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CGIAR

*Consultative Group on International Agricultural Research*

*The CGIAR really meets everything that we care about in the Bank—bringing together*



*excellence, bringing together diversity, allowing people to have their own ingenuity, integrity, creativity, doing it on a national basis, being respectful of the experience of people throughout the world, drawing that experience together, not trying to impose something from the top, and benefiting from a truly multinational institution.*

—James D. Wolfensohn, President of the World Bank Group, delivering the opening remarks at the celebration of the twenty-fifth anniversary of the CGIAR, International Centers Week, October 28, 1996, Washington, DC.

*front:* CALLIANDRA-  
MAIZE INTERCROPPING IN  
KENYA. CALLIANDRA IS  
INCREASINGLY BEING  
GROWN BY FARMERS FOR  
USE AS FODDER. (ICRAF)

*back:* SCIENTIST USING  
ELECTROPHORESIS IN  
BIOTECHNOLOGY  
RESEARCH. (CIP)



# ABOUT THE CGIAR

## An Overview

The Consultative Group on International Agricultural Research is an informal association of fifty-three public and private sector members from the South and North. The mission of the CGIAR is to contribute, through its research, to promoting sustainable agriculture for food security in developing countries. FAO, UNDP, UNEP, and the World Bank are the CGIAR's cosponsors. Seventeen CGIAR members are from the South, and twenty-one from the North; the remainder are foundations and international and regional organizations.

The vision of the CGIAR is of a world in which agricultural research has a positive impact on food security, income and employment generation, conservation of natural resources, and the environment. The defining terms of this vision are: less poverty; a healthier, better nourished human family; reduced pressure on fragile natural resources; and people-centered policies for sustainable development. The CGIAR fulfills its mission by adopting and supporting the implementation of a research agenda, carried out by a network of sixteen international agricultural research centers in full association with partner institutions.

Since its establishment in 1971—to consolidate and spread the benefits of international agricultural research beyond Asia, where unprecedented harvests from new varieties of rice and wheat overcame the threat of famine in the late 1960s—the research supported by the CGIAR has expanded and diversified, and membership in the CGIAR has increased.

Productivity and natural resources management are the twin pillars of CGIAR research on food crops, forestry, livestock, irrigation management, aquatic resources, and policy issues, and in its services to national agricultural research systems. Research supported by the CGIAR covers commodities that provide 75 percent of food energy and a similar share of protein requirements in developing countries.

Membership in the CGIAR is open to any country, foundation, or international or regional organization which supports the mission of the CGIAR; is willing to participate in decisionmaking and, in particular, the adoption of the system's research agenda; and is committed to providing support for the implementation of that agenda. Contributions by CGIAR members are voluntary, and are made as grants. Each CGIAR member is free to contribute directly to the center(s) and program(s) of its choice.

*The mission of the CGIAR is to contribute, through its research, to promoting sustainable agriculture for food security in developing countries. The CGIAR fulfills its mission by adopting and supporting the implementation of a research agenda, carried out by a network of sixteen international agricultural research centers in full association with partner institutions.*



Research activities included in the agreed agenda are expected to meet four criteria. They must:

- be aimed at producing research or research-related international public goods;
- be of high priority in terms of achieving the CGIAR's goals and objectives;
- have acceptable probabilities of success; and
- have no alternative producers or sources of supply with suitable costs or reliability.

Decisions on research policy are made, and research programs are carried out, in consultation and collaboration with a range of partners in the global agricultural research system, including national agricultural research systems in developing countries, universities, advanced research institutes, non-governmental organizations, farmer associations, community organizations, and the private sector.

## R e s e a r c h   a n d   I t s   I m p a c t

The founders of the CGIAR were convinced that new, science-based agricultural technologies could be effective weapons on the front lines in the battles against hunger and poverty. The continuing transformation of tropical agriculture has had a five-fold impact in developing countries, as described below.

**Increased productivity has made more food available.** Globally one of the greatest achievements of this century has been the phenomenal increase in agricultural productivity through the adoption of science-based technologies. The data in Asia is striking. Over the thirty years ending in 1991, rice production increased by 123 percent, with yields increasing by approximately 88 percent. Wheat production rose by 338 percent, with yields increasing by 204 percent, during the same period.

**Intensive productivity has preserved land and biodiversity.** Many hectares of environmentally sensitive land have been saved from cultivation, and their biodiversity protected, as a result of high-yield agricultural production on fertile land. Intensive production has increased the amount of food produced per hectare, thus substantially raising the number of people fed, without increasing land area.

**Lower food prices and increased incomes have made more food accessible to more people.** The impact of food access on poverty alleviation is manifest in many countries in Asia and Latin America. The consumer price of rice and wheat in Asia dropped by over 40 percent between 1960 and 1990. The poor have benefited greatly from expanded food security because they spend a higher proportion of their income on food than do others.

**Higher calorie intake has improved nutrition and health, and increased life expectancy.** This has been observed in developing countries generally, and specifically in the green revolution countries of Asia. In developing countries, life expectancy at birth has risen from an average of 47.4 years in 1960 to 1965 to 62.4 years in 1990 to 1995. Life expectancy at birth in India, a pioneering green revolution country, is 61 years. Similarly, the daily per capita calorie intake in developing countries has grown from 2,060 in 1960 to 2,470 in 1990. The figure for India is 2,230.

**The contribution of agriculture to growth has led to overall economic advances.** In this area as well, Asia, where agricultural development has almost always preceded development in general, is a showcase of results. In 1995, for instance, the 59 countries of Asia and the Pacific region recorded an average growth of 7.8 percent compared to a world average of 2.6 percent.

## Meeting Future Challenges

As the world moves toward 2020, when the world's population will be about 9 billion—7 billion in developing countries—the world's very poor will number one and a half billion. Some 70 percent of the poor will be women. Within the same time frame, urbanization and increased income in developing countries are likely to change dietary habits, increasing the demand for livestock and high value agricultural products. This, in turn, will increase the demand for cereals and coarse grains for use as animal feed, in addition to their fundamental use as food for people.

Simultaneously, current trends suggest that the world will continue to face serious environmental concerns such as water and wind erosion, loss of soil nutrients, salinization, waterlogging, tropical deforestation, and loss of biodiversity, unless corrective measures are taken. Agriculture is at the heart of any effective solution to the nexus of problems encompassing population growth, environmental destruction, poverty, and food insecurity.

To prepare itself to meet these challenges, the CGIAR undertook an eighteen-month program of renewal, beginning in May 1994, to clarify its vision,



refocus its research agenda, broaden its partnerships, stabilize its finances, and tighten its governance and operations. A key event of the renewal program was a Ministerial-Level Meeting held in Lucerne, Switzerland in February 1995, at which participants adopted a *Declaration and Action Program* that serves as the charter of the CGIAR.

Based on the principles adopted as part of the renewal program, the CGIAR will focus on five major research thrusts over the next twenty years.

**Improving Productivity.** The CGIAR strives to make developing country agriculture more productive through genetic improvements in plants, livestock, fish, and trees, and through better management practices. One important feature of the CGIAR's breeding research is its focus on building into plants greater resistance to insects and diseases that adversely affect productivity and the stability of production in the tropics. While protecting farmers from losses, these improved plants protect the environment because they require little, if any, chemical controls.

**Protecting the Environment.** Conserving natural resources, especially soil and water, and reducing the impact of agriculture on the surrounding environment, is an essential, and growing, part of the CGIAR's efforts. The CGIAR plays a leading role in developing new research methods to identify long-term trends in major agricultural environments, and in developing solutions to pressing environmental problems.

**Saving Biodiversity.** The CGIAR holds in trust for the future one of the world's largest collections of *ex situ* genetic resources, containing over 600,000 accessions of more than 3,000 crop, forage, and pasture species. The collection includes improved varieties and, in substantial measure, the wild species from which those varieties were created. Duplicates of these materials are freely available to researchers around the world so that new gene combinations can be brought to bear on current problems. The CGIAR has placed its collections under the auspices of FAO as part of an international network of *ex situ* collections.

**Improving Policies.** Agricultural producers are heavily influenced by public policy. The CGIAR's policy research aims to help streamline and improve policies that strongly influence the spread of new technologies and the management and use of natural resources.

**Strengthening National Programs.** The CGIAR is committed to strengthen national agricultural research in developing countries through working relation-

ships with colleagues in national programs, strengthening skills in research administration and management, and formal training programs for research staff.

Looking to the future, the renewed CGIAR is committed to harnessing cutting-edge science, including biotechnology, to serve the needs of the poor and hungry. The CGIAR will carry out its work as part of a coalition of agricultural research partners; a Global Partnership committed to alleviating poverty, increasing productivity and resource efficiency to feed an expanding world population, conserving biodiversity, and protecting the environment. 



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## LIST OF ACRONYMS

CGIAR	Consultative Group on International Agricultural Research
DANIDA	Danish International Development Authority
EC	European Commission
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GIS	Geographic Information System(s)
GNP	Gross National Product
GRPC	Genetic Resources Policy Committee, CGIAR
IAEG	Impact Assessment and Evaluation Group, CGIAR
IAR	Institute of Agricultural Research, Njala, Sierra Leone
ICW	International Centers Week, CGIAR
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
INGA	International Network on Genetics in Aquaculture, ICLARM
MTM	Mid-Term Meeting, CGIAR
NARS	National Agricultural Research System(s)
NGO	Non-governmental Organization
ODA	Official Development Assistance
PFA	Platform for Action, Fourth World Conference on Women
TAC	Technical Advisory Committee, CGIAR
TLU	Tropical Livestock Unit
TRIPS	Trade Related Intellectual Property Protection System
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIFEM	United Nations Development Fund for Women
US	United States
USAID	United States Agency for International Development
WANA	West Asia and North Africa
\$	All financial data are given in US dollars

## CGIAR CENTERS

CIAT	Centro Internacional de Agricultura Tropical
CIFOR	Center for International Forestry Research
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CIP	Centro Internacional de la Papa
ICARDA	International Center for Agricultural Research in the Dry Areas
ICLARM	International Center for Living Aquatic Resources Management
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
IIMI	International Irrigation Management Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IPGRI	International Plant Genetic Resources Institute
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
WARDA	West Africa Rice Development Association

1996

*The*  
*Year in*  
*Review*

*front:* DOWNY MILDEW  
IS PEARL MILLET'S  
BIGGEST ENEMY. ICRISAT  
RECEIVED THE 1996  
KING BAUDOUIN AWARD  
OF THE CGIAR FOR ITS  
WORK TO IMPROVE  
PEARL MILLET. (ICRISAT)



*back:* TILAPIA BROOD-  
STOCK BEING  
CONDITIONED IN  
PREPARATION FOR  
BREEDING. SIMPLE  
SELECTIVE BREEDING  
OF FARMED TILAPIA HAS  
LED TO GAINS IN  
PRODUCTIVITY THAT  
HAVE BENEFITED  
FARMERS. (ICLARM)



The annual reports of the CGIAR published by the CGIAR Secretariat complement center-specific reports by providing a broad systemwide perspective. This annual report is noteworthy in several respects. It commemorates the twenty-fifth anniversary of the CGIAR; details the results of the Global Forum on Agricultural Research; highlights CGIAR research from a regional perspective, focusing on West Asia and North Africa; and, provides perspectives of eminent leaders shaping the directions of development today.

