are being developed for Niger, Honduras, and Vietnam, and district level LQIs for the Central Hillsides of Honduras and Jhabua District in the state of Madhya Pradesh, India.* Country case studies in Burkina Faso, Senegal and Tunisia are starting, which include identification and measurement of LQIs and development of a national information system on land related issues, in collaboration with NARS and other national organizations.

(LQI Coalition)

(Continued from page 1)

Toward Global Partnerships

search centers in and outside the CGIAR, and from the CGIAR itself.

The Global Forum culminates a long series of study panels, preparatory meetings and regional and sub-regional fora. IFAD played a strong leadership role in organizing, as part of the CGIAR renewal process, consultations in late 1994 and early 1995 on the NARS vision of international agricultural research. The second consultation developed an action plan, later adopted by the CGIAR, that proposed holding a series of regional fora. These fora, held between late 1995 and mid-1996, decisively influenced the development of the Global Forum's agenda by discussing NARS/NGO/CGIAR relations in the reality of the regional context. Klaus Winkel (Denmark), Andrew Bennett (U.K.), Abbas Kesseba (IFAD), Cyrus Ndiritu (Kenya) and William Dar (Philippines) were among the main actors in the process that is about to culminate in the Global Forum.

In essence, the upcoming Global Forum manifests the resolve of the international community to integrate its best scientific talent in order to maximize its agricultural research capacity in the face of the daunting list of poverty, food security and natural resource problems that lie ahead. In the proposed Declaration and Action Program, a wide range of interests, ideas and trends will converge into a single expression of determination. If adopted it will be submitted to the November World Food Summit in Rome by CGIAR Chairman Ismail Serageldin.

Alexander von der Osten is the Executive Secretary, CGIAR.

The CGIAR

CGIAR Chairman
Ismail Serageldin

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- **CIMMYT-Centro Internacional de Mejoramiento de Maiz y Trigo**
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- **CIP-Centro Internacional de la Papa**
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- **ICARDA-International Center for Agricultural Research in Dry Areas**
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- **ICLARM-International Center for Living Aquatic Resources Management**
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  0718 Makati, Metro Manila, Philippines
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- **ICRAF-International Centre for Research in Agroforestry**
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  Fax 874-1772276 via INMARSAT Satellite

- **ILRI-International Livestock Research Institute**
  P.O. Box 30709
  Nairobi, Kenya
  Tel. (254-2)630743
  Fax (254-2)631499

- **IPGRI-International Plant Genetic Resources Institute**
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  00145 Rome, Italy
  Tel. (39)6-518921
  Fax (39)6-575-0309

- **IRRI-International Rice Research Institute**
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  Tel. (31)70-3496100
  Fax (31)70-3819677

- **WARDA-West Africa Rice Development Association**
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