This report also marks a transition in the time period covered by CGIAR annual reports. In recent years, the annual report has had dual year coverage—from Mid-Term Meeting to Mid-Term Meeting. This was the case with the last annual report, which focused on MTM95 to MTM96. This annual report reverts to calendar year coverage. It focuses, in particular, on post-MTM96 until year end, as the previous annual report covered events up to May. The 1997 annual report will re-establish complete calendar year coverage.

In 1996 the CGIAR celebrated twenty-five years of effort and achievement, as it prepared to confront future challenges with renewed vigor. The twenty-fifth anniversary of the CGIAR was commemorated at International Centers Week 1996 in October. Distinguished current and former CGIAR leaders, including many of the founders of the CGIAR, participated in the celebration. The commemoration was characterized by an emphasis on challenges and opportunities for the future, based on the experience of the past.

The year saw continued progress made in increasing the participation of the South in CGIAR decisionmaking, strengthening the CGIAR's partnerships, achieving openness and transparency, and further restructuring operations to ensure maximum efficiency, effectiveness, and impact of research programs.

A significant manifestation of this progress was the Global Forum on Agricultural Research, convened during International Centers Week, which brought together, for the first time, representatives of all components of the evolving global agricultural research system. The Forum culminated in the adoption of a *Declaration and Plan of Action for Global Partnership in Agricultural Research*, subsequently tabled at the World Food Summit.

Three new members from the South joined the CGIAR in 1996—Pakistan, Syria, and South Africa—bringing the total number of developing country members to seventeen, as compared with twenty-one developed country members. As well, the CGIAR strengthened its partnerships with the NGO and private sector



Alexander von der Osten, CGIAR Executive Secretary

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communities through the CGIAR NGO Committee and Private Sector Committee, respectively.

Important decisions were made in 1996 by the CGIAR membership with regard to the CGIAR's research agenda. In a comprehensive review of priorities and strategies that defined the long-term directions of CGIAR research, the CGIAR reaffirmed:

- its focus on poverty alleviation, environmental protection, and food security;
- its emphasis on international public goods research that benefits the rural poor and women in particular; and
- its comparative advantage in conducting strategic research.

As well, medium-term planning for 1998 to 2000 was initiated. The research agenda for 1997 was approved, with a projected financing plan of \$325 million—up from \$300 million in 1996. Areas identified for CGIAR engagement in Eastern/Central Europe and Central Asia/Caucasus were endorsed, and a commitment in principle was made to carry out programs in the region, subject to the provision of additional funds by members.

Plans were finalized in 1996 for a review of the CGIAR system, to begin in 1997 and to be completed in 1998, under the chairmanship of Mr. Maurice Strong, Secretary General of the 1992 United Nations Conference on Environment and Development. The review will be forward looking, examining the future role of the CGIAR; specifically, how best it should reposition itself in the evolving global agricultural research system.

1996 was indeed a momentous year in the life of the CGIAR. With the wisdom of its past and a vision of the future as guidance, the CGIAR and its partners will continue to work together today and into the next millennium to realize the goal of a food secure world. 



## THE CGIAR AT 25: INTO THE FUTURE

Years bring atrophy to some institutions. Others become overconfident. Neither condition afflicts the CGIAR. With all humility we can draw strength from the achievements of the CGIAR. They are real, have made a difference in the lives of countless people, and are so recognized. Without these achievements, the world's poor would be poorer today; more would go hungry, more would sicken from hunger-related disease, more would succumb to the sullen bitterness caused by helplessness and hopelessness.

The success of past efforts challenges us to mobilize again to meet new challenges, to chart new courses, to undertake renewed agricultural transformation, and to reach out to the fulfillment of a vision in which the world's deprived and disadvantaged are liberated from the grip of extreme poverty and hunger.

Our vision of the future has to be multidimensional because real life has many dimensions. Our vision has to be people-centered, gender conscious, and empowering of the weak and vulnerable. Our vision must be based on a clear recognition of access to food as a basic human right. The *Universal Declaration of Human Rights* (1948) said that “everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food.” The *International Covenant on Economic, Social, and Cultural Rights* (1966) proclaimed the “right of everyone to adequate food,” and declared that freedom from hunger is a universal and fundamental right. We must work with our partners to transform those principles into living reality, recognizing that food security is more than food production—it is about poverty reduction, access, and nutrition.

Our vision must recognize that development has a cultural content, that respecting indigenous knowledge built up through years of practice helps to develop such a cultural content, while at the same time enriching the process of scientific inquiry. Our vision must encourage us to act in ways that will leave future generations as much as, if not more than, what we found ourselves. We must learn to husband the resources of this fragile planet, just as we have learned to enjoy its bounty.

Spectacular successes in almost every aspect of life across much of the world in the past few decades suggest that we can dare to hope for a vision fulfilled. Indeed, developing countries, in many respects, covered as much distance in their human development during the past thirty years as the industrial world managed over a century. Infant mortality rates in developing countries dropped by over 50 percent—from 150 per thousand live births to 70 per thousand live births. Life expectancy increased by a third—from 47 years to 62 years. Combined primary



Ismail Serageldin,  
CGIAR Chairman

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and secondary school enrollment more than doubled. Economic growth rates in several countries were high, and continue to rise. One-and-a-half billion people, mostly in East Asia, secured per capita annual income growth of more than 7 percent in the 1980s. If this is the way in which the disadvantaged are all moving, we can truly look to the twenty-first century with great optimism.

That is just the sunny scenario. As everyday experience suggests, these statistics tell only half the story. During the same period, another billion people, many in Sub-Saharan Africa, were the victims of a continuous shrinkage of per capita income. Some 17 million people die every year in developing countries from curable diseases. Millions are out of school. Almost a third of the world's population lives in poverty. About 200 million people are affected by desertification. Internal and cross-border conflicts have added to human misery, driving millions of dispossessed people into refugee camps—more correctly, refugee hovels. For them the only vision is a persistent, real-life nightmare. It does not have to be so. I see a world where contradictory tendencies coexist; where crisis and opportunity are two sides of the same coin. We must grasp opportunity and subdue crisis.

One set of tendencies is positive. I see a world in which ever more dazzling advances in science will be achieved. I see a world of ever greater interconnect- edness through telecommunication, computers, and economic integration. I see a world where greater and greater opportunities exist for the knowledgeable, the nimble, and the able. Small countries, if they have the right skills, attitudes, and policies, will be able to consider the entire world their market, and will be able to tap into endless sources of capital. Their growth, prosperity, and well-being will not be hostage to the size of their geographic boundaries, the magnitude of their internal markets, or the domestic savings they can mobilize.

I also see the downside of such a world, speeding toward its knowledge-based economy—inequities rising between and within countries; a small elite of rich people in poor countries connected to a global community of science, business, and the arts; and poor people in rich countries joining the vast majority of humanity in the developing world as gaps grow wider, frustrations increase, and the poor everywhere are left behind. If the downside dominates, the contributions of science would give ever more to an ever smaller part of the human family.

It is up to us, and all like us who are concerned with the human condition, to try to ensure that we harness the power of science for the full benefit of humanity, for the poor, the destitute, and the hungry among us, and for the gener- ations to come.

There is a central core of universal values that any truly modern society must possess, and these are very much the values that science promotes: rationality, creativity, the search for truth, adherence to codes of behavior, and a certain constructive subversiveness. Science requires the challenge of the established order; the right to be heard however outlandish the assertion, subject only to the test of rigorous method. The scientist at her lab bench and the farm family in the hinterland must both share this right. Indeed, the vision of partnership between the farmer in the field, with her practical wisdom honed through the centuries, and the scientist exploring the cutting edge of contemporary knowledge in the laboratory is one that is not alien to true scientific values.

Science is a cultural current that brings imagination and vision to bear on concrete problems and theoretical speculation, as in William Blake's immortal phrase, "What is now proved was once only imagined." Imagination and vision are at the very heart of the scientific enterprise. Jacob Bronowski<sup>1</sup> put it beautifully when he said, "We are the visionaries of action; we are inspired with change. We are the culture of living change."

Agricultural science can open the doors to pervasive societal change, for all of us, whatever our calling or specialty, depend on agricultural science. We are all the guests of the green plants and those who tend them and the animals who use them. Agriculture is not only a means of producing more to feed more people. Agricultural transformation is the trigger that can help the human family cope with the nexus of problems related to poverty, hunger, and environmental degradation.

Overcoming poverty and hunger, increasing food production, and halting the degradation of natural resources require action on a broad and complex rural development front. We need to intensify agricultural production systems sustainably, while preventing damage to natural resources and biodiversity and contributing to the improved welfare of farmers, especially smallholders and the landless. These are momentous challenges. I am convinced, however, that science can enable us to meet them—if we define our goals with clarity, if we work together, and if we never lose sight of the overarching objective of strengthening the weak, sustaining the poor, feeding the hungry, and empowering the unempowered. 

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<sup>1</sup> The late scientist and mathematician who wrote *The Ascent of Man*.

# MAJOR EVENTS AND TRENDS

## Twenty-fifth Anniversary Celebrated

### Taking Stock for the Future

The year 1996 marked the twenty-fifth anniversary of the first formal meeting of the CGIAR on May 19, 1971. The anniversary was commemorated at International Centers Week 1996 in October, under the overall theme “The CGIAR at 25: Into the Future.” The opening day of ICW96 was devoted to a celebration of the CGIAR’s past achievements and future prospects. Numerous distinguished CGIAR alumni, current and former CGIAR leaders, and special guests, including participants in the Bellagio meetings which led to the founding of the CGIAR, attended the celebration. The visionaries, leaders, and scientists in the field who built the CGIAR’s reputation for excellence were lauded in a program that placed emphasis on scientific capacity and the means by which the CGIAR could garner its wealth of knowledge and experience to help realize global food security in the future.

*The day of commemoration featured reflections on the achievements of the CGIAR in its first twenty-five years, and on how the CGIAR might best translate its lessons from the past into wisdom for the future.*

The day of commemoration featured reflections on the achievements of the CGIAR in its first twenty-five years, and on how the CGIAR might best translate its lessons from the past into wisdom for the future. Among those participating in the formal program was World Bank Group President James Wolfensohn, who delivered opening remarks. Mr. Maurice F. Strong gave the 1996 Sir John Crawford Memorial Lecture. Former CGIAR Chairmen Warren Baum, W. David Hopper, Wilfried Thalwitz, and V. Rajagopalan, and former TAC Chair Guy Camus, engaged in a roundtable discussion. 1996 World Food Prize co-recipient Gurdev Khush delivered a commemorative address, and CGIAR Chairman Ismail Serageldin delivered a keynote address on a science-based vision for the future.

In his opening remarks, Mr. Wolfensohn pledged the World Bank’s continuing support for the CGIAR, describing it as “perhaps the most successful partnership in the history of development.” He praised the CGIAR’s unparalleled work in research, advancing science, training, and capacity building, and lauded the qualities of excellence, diversity, ingenuity, integrity, and creativity, among others, that have distinguished the CGIAR in the past. He emphasized the importance of integrating the CGIAR’s activities into the rural system, and said the CGIAR’s work would be pivotal to meeting the food needs of the world’s poor in the future.

In the 1996 Sir John Crawford Memorial Lecture, Mr. Strong applauded the CGIAR’s role in the approximate doubling of rice, wheat, and maize yields between the 1960s and 1990s. He called for increased global food security, at both the

national and household levels, and highlighted the challenges and problems that would be faced in meeting future world food needs—a doubling of food production by 2025. To help bring about a sustainable food production system that is essential for food security, he advocated the CGIAR centers take the lead in creating a positive synthesis between modern scientific techniques and traditional practices, integrating their work more fully with the institutions, scientists, and farmers in the communities in which they are located. As well, the CGIAR should focus more of its efforts on helping small farmers, and women in particular, to access the knowledge and resources required to increase their own productivity.

In a roundtable discussion, four former CGIAR Chairmen and a former TAC Chair each shared a personal message. Reflections touched on the major achievements of the CGIAR during their tenures, personal views of the highlights of their chairmanships, and assessments of how best the CGIAR can continue to serve the world's poor in the next twenty-five years. Major points emerging from the discussion were: a recognition of how the priorities and functions of the CGIAR have changed over time and how it has become truly global in character; the urgent need to raise food security and production in Africa; the potential of Central and Eastern Europe and the countries of the former Soviet Union to become, once again, a major source of food for all of mankind, if current problems facing the region are overcome; the importance of merging efforts to increase productivity and sustainably manage natural resources in the research of the CGIAR; the need to expand the donor base of the CGIAR; and, the significant role the private sector should play as both a research partner and financial supporter of the CGIAR's efforts in the future.

### **Ensuring Scientific Excellence**

In addition to honoring past achievements, present and future scientific issues of concern to the CGIAR were also highlighted during the day of commemoration. These and other issues before the CGIAR must be addressed with the same adherence to excellence that has been the hallmark of the system for the past twenty-five years.

Tribute was paid to the World Food Prize laureates from within the CGIAR system. CGIAR Chairman Ismail Serageldin indicated that it was a privilege for the CGIAR, and a testimonial to the quality of its work, that over half of the World Food Prize winners have been associated with the CGIAR. 1996 World Food Prize co-recipient Gurdev Khush of IRRRI delivered a commemorative address on the theme "Science in the CGIAR: Yesterday, Today, and Tomorrow," focusing on the

evolution of rice research and future challenges. The other co-recipient was Mr. Henry Beachell, a retired IRRI scientist.

During ICW96 the King Baudouin Award of the CGIAR and the Chairman's Excellence in Science Awards were presented to recognize and commend outstanding scientific achievement, and to serve as an incentive for continued scientific excellence at the centers. As well, the Nyle C. Brady Award was presented to recognize outstanding leadership within the CGIAR system.

#### *The King Baudouin Award of the CGIAR*

The 1996 King Baudouin Award of the CGIAR, a biennial award which recognizes outstanding research by one or more of the CGIAR's centers, was presented to ICRISAT for its contribution to the development of disease-resistant, yield-increasing pearl millet in collaboration with advanced institutions and national research programs. Research at ICRISAT has focused primarily on the development of pearl millet hybrids that are resistant to downy mildew and to ergot and smut diseases, the crop's most serious biotic constraints. ICRISAT research has also centered on the crop's major abiotic constraints: drought, heat, and low soil fertility. Interdisciplinary efforts and partnerships with NARS have characterized ICRISAT's efforts. The center estimates that annual returns to pearl millet farmers from cultivated varieties developed by ICRISAT and its partners amount to \$54 million. [For further details see box on page 19.]

#### *Chairman's Excellence in Science Awards*

The Chairman's Excellence in Science Awards were inaugurated at ICW96 to honor special achievement at the CGIAR centers in the following three categories: Promising Young Scientist; Outstanding Local Professional; and Outstanding Scientific Partnership.

The Promising Young Scientist Award was presented to Mr. Shaobing Peng of IRRI to recognize outstanding achievement in research on the physiological processes underlying yield potential in rice. Brought up in a small rural community in the People's Republic of China, at just twenty-eight years of age Mr. Peng had already established his expertise in research on the physiological processes underlying yield potential, water use efficiency, and nutrient uptake and metabolism, with particular reference to nitrogen. Since joining IRRI in 1991, Mr. Peng established and has led a research program which has provided the crucial linkages among crop physiology, systems analysis, and agronomic issues. Mr. Peng's

## ICRISAT Wins *King Baudouin Award* of the CGIAR

The 1996 King Baudouin Award of the CGIAR<sup>2</sup> was presented to ICRISAT, to recognize outstanding achievement in the development of disease-resistant, yield-increasing pearl millet in collaboration with advanced institutions and national research programs.

Pearl millet is grown by poor farmers on about 27 million hectares of dryland, primarily in Asia and Africa. In these areas, it is the only cereal that reliably provides grain and fodder under hot, dry, rainfed conditions, and on shallow or sandy soils with low fertility and water holding capacity. The people who live in these dryland areas are among the poorest anywhere. Diseases are the most important biotic constraints of pearl millet, particularly downy mildew, which can reduce yields by more than 40 percent, as well as the panicle diseases, ergot and smut. The major abiotic constraints are drought, heat, and low soil fertility.

ICRISAT's research has primarily focused on developing hybrids with high grain yield and resistance to downy mildew, ergot, and smut. ICRISAT's downy mildew research has resulted in significant scientific findings. Hybrids with enough of both heterogeneity for resistance and uniformity for agronomic characters are possible means of achieving the durable resistance previously available only from open-pollinated cultivars. ICRISAT began first field evaluations of such hybrids in 1996. Research on ergot and smut has emphasized control through host plant resistance, and has resulted in the development of screening techniques and lines providing reasonable yield and resistance.

ICRISAT's drought tolerance research has focused on breeding attributes of landraces—farmers' varieties—into improved materials. ICRISAT is working with other institutions to assess the severity of the lack of soil nutrients (IFDC), and to search for ways to enrich poor soils with biomass provided by crop residues and animal dung (ILRI). Agroforestry alternatives are also being developed (with ICRAF).

Interdisciplinary efforts and partnership with NARS have characterized ICRISAT's research. It is now expanding to include a greater sharing of roles with networks, NGOs, and farmer groups, including farmer-managed trials to understand their preferences. ICRISAT has estimated that the annual returns to pearl millet farmers from cultivated varieties developed by the center and its partners amount to \$54 million.

<sup>2</sup> When the CGIAR was awarded the King Baudouin International Development Prize by Belgium in 1980, it decided to invest the prize money and use the income for a biennial award in recognition of outstanding work done by one or more of the centers. TAC serves as the selection committee for the CGIAR's King Baudouin Award.

success is an inspiration to all young scientists who wish to dedicate their careers to agricultural research for the benefit of the poor in the developing world.

The Award for Outstanding Local Professional was presented to co-recipients Ms. Thelma R. Paris of IRRI and Mr. Shashi B. Sharma of ICRISAT. Ms. Paris received the award for outstanding achievement in research to link human nutrition and agriculture, and for her studies on gender issues in rice-based farming. She is a prominent researcher and leader in the field of integrating women's concerns into the technology generation process. Her work has built bridges between scientists and farmers, in order that farmers directly benefit from rice research and development. Her approach has also paved the way for NARS to address gender concerns in their own research and development efforts.

Mr. Sharma received the award in recognition of outstanding achievement in research on nematode parasites of pigeonpea, chickpea, and groundnut. His work has significantly increased knowledge, awareness, and understanding of these parasites, and the production constraints they pose. As well, he has developed diverse research tools, techniques, and environmentally friendly management approaches that aid in the protection of crops from nematode damage. His research has resulted in a critical leap forward in successful nematode management and in ensuring sustainability and profitability of subsistence farming in many areas where nematodes are prevalent.

The Award for Outstanding Scientific Partnership was presented to co-recipients IITA and the Institute of Agricultural Research in Njala, Sierra Leone to recognize outstanding achievement in collaborative research on the improvement of root and tuber crops in West Africa. Central to the project's success have been the efforts of IAR Director Mohammed T. Dahniya. The partnership between IITA and IAR, which has involved communication and information exchange, the conduct of joint research, particularly on the genetic improvement of cassava, and training, has been a major factor in the improvement of root and tuber crops in the western part of West Africa.

#### *Nyle C. Brady Award*

The Nyle C. Brady Award honoring outstanding leadership was presented to ISNAR Director General Christian Bonte-Friedheim for his pioneering and life-long efforts to champion the cause of national agricultural research systems, and to forge strong partnerships between the international and national agricultural

research communities. Mr. Bonte-Friedheim was the FAO cosponsor representative to the CGIAR for five years before assuming leadership of ISNAR. Throughout this association he has been an advocate for the South, its capabilities, and its potential.

### **Beyond 25—Moving Ahead**

The anniversary celebration concluded with a keynote address by CGIAR Chairman Ismail Serageldin on the topic “Into the Future.” Mr. Serageldin spoke of the CGIAR’s achievements and the difference that has been made as a result in the lives of countless of the world’s poor. The success of its past efforts compels the CGIAR to meet the challenges of the future. He elaborated the CGIAR’s vision of the future as one that is: people-centered, gender conscious, and empowering of the poor; founded on a clear recognition of access to food as a basic human right; respectful of indigenous knowledge and its contribution to cultural development; and, recognizing the need to responsibly husband the Earth’s fragile natural resources on behalf of future generations.

The CGIAR’s research programs need to be guided, he said, by considerations of biodiversity preservation, environmental concerns, the changing interface between the public and private sectors, intellectual property rights, bioethics, and the need for greater stakeholder participation in the research process. Important areas for research in the future will be: the preservation of biodiversity; research on postharvest production technologies; and the greater use of biotechnology. To address these issues effectively researchers must act in concert and research responsibilities must be distributed among local, national, regional, and international partners; indigenous knowledge must be integrated with new science; and, NARS must remain the cornerstones of the global effort involving the CGIAR centers, advanced research institutions, NGOs, and the private sector.

### **C e n t e r s F o r u m**

Centers Forum 1996, held at International Centers Week, focused on center research challenges and opportunities from a regional perspective. Senior NARS leaders from the regions chaired sessions in which centers presented highlights of current research, assessed future research needs, and outlined what is in the pipeline for meeting these needs in each of the four major regions of the developing world: Sub-Saharan Africa; Asia; Latin America and the Caribbean; and, West Asia and North Africa.

*NARS must remain the cornerstones of the global effort involving the CGIAR centers, advanced research institutions, NGOs, and the private sector.*

Commentary by *His Excellency Poul Nielson,*  
Minister of Development, Denmark

*The following are excerpts from the commentary by His Excellency Poul Nielson, Denmark's Minister of Development, published in the daily newspaper "Kristeligt Dagblad" on Monday, October 28, 1996, coinciding with the celebration of the twenty-fifth anniversary of the CGIAR at International Centers Week.*

In the late 1960s and early 1970s there was no hope in the race between population growth and food production. Population growth would shortly overtake growth in agricultural production, resulting in hunger on a massive scale, particularly in the more populous nations. This did not happen, although it nearly did, due to poor farming years in some areas. The reason is not that population growth stopped; rather, there was an entirely unexpected spurt in food production.

Behind this unexpected and rapid progress were the research centers of the CGIAR. Their pioneering work on plant improvement led to what is known as the green revolution. New varieties of crops, combined with more effective methods of cultivation, resulted in high and stable yields, and farmers both large and small in developing countries were quick to switch to them. Country after country was taken off the endangered list, and the story is still continuing to this day. The CGIAR centers, formally assembled in 1971, and later expanded with Danish support, have been truly effective.

Today, the CGIAR is taking the first day of its annual meetings to mark the jubilee of its founding and to look toward the future. The CGIAR's agenda is considerably more complicated now than it was twenty-five years ago when the main issue was increasing agricultural production. Although this is still the primary concern, environmentally friendly production methods, the poverty aspect of its work, and support to developing country researchers are also emphasized by the CGIAR.

Denmark is deeply involved in the CGIAR's success: it makes a solid financial contribution; there are Danish employees at ten of the centers and Danish managers at seven of them; and there are many examples of cooperation between Danish research and the CGIAR.

The CGIAR is a central element of Denmark's strategy for agricultural development in developing countries. There is good reason to congratulate the CGIAR on a splendid effort over twenty-five years. And there is at least as much reason to wish it luck in its efforts in the coming years.

Statement by *The Honorable Sally Shelton*,  
Assistant Administrator, United States  
Agency for International Development

*The following are excerpts from the statement made by The Honorable Sally Shelton, USAID's Assistant Administrator for Global Programs, Field Support, and Research, at International Centers Week 1996.*

The twenty-fifth anniversary of the CGIAR, which we are celebrating this week, is a very special occasion. As I look around the room, I see a stunning number of international economists, agronomists, scientists, and others who believe that food security is going to be one of the most pressing challenges facing our world.

The United States Government is very much concerned about food shortages in the coming years. Despite the very serious budget pressures under which USAID has been laboring for the last several years—and this year is no different—we will increase our commitment to the CGIAR by 17 percent in 1997. We are optimistic for 1998, and are requesting an even larger increase. We are also looking at how we can engage American universities and colleges more intimately in the CGIAR's efforts.

Chairman Serageldin, let me once again express my government's strong support for your extraordinarily able leadership of the CGIAR. Without the commitment of the many people here, the CGIAR would not be where it is today, and without your leadership we would not be able to move forward.

The CGIAR is materially changing for the better the lives of millions of farmers and nonfarmers around the world. It behooves all of us to try to increase popular support for, and better grassroots understanding of, what the CGIAR does. So my congratulations to you, Mr. Chairman, and to all those who have succeeded in bringing the CGIAR such a long way in the last twenty-five years.

Statement by *Mr. Kunio Nakamura*, Assistant  
Director, Multilateral Cooperation  
Division, Ministry of Foreign Affairs, Japan

*The following are excerpts from the statement made by Mr. Kunio Nakamura, Assistant Director of the Multilateral Cooperation Division of the Ministry of Foreign Affairs in Japan, at International Centers Week 1996.*

On behalf of the Government of Japan, I offer my congratulations to the CGIAR on its twenty-fifth anniversary. Through its efforts, and with the support of the international community, the CGIAR has continuously been a center of excellence in the field of global agricultural research. We appreciate the efforts of all the people involved, from staff members to donors, in the past activities of the CGIAR, leading up to today.

Japan recognizes the vital importance of science to achieving the interrelated goals of poverty reduction, environmental protection, and food security. Japan commends the dedication and persistence of center scientists to solve complex, real-life problems, to break down barriers posed by pests and diseases, difficult soil and climatic conditions, and the natural limitations of crop varieties, to forge new solutions which make a material difference in the lives of the world's poor. The great strides in agriculture made during the past twenty-five years give testimony to the power of science to address the daunting challenge of feeding a burgeoning global population with increasingly scarce natural resources.

Japan believes that science to advance agriculture is the key to enabling many developing countries to unlock their capacity for full-scale growth and development. Science must continue to be brought to bear on further increasing crop yields. Equally important, science has much it can contribute to the preservation of the environment and to the sustainable use of natural resources.

Japan is proud to be one of the leading donor countries of the CGIAR. Its record of support to the CGIAR is evidence of its belief in the power of science and its commitment to finding solutions to the problems of poverty, hunger, and environmental degradation in developing countries.

Science and technology to advance agriculture is not only for us, but also for future generations that will inhabit this small planet.

Some of the diverse and innovative ways in which centers are responding to regional challenges and opportunities follow.

- Centers are increasingly adopting a multidisciplinary, systems approach to achieve higher productivity, reduce risks to farmers, create employment, and increase incomes.
- Research strategies include biotechnology, farmer-participation, germplasm enhancement, and novel work with farmers' landraces and wild relatives of crop species.
- Advances in crop modeling, remote sensing, and geographic information systems are being used to identify and address both opportunities and diversity in cropping systems.
- Centers are forging expanded partnerships to set priorities, pool resources, and coordinate research tasks to tackle the larger, more complex research agenda. Partnerships involve greater collaboration with advanced research institutions, the private sector, NGOs, and community groups, as well as with the centers' traditional NARS partners. Facilitating South-South dialogue is a key objective.

The regional approach to research challenges led into the broader perspectives of the Global Forum.

## Global Forum on Agricultural Research

A Global Forum, in which a broad spectrum of partners engaged in agricultural research participated, was convened during ICW96, under the chairmanship of IFAD President Fawzi Al-Sultan. For the first time, representatives of the various components of the global agricultural research system came together to explore the needs and opportunities for agricultural research, the scope for collaboration, and practical measures to strengthen partnerships.

The origins of the Global Forum lie in the efforts of the CGIAR to broaden its partnerships with NARS, regional organizations, advanced research institutions, NGOs, universities, and the private sector, among others, and to increase the participation of the South in CGIAR decisionmaking. The Global Forum signaled the degree to which partners have been integrated into CGIAR decisionmaking at the system level, and the importance placed by the CGIAR on their participation.

Presentations were made by representatives of the regional fora from Asia and the Pacific, Latin America and the Caribbean, Sub-Saharan Africa, and West Asia and North Africa, outlining their research needs and sharing with the group their regional action plans, drawn up through consultation among NARS members. Common themes included concern about population growth, poverty, food security, and environmental degradation, the need for greater collaboration in research and resource mobilization, and the importance of synthesizing modern technology with traditional farming and knowledge systems to create problem-solving techniques.

Presentations were also made by representatives of NGOs, the private sector, advanced research institutions, and universities, and by the CGIAR's Technical Advisory Committee. As well, avenues for collaboration were explored in four major areas of interest: biotechnology; genetic resources conservation and utilization; ecoregional research; and, public policy and institutional strengthening.

Five key goals were emphasized by the Global Forum:

- to enhance the capacity of NARS to generate and transfer in a participatory mode appropriate technology that responds to the needs of the end users;
- to improve priority setting for a global framework for agricultural research;
- to strengthen NARS-NARS partnerships and the emerging regional fora;
- to develop partnerships among all partners in the global agricultural research community; and
- to secure financial support for implementing a plan of action.

The Global Forum culminated in the adoption of a *Declaration and Plan of Action for Global Partnership in Agricultural Research* [see box on pages 27-28], subsequently tabled at the World Food Summit. Participants took the opportunity of the Global Forum to declare their commitment to the development of sustainable agriculture and the importance of collaboration in agricultural research. To accomplish the common goals of alleviating poverty, achieving food security, and ensuring the sustainable use of natural resources, it was agreed that a global agricultural research system must be nurtured.

## Declaration and Plan of Action for Global Partnership in Agricultural Research

### *Declaration*

**W**e, the representatives of the national agricultural research systems, regional and subregional organizations, universities and advanced research institutions, non-governmental organizations, farmer organizations, the private sector, and international agricultural research centers, gathered in a Global Forum on Agricultural Research at the Consultative Group on International Agricultural Research, International Centers Week 1996:

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

- to alleviate poverty;
- to increase productivity and resource use efficiency to feed an expanding population; and
- to address environmental degradation, sustainably manage the natural resource base, and develop and implement more appropriate agricultural policies and sustainable technologies;

**Aware** that the world leaders are holding a summit to address the global challenge of ensuring food security;

**Convinced** that scientific and technological responses and sociocultural factors are essential elements in improving food and nutritional security, as well as more sustainable use of cropland, rangeland, aquatic, and forest resources;

**Realizing** that the national agricultural research systems are the cornerstones of the emerging global research system; and

**Recognizing** that current cooperative research arrangements need to be adjusted to meet challenges of unprecedented nature and magnitude:

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

## *Plan of Action*

**W**e commit ourselves to undertake the following actions, in the pursuit of our common objectives and the foregoing *Declaration*:

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

- alleviating poverty;
- achieving food security; and
- assuring sustainable use of natural resources;

**Contribute** to the strengthening of national agricultural research systems and the subregional and regional fora;

**Foster** the participation in research collaboration by national agricultural research institutes, regional and subregional research organizations, international agricultural research centers, advanced research institutes, universities, the private sector, non-governmental organizations, farmers, and farmers' organizations;

**Encourage** the identification of concrete collaborative projects through suitable mechanisms, including subregional and regional fora; and

**Convene** a Global Forum on Agricultural Research every three years to exchange information in order to identify common challenges, confirm principles of collaboration, and propose alternative means of implementing collaborative programs with the purpose of facilitating partnerships.

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

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

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

The *Plan of Action* elaborates a number of specific activities and initiatives, including:

- mobilizing international support for a global framework for agricultural research;
- strengthening NARS and subregional and regional fora;
- fostering multilevel partnerships among all components in the global agricultural research system, with an emphasis on a participatory approach;
- identifying concrete collaborative projects; and
- convening a Global Forum on Agricultural Research every three years, to discuss common challenges, opportunities for partnerships, and the means of implementing collaborative programs.

### W O R L D F O O D S U M M I T

The CGIAR was an active participant in the World Food Summit, held at FAO in Rome, Italy on November 13-17, 1996. The Summit was convened to renew the commitment of the nations of the world to ensuring food security, by raising the awareness of heads of state and of government of the enormous effort that will be required in worldwide agriculture over the next thirty years to meet global food needs, and by gaining their renewed commitment to develop the cohesive policies and cooperation needed to overcome global food insecurity.

IFPRI represented the CGIAR in preparations for the World Food Summit. IFPRI's involvement included participation in intersessional planning meetings, meetings of the Food Security Committee, and pre-Summit meetings in a number of countries, as well as reviewing most of the fifteen technical background papers, and contact with several country delegations. One of the papers, pertaining to food security and agricultural research, was co-authored by the CGIAR.

In a statement to the Summit, CGIAR Chairman Ismail Serageldin indicated that the CGIAR centers have a special role to play in the global effort. "They can," he said, "while conducting cutting edge science for the benefit of the world's poor, serve as platforms for the exchange of ideas and the development of new technologies." He reminded the Summit of the CGIAR's established track record of

international collaboration. It was the first, and the only group so far, to have placed its collections of plant genetic resources, numbering over 600,000 samples, under the intergovernmental auspices of the FAO Commission on Genetic Resources for Food and Agriculture. Further, the CGIAR was very closely associated with FAO in the International Conference on Plant Genetic Resources held in Leipzig, Germany in June 1996.

Mr. Serageldin noted the importance of the Global Forum on Agricultural Research, convened during International Centers Week 1996, to help lay the foundation of enhanced cooperation among all actors in the global agricultural research system. The *Declaration and Plan of Action for Global Partnership in Agricultural Research* adopted at the Global Forum on Agricultural Research was tabled at the World Food Summit.

The Summit adopted a *Declaration and Plan of Action*, containing seven commitments. Agricultural research falls under the third commitment regarding the pursuit of participatory and sustainable food, agriculture, fisheries, forestry, and rural development policies and practices. Objective 3.4, in particular, relates to support for cooperation between the public and private sectors to strengthen and broaden research in agriculture, fisheries, and forestry, committing member governments in paragraph (b) to:

*Strengthen international research systems, in particular the Consultative Group on International Agricultural Research (CGIAR), and promote coordination and collaboration among international, developed country, and developing country institutions.*

## T h e R e s e a r c h A g e n d a

### **1998-2000 Medium-Term Research Plans**

In 1996 the CGIAR centers began preparing and interacting with TAC on their medium-term research plans for 1998-2000, within the general framework of priorities and strategies established at the 1996 Mid-Term Meeting in May. At MTM96, the CGIAR membership endorsed the long-term priorities and strategies—based on recommendations by TAC, with some modifications—that will guide center research and determine resource allocations through the 1998-2000 medium-term planning period. TAC periodically reviews the long-term priorities and strategies of the CGIAR and makes recommendations to the CGIAR membership on a framework that defines longer-term directions for CGIAR research and

its implementation through CGIAR programs. Typically, this review takes place every five years to ensure that the CGIAR is responsive to changes in the external environment.

Fully elaborated in the *1995-1996 CGIAR Annual Report* and in the *Summary of Proceedings and Decisions* of MTM96, the priorities and strategies endorsed stress a pro-poor, pro-conservation strategy based on increasing productivity. Particular emphasis was placed on: the rural poor, on women, and on an integrated approach to agricultural production and environmental conservation; the need for more research on the soil and water aspects of natural resources management and on postharvest technology development; and, the need to increase collaboration among centers and with partners, with an emphasis on a bottom-up, participatory approach.

At ICW96, research directions for 1998 and the progress made in preparing center medium-term plans were considered. The CGIAR membership will review TAC's recommendations and take decisions on allocations for the 1998-2000 planning period at the 1997 Mid-Term Meeting. This follows the rhythm of decisionmaking endorsed at the Lucerne Ministerial-Level Meeting and introduced at the 1995 Mid-Term Meeting, in which the research agenda and funding requirements of any year are outlined during the Mid-Term Meeting of the preceding year, with the subsequent adoption of the financing plan at International Centers Week of the preceding year.

## **Genetic Resources**

The CGIAR continued to be actively engaged in 1996 in the ongoing international dialogue related to genetic resources. The CGIAR played an important role in FAO's Fourth Technical Conference on Plant Genetic Resources, held in Leipzig, Germany in June 1996, and contributed to two key documents considered at the Leipzig Conference: *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*. IPGRI played an instrumental role in the preparation of both documents, and many other CGIAR centers were involved in both the preparatory process and in the conference itself. A central role for the CGIAR centers is foreseen in the *Global Plan of Action*, which covers four broad areas: *in situ* conservation; *ex situ* conservation; utilization; and, institution and capacity building. The Conference adopted the *Leipzig Declaration*, committing governments to implement the *Global Plan of Action* under the guidance of the FAO Commission.

*The priorities and strategies endorsed by the CGIAR membership stress a pro-poor, pro-conservation strategy based on increasing productivity.*

The CGIAR Genetic Resources Policy Committee prepared a special statement—the Stockholm Statement [see box on pages 33-35]—in 1996 to highlight issues of fundamental importance if the CGIAR is to continue to operate on the basis of free access and exchange of genetic resources. The CGIAR continues to strongly maintain that public access to germplasm research products must be ensured and promoted, and these resources must be managed in the best interest of partners, including farmers.

### **Central and Eastern Europe and the Former Soviet Union**

In recognition of the potential benefits of the CGIAR's research and other expertise to the countries of Central and Eastern Europe and the former Soviet Union, a Task Force was established at ICW95 to explore the level of demand in the region for the CGIAR's work, potential program opportunities, and center interest in expanding the CGIAR's role in the area. Given the significant differences among countries in the region, despite their unifying characteristic as economies in transition, the Task Force divided countries in the region into two subgroups: Central/Eastern Europe; and, Central Asia/Caucasus.

The Task Force found compelling reasons for the CGIAR to expand its mandated area to encompass the region, particularly Central Asia/Caucasus, including the CGIAR's suitability for solving local agricultural research problems, and the limited number of alternative sources of technical expertise available in the region.

The Task Force identified three areas of activity on which the CGIAR should focus regionwide: increasing access to information; increasing access to genetic resources; and, transforming national agricultural research systems. For the countries of Central Asia/Caucasus, the Task Force identified two additional areas: intensifying existing and potential CGIAR activities; and, developing a strategy for the region.

The Task Force made the following recommendations.

- The CGIAR should expand its geographic focus to include Central and Eastern Europe and the former Soviet Union.
- Centers should strengthen existing links and develop programs with partners in the region, coordinate their efforts, and develop a regional strategy for the CGIAR.

## *Stockholm Statement* on Genetic Resources for Sustainable Food Security

### **CGIAR Genetic Resources Policy Committee Stockholm, Sweden, October 2-4, 1996**

**D**uring the last twenty-five years, global food production has remained above the rate of growth in population, thanks to the creative use of genetic diversity and appropriate management practices. International flows of genetic materials have been the foundation on which current food security systems have been developed nationally and globally. The high priority accorded by the CGIAR to genetic conservation, evaluation, and utilization has yielded rich dividends in terms of higher productivity, profitability, stability, and sustainability of major farming systems in developing countries. In recent years, work on genetic resources conservation and enhancement has been extended to trees, fish, and animals. Through the International Board for Plant Genetic Resources, which was reorganized as IPGRI, and other centers, the CGIAR has assisted NARS for over two decades to build their professional capacity and infrastructure for the conservation and sustainable use of genetic resources.

As we approach the new millennium, as well as the bicentenary of Malthus' essay on population, there is renewed concern about the future of global food security. This concern arises, on the one hand, from the growth in population and a higher demand for food due to increased purchasing power, and, on the other hand, from growing damage to the ecological foundations essential for sustainable advances in agriculture. Challenges to food security demand achieving sustainable advances in crop, animal, and aquatic productivity per unit of land, water, energy, labor, and capital. This in turn will call for ready access to a wide range of genetic material.

The coming into force of the Convention on Biological Diversity, the adoption of TRIPS provisions under GATT, as well as an increasing trend toward privatization of agricultural research have created a new and complex policy environment for institutions working with genetic resources, such as the CGIAR.

The adoption of the first *Global Plan of Action* by 150 governments at the FAO Conference in Leipzig in June 1996 has significant, immediate, and direct implications for the work of the CGIAR. The *Global Plan* lays the

framework for a concerted global effort to conserve and use sustainably plant genetic resources based on action at the local, national, regional, and international levels. It is critical that the priorities for action identified in the *Global Plan* be fully reflected in the future strategies and programs of the CGIAR centers.

In line with the *Global Plan*, center strategies for reducing genetic vulnerability and increasing food security inevitably involve strengthening existing relationships and forging new ones with a wide range of partners, including government research organizations, universities, NGOs, local community groups, and the private sector. The CGIAR's support to networking and increasing human and institutional capacities to undertake the work will be critical to the achievement of the *Global Plan's* objectives. New approaches to the maintenance and creation of diversity will be needed to supplement existing efforts.

The collections maintained in trust by the CGIAR centers, within the context of the FAO Network of *Ex Situ* Collections, must continue to be managed in the best interests of the world community, and especially those farming communities that have contributed so much to the development and conservation of plant genetic resources. Many such communities have been bypassed by recent agricultural developments. In line with the requirement of the Convention on Biological Diversity to share benefits equitably, it is incumbent on the CGIAR and its partners to give special attention to the needs and aspirations of such communities.

The collections must continue to be developed and conserved to international standards. Characterization and evaluation data must continue to be readily available. The materials themselves must be accessible to all those that need to use them in the interest of the public good, and especially for strengthening local, national, and global food security.

As the world develops new systems for access and the equitable sharing of benefits, it is imperative that due recognition be given to the maintenance of national and international flows of genetic diversity. Much of the success of past efforts of the CGIAR in raising productivity and alleviating poverty has depended on such flows to and from the centers. Future efforts, even under evolving plant improvement paradigms, will continue to depend on



the widespread availability of genetic diversity. For the crops of major importance for food security, the diversity of which is widely distributed geographically, multilaterally agreed systems of access are likely to provide the best mechanisms for promoting continued and timely flows of genetic diversity. Such systems can make significant contributions to the implementation of the Convention on Biological Diversity, and further its goals of facilitating access and promoting an equitable sharing of benefits.

The implementation of the *Global Plan of Action* has important implications for resource allocation to and within the global plant genetic resources system. It is also incumbent on all actors, including the CGIAR, to strive to allocate adequate resources for the implementation of those priorities identified in the *Global Plan*. Sustained financial support is essential for the security of the invaluable genetic wealth conserved and used by the CGIAR and its partners. We urge that this critical issue be addressed during the forthcoming review of the CGIAR system.

Recent years have seen the emergence of global intergovernmental fora concerned with the conservation and use of genetic resources, in particular the Conference of the Parties to the Convention on Biological Diversity and the FAO Commission on Genetic Resources for Food and Agriculture. Decisions of the World Trade Organization also have a bearing on access to genetic resources. These fora are critical in providing a policy and legal framework for the CGIAR's activities in genetic resources. The relationship between these fora and the CGIAR need to be strengthened and should be examined in the forthcoming review of the CGIAR system. It is important, perhaps now more than ever, that national governments harmonize their positions in these different fora, and work together to resolve expeditiously the outstanding issues related to genetic resources, and to ensure that these resources are adequately protected and available for use.

The World Food Summit to be held in Rome in November 1996 provides a unique opportunity for renewed commitment to the cause of conserving and harnessing agrobiodiversity for the alleviation of poverty, protection of the environment, and the achievement of sustainable food and nutrition security.

- Additional funding for these programs should be provided by CGIAR members and other partners; such activities should be considered as part of the CGIAR research agenda, to be developed and financed according to standard policies and procedures.
- NARS in the region should establish two regional fora to promote dialogue, foster cooperation, generate collaborative programs, and facilitate liaison with the CGIAR.

The CGIAR membership endorsed—subject to the provision of additional funding—the recommendations of the Task Force, identifying a clear program of work in the region where the CGIAR has a distinctive comparative advantage, and determined that programs carried out by centers in the region would fall under the CGIAR’s research agenda and be reviewed by TAC.

### Review of the CGIAR System

At the 1996 Mid-Term Meeting, the CGIAR membership approved a review of the CGIAR system. There was widespread endorsement for a review from all components of the CGIAR system and from the CGIAR’s partners. At ICW96, the particulars of the planned review were endorsed.

Chaired by Mr. Maurice Strong, the review will be undertaken by an independent panel of experts. It will be forward looking in focus, and will concentrate on issues pertaining to science, strategy and structure, and governance and finances. The review will examine the CGIAR’s role in the global agricultural research system, specifically how the CGIAR should position itself in an evolving world situation that foresees stronger national agricultural research capacities, where farmer associations and NGOs play an increasingly important role, where questions of indigenous knowledge receive greater recognition, and where there is greater involvement with other actors, including advanced research institutions and the private sector. The review panel will begin its task in 1997. A final report on its findings could be submitted to the CGIAR membership as early as the 1998 Mid-Term Meeting.

CGIAR Chairman Serageldin has emphasized several aspects of the review.

- The review should take the CGIAR’s mission—contributing, through its research, to promoting sustainable agriculture for food security in developing countries—as a “given,” and examine how successful the

system has been in carrying out this mission and what it needs to do to further strengthen its performance.

- Because the business of the CGIAR is science, the review team should outline the scientific challenges that the system will need to address in the twenty-first century, and provide an opinion on the quality and relevance of the science practiced at the centers. The team should also examine the system's strategy, structure, governance, and finances.
- The review must be conducted by independent, strategic thinkers of acknowledged stature who are sensitive to issues of development and the role scientific research can play in addressing them.
- The review should be completed in a reasonably short time, but not at the expense of compromising quality or coverage. 

### *New* CGIAR Members in 1996

*I*n 1996 three new members joined the CGIAR, all from the South. At the Mid-Term Meeting in May, Syria and Pakistan were admitted into the CGIAR. At International Centers Week in October, South Africa was welcomed into the Group. This brings the total number of members from the South to seventeen, further realizing the CGIAR's efforts to expand membership from the South to ensure full South-North ownership of the CGIAR.

COMMEMORATION IN PICTURES

*Our Anniversary*



19



# Anniversary



71-1996



# FINANCIAL HIGHLIGHTS

CGIAR members support centers and programs of their choice within a research agenda agreed to by the CGIAR membership as a whole, and each center directly receives and spends funds. Thus, the CGIAR financial outcome for 1996 discussed here is consolidated from the financial results of the sixteen independent CGIAR centers. The results are reported in US dollars. CGIAR financial highlights for 1992 to 1996 are shown in Table I. Further details are provided in the *CGIAR 1996 Financial Report*, a separate publication available from the CGIAR Secretariat.

*At the commencement of the Mid-Term Meeting in May 1996, there was concern over the financing of the 1996 research agenda. Several members, most notably Denmark, provided additional resources of about \$10 million to the five centers facing the brunt of the problems.*

**Table I. CGIAR Research Agenda: Financial Highlights, 1992-1996**  
(in \$ million and percentages)

	1992	1993	1994	1995	1996
<b>Member Contributions (in \$ m)</b>	247	235	268	270	304
Annual change (%)	7%	-5%	14%	1%	13%
<b>Composition of Membership Support (in \$ m)</b>					
DAC Countries:					
Europe	93	81	100	107	132
Pacific Rim	31	37	41	39	43
North America	66	56	48	45	45
Developing Countries	2	2	3	5	8
Foundations	3	3	4	4	6
International and Regional Organizations	53	56	71	68	65
Non-CGIAR donors			0	1	5
<b>No. of Contributing CGIAR Members</b>	36	38	40	41	44
<b>CGIAR Contributions as % of ODA</b>	0.41%	0.42%	0.45%	0.46%	0.51% <sup>a</sup>
<b>Composition of CGIAR Investments by Undertakings (%)</b>					
Increasing Productivity	49%	48%	46%	47%	40%
Protecting the Environment	11%	14%	15%	16%	16%
Saving Biodiversity	8%	6%	9%	10%	11%
Improving Policies	10%	10%	10%	9%	12%
Strengthening NARS	22%	22%	20%	18%	21%
<b>Center Operating Expenditures (in \$ m)</b>	259	254	265	286	325
<b>Distribution by Object of Expenditure (%)</b>					
Personnel	57%	59%	56%	55%	53%
Supplies/Services	30%	28%	31%	31%	34%
Travel	6%	6%	6%	7%	7%
Depreciation	7%	7%	7%	7%	6%
<b>Allocation by Region (%)</b>					
Sub-Saharan Africa	39%	37%	39%	39%	38%
Asia	33%	34%	32%	32%	32%
Latin America and the Caribbean	16%	15%	18%	17%	17%
West Asia and North Africa	12%	13%	11%	12%	12%

<sup>a</sup> Estimate.

## Renewal: Maintaining Stability

At its Mid-Term Meeting in May 1994, the CGIAR launched a program of renewal in response to a major crisis it confronted, which was manifested by severe financial problems. The eighteen-month renewal program was underpinned by a short-term financial stabilization program, the cornerstone of which was an exceptional financial offer by the World Bank. By the conclusion of the renewal program at end-1995, the financial targets of the stabilization program had been fully met.

The 1996 financial framework was set against this backdrop of success. At International Centers Week in October 1995, resource requirements to fully finance the research agenda, which comprises the bulk of CGIAR center projects and activities, were approved at a level of \$300 million for 1996. Shortly thereafter, however, it became evident that a mini-crisis was pending, threatening to jeopardize the financial stability achieved in the renewal process.

At the commencement of the Mid-Term Meeting in May 1996, there was concern over the financing of the 1996 research agenda due to several emerging financial developments. The agenda appeared to be at risk of being underfunded by about \$20 million at the aggregate level. Furthermore, the potential funding shortfall was unevenly distributed among centers, placing the execution of the agenda by some centers in danger. The potential underfunding also put the World Bank's matching contribution in jeopardy, raising the possibility that a refund of part of the Bank's contribution would be required, thereby worsening the financial situation. Discussions at the Mid-Term Meeting on these developments led to the implementation of some immediate measures to resolve the crisis in 1996, as well as modifications in the CGIAR's financing arrangements to avoid a recurrence of similar financial problems in future years.

Several members, most notably Denmark, provided additional resources of about \$10 million to the five centers facing the brunt of the problems. Centers, TAC, and members worked together to further realign resources in support of the research agenda from earlier commitments to activities outside of the agenda. The centers concerned initiated actions to curtail spending, including reductions in staff at four centers.

The 1996 financial results reflect the impact of these decisions. The actual funding for the agreed agenda amounted to \$304 million. Full access to the Bank's matching contribution was thus ensured, as this amount represented full financing

of the agreed agenda resource requirements, as estimated in October 1995. Four centers implemented steps to reduce costs through staff separations that will result in cost reductions of well over \$10 million in future years. While these steps represent responsible management actions to reduce the financial imbalance and to reposition the system, they were quite painful for center staff, especially in instances where as much as a 25 percent reduction in staff took place.

*Today, the overall finances of the CGIAR are strong and healthier than they have been in many years. By 1996, the level of annual support for the research agenda had expanded by some 25 percent, from \$236 million in 1993 on the eve of the renewal program.*

Today, the overall finances of the CGIAR are strong and healthier than they have been in many years. By 1996, the level of annual support for the research agenda had expanded by some 25 percent, from \$236 million in 1993 on the eve of the renewal program. The refinements introduced at the 1996 Mid-Term Meeting completed the package of new financial instruments and procedures implemented during the program of renewal, and are more consistent with the CGIAR's decentralized and informal financial structure. These two outcomes should result in the stability of the CGIAR's finances in the future.

#### Disbursement Schedule

At the beginning of the year progress continued toward meeting the disbursement targets set under the stabilization program—50 percent of commitments disbursed in January and the balance by mid-year. In the first quarter of 1996, 27 percent of resources were made available in comparison with 23 percent in 1995. For the rest of the year, however, although disbursements maintained pace with 1995 in dollar terms, there was a slippage in percentage terms. Consequently, by the end of the third quarter the disbursement lagged 11 points behind 1995, when 75 percent had been disbursed by early October. Part of the explanation for the slippage can be found in the funding gaps faced by some centers at mid-year. Although financing was found to meet the gaps, actual release of funds against these extraordinary commitments was not possible until the last quarter of the year.

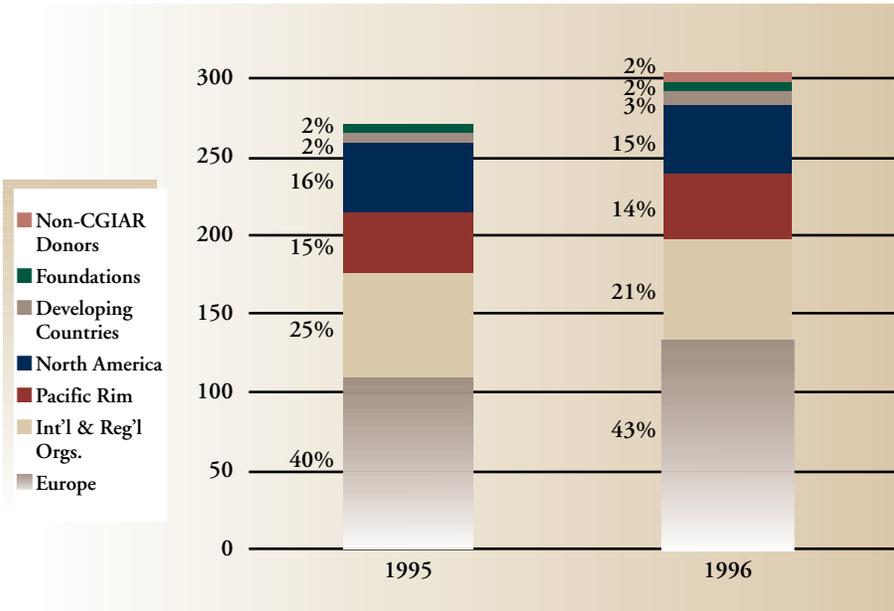
#### Contribution Profile

Contributions from members in support of the agreed research agenda totaled \$304 million in 1996. Forty-four members—three more than in 1995, with contributions from Brazil, Côte d'Ivoire, and the Kellogg Foundation—provided support for the CGIAR research agenda. For analytical purposes only, these members can be placed into four distinct groups: industrial countries (19); developing countries (11); foundations (3); and international and regional organizations (11). Industrial countries can be further subdivided along geographical lines into

three subgroups: Europe; North America; and the Pacific Rim. It should be emphasized, however, that, as contributions to the CGIAR are voluntary and each member has the freedom to decide which centers to support and at what level, the trends emerging from any of the groupings should not be interpreted as policy decisions by the group concerned.

As shown in Chart 1, contributions to the agenda in 1995 and 1996 by member groups indicate a continued decline in the North America group, while both the European and developing countries groups expanded their shares. This reflects the special efforts by individual members—Australia, France, Japan, Norway, and Sweden, in addition to the substantial effort by Denmark—to mobilize additional resources for the rescue package devised at the 1996 Mid-Term Meeting. It also reflects the initiation in 1996 of a substantial contribution by the European Commission to ICARDA. In addition to a first-time contribution by Côte d'Ivoire, several other developing country members stepped up their support in 1996. Indonesia increased its cash contribution to \$0.5 million. Iran and the Philippines increased their agenda support as well. Through these efforts, contributions from developing countries increased by over 66 percent from 1995, increasing their share of the total from 1 percent in 1994 and 2 percent in 1995, to 3 percent in 1996.

**Chart 1. Agenda Contributions, 1995-1996**  
(by member group in \$ million and percentages)



The support provided by the top ten contributors to the CGIAR in 1996 funded about three-quarters of the research agenda. Their contributions are illustrated in Chart 2. Japan maintained its standing as the largest contributor after the World Bank. Also notable is that Denmark and Switzerland became, for the first time, two of the top six contributors.

**Chart 2. 1996 Top Ten Agenda Contributors (in \$ million)**



### Allocation of Agenda Support

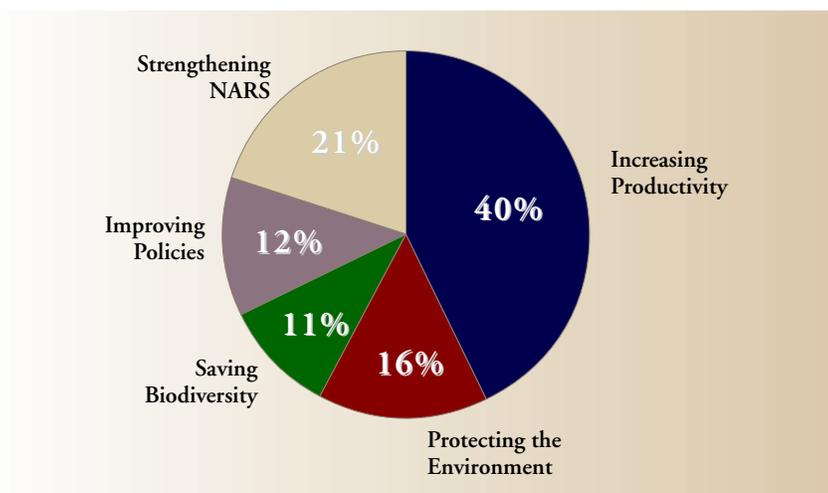
The allocation of resources in support of the research agenda is reviewed below from four perspectives: by undertaking; by object of expenditure; by center; and, by region.

#### Investments in Undertakings

Investments in the five principal CGIAR undertakings—increasing productivity, protecting the environment, saving biodiversity, improving policies, and strengthening NARS—for 1996 are shown in Chart 3. The overall distribution of resources is consistent with the investment pattern endorsed by the CGIAR. Although investments in “increasing productivity” continued to decline, nonetheless, “increasing productivity” continued to be the primary thrust of CGIAR activities, with crops

the major focus, accounting for 72 percent of investments, followed by livestock at 18 percent, forestry at 8 percent, and fish at 2 percent.

**Chart 3. 1996 CGIAR Investments by Principal Undertaking**



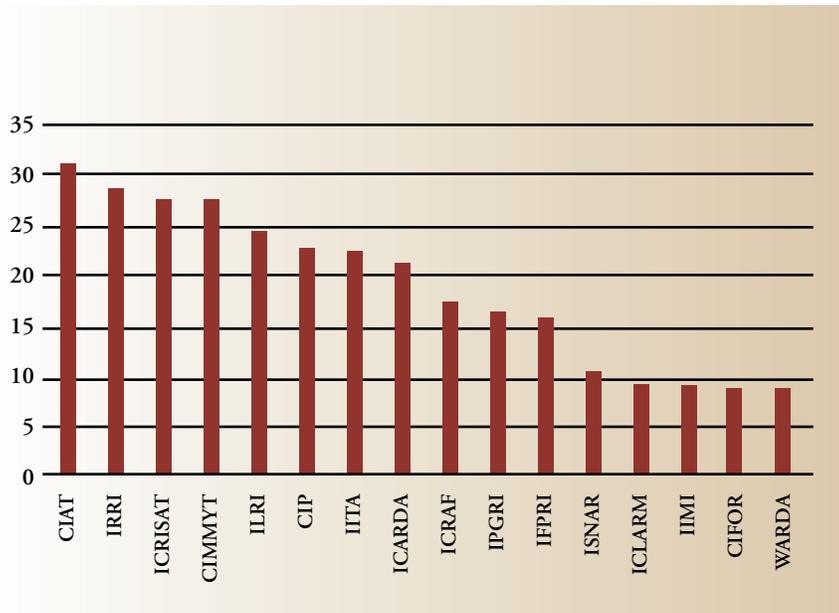
### **Expenditure by Object**

The trend in reduced spending on personnel noted in the past two years continued in 1996. Personnel costs amounted to 53 percent of total spending in 1996, compared to 55 percent in 1995, and an average of 57 percent from 1992 to 1994. Despite this decline, actual dollar amounts spent on personnel increased in 1996, reflecting the extraordinary costs associated with staff separation at several centers. There is no question that the reductions of international and national staff have been painful; however, they were necessary to enable the centers concerned to respond to changes in the research environment and priorities of the CGIAR.

### **Distribution among Centers**

Chart 4 [see page 46] illustrates the distribution of 1996 agenda support among the sixteen independent centers supported by the CGIAR. Over the past several years, the distribution of resources has remained relatively stable among centers. Agenda funding expanded for all centers in 1996 over 1995 levels, increasing by over \$1 million each for most centers. In 1996 CIAT, IRRI, CIMMYT, ICRISAT, ILRI, and IITA maintained their 1995 standing as the six largest recipients of CGIAR resources.

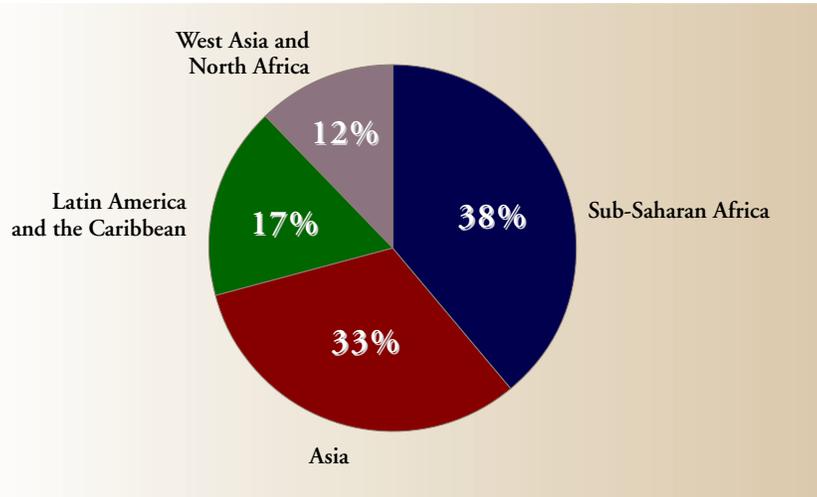
**Chart 4. Distribution of 1996 Agenda Support by Center (in \$ million)**



### Allocation by Region

The 1996 allocation of CGIAR resources by the developing regions of the world is shown in Chart 5.

**Chart 5. 1996 CGIAR Allocations by Developing Regions**



The overall distribution of resources does not indicate significant shifts from 1995 and none are expected in the near future. Allocations for research targeted to Sub-Saharan Africa continued to be the major focus of CGIAR activities, with 38 percent of resources aimed at addressing research and training needs in Sub-Saharan Africa. Allocations for research targeted to other regions stabilized in percentage terms, and continued to increase in dollar terms for all regions. Almost all centers had activities aimed at Sub-Saharan Africa in 1996, with four centers—IITA, ILRI, ICRAF, and ICRISAT—accounting for over two-thirds of the resources committed. The pattern was similar in Asia. A majority of the centers carried out activities in Asia in 1996, and four centers—IRRI, ICRISAT, CIMMYT, and CIP—accounted for the bulk of the allocations. On the other hand, over two-thirds of the allocations made in West Asia and North Africa continued to be made by ICARDA, while CIAT accounted for about half of the allocations made in Latin America and the Caribbean. 

*Focus*

WANIA *on*  
*Research*

*front:* HARVESTING  
POTATOES IN TUNISIA. (CIP)



*back:* OVERGRAZING  
IS A KEY CAUSE OF  
RANGELAND DEGRADA-  
TION IN WEST ASIA AND  
NORTH AFRICA. (ICARDA)

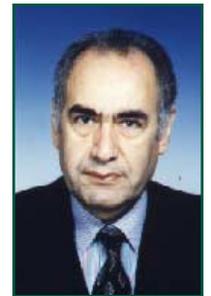


# WEST ASIA AND NORTH AFRICA: A REGIONAL VISION

## PART TWO

The West Asia and North Africa region is characterized by high population growth, expected to more than double by 2020; low and erratic rainfall; limited areas of arable land; and severely limited water resources for the development of irrigation. As there are limited possibilities for the expansion of farming areas or irrigation, methods for more efficient and sustainable use of these limited resources must be found.

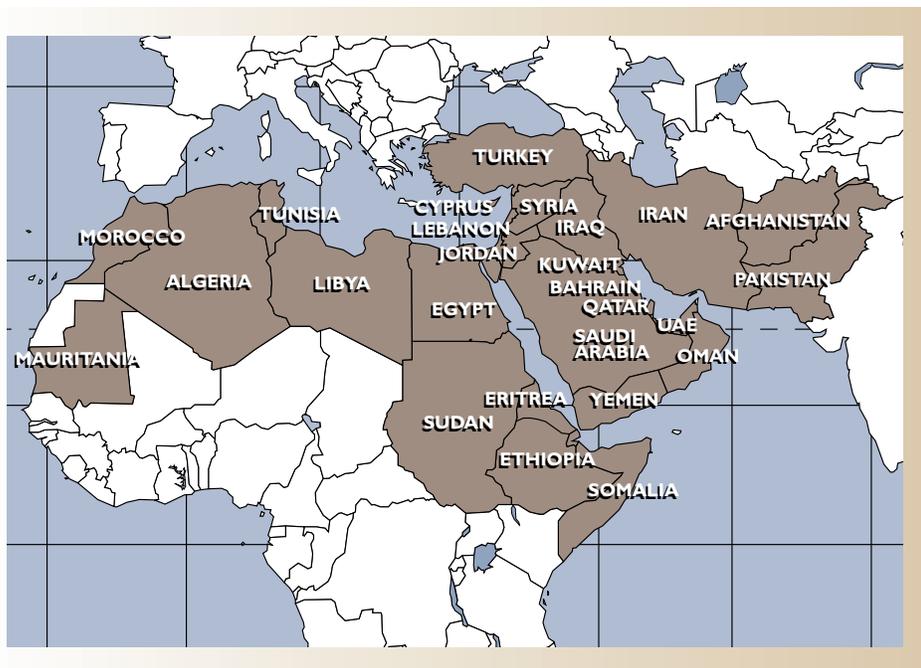
The WANA region is an enormous and diverse area, from Morocco in the west, to Pakistan and Afghanistan in the east, from Turkey in the north, to Ethiopia and Somalia in the south, as shown in Figure 1. Within these limits lie deserts, with rainfall well below the 100 millimeter isohyet; enormous tracts of steppe—semi-desert rangeland that provides much of WANA’s animal production; highland areas which support a large population, particularly in Iran, Pakistan, Turkey, and North Africa; and, fertile areas around such major rivers as the Euphrates and the Nile. All of these areas face environmental threats, which are damaging production at a time when more and more food is needed. Even the fertile, higher rainfall land is at risk from such factors as soil salinity and cereal monoculture, resulting from agricultural intensification to meet the food demand of the growing population.



Adel El-Beltagy, Director General, ICARDA

The West Asia and North Africa region is characterized by high population growth, low and erratic rainfall, limited areas of arable land, and severely limited water resources. Methods for more efficient and sustainable use of these limited resources must be found.

Figure 1. The West Asia and North Africa Region



## ICARDA in WANA

Realizing the need for a separate international agricultural research center working in the fragile environments of the world's dry areas, the CGIAR established ICARDA in 1977. ICARDA has world responsibility for the improvement of barley, lentil, and faba bean, and regional responsibility for the improvement of wheat, chickpea, forage, and pasture crops. It also has a mandate for the management of small ruminants and rangeland—steppe—in dry areas. ICARDA shares responsibility in the WANA region for wheat with CIMMYT and for chickpea with ICRISAT; the latter two centers have global responsibility for these crops, respectively. ICARDA's Latin America program, which works mainly on barley, is hosted by CIMMYT.

Like other CGIAR centers, ICARDA works with national agricultural research systems. This cooperation is strengthened through six regional programs based in: Jordan for West Asia; Morocco/Tunisia for North Africa; Turkey for highlands in the WANA region; Mexico for Latin America; the United Arab Emirates for the Arabian Peninsula; and Egypt for the Nile Valley and Red Sea region. There is also a possibility of a seventh regional office for the newly independent republics of Central Asia, an area with which the CGIAR has had growing cooperation since the adoption of the *Lucerne Declaration and Action Program* at a Ministerial-level Meeting in February 1995.

Much of ICARDA's work in WANA is multidisciplinary, and cannot easily be classified into crop, or natural resource, or livestock groupings. For example, biodiversity might be regarded as a natural resource, but its conservation is tied closely to its use in crop breeding.

## WANA: A Rich Region?

Poverty in the WANA region is masked when the poor countries are averaged with the rich. Consider Bahrain, Libya, Oman, Saudi Arabia, Kuwait, and the United Arab Emirates—some of the major oil exporters with small populations. There are large disparities between these nations and the remaining countries in WANA. With only 7 percent of the region's population, these oil exporters represent the region's highest per capita Gross National Product, averaging just over \$9,000, as shown in Table I. (Even so, their per capita GNP is only a quarter of that of industrial countries.) The remaining 93 percent of WANA's population has a far lower per capita income. Thus, the western stereotype of the "rich Arab" represents only a tiny minority of the people in WANA.

The four most economically disadvantaged states of South WANA (Eritrea, Ethiopia, Somalia, and Sudan) have per capita GNP of only \$88. The oil exporters with large populations (Algeria, Iran, and Iraq) have a per capita GNP of \$1,929. The remaining countries of WANA, which account for 75 percent of the population or 421 million people, have a per capita GNP of less than \$2 per day. In fact, 42 percent of the total population—239 million people—has a per capita GNP of less than \$1 per day and is, thus, living in the grip of severe poverty.

**Table I. GNP and Population of Seven Groups of WANA Countries**

	AVERAGE PER CAPITA GNP (\$)	POPULATION (millions)	
	1992	1994	2020
Oil Exporters with Small Populations (Bahrain, Libya, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates)	9,016	29	58
Oil Exporters with Large Populations (Algeria, Iran, Iraq)	1,929	113	222
Fast Population Growth (Syria, Jordan)	1,000	20	41
Transitional Population Growth I (Lebanon, Morocco, Tunisia, Turkey)	1,520	99	150
Transitional Population Growth II (Egypt)	586	62	89
East WANA (Afghanistan, Pakistan, Yemen)	379	146	313
South WANA (Eritrea, Ethiopia, Somalia, Sudan)	88	93	198
<b>Total Population</b>		<b>562</b>	<b>1,071</b>

Sources: GNP data are from the Socioeconomic Time-Series Access and Retrieval System, Version 3.0, World Bank, May 1993, except data for South WANA, which are from the Statistical Yearbook, 40th issue, 1993, United Nations (1995), and are for Gross Domestic Product (GDP) rather than GNP; population data are from FAOSTAT.PC 1995; population projections are from World Population Prospects, rev. 1992, United Nations (1993).

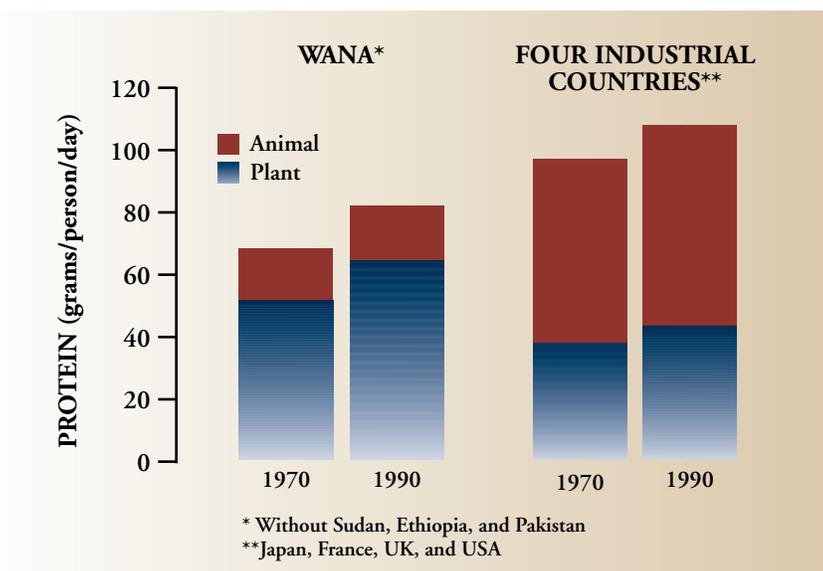
The agriculture sector in WANA employs a large segment of the population; nearly 50 percent, for example, in Turkey and Morocco. Women contribute about half of the agricultural labor, well above their share of the total labor force, at 26 percent. There is more absolute poverty and incidence of poverty in rural areas than in urban areas. Even though infrastructure in the rural sector has improved

in the last 20 years, there has not been a proportionate increase in employment or poverty alleviation. This, coupled with the economic disparities among countries, has resulted in migration from rural to urban areas and from poor to rich countries both within and outside of WANA. For example, the Gulf countries employ 3.5 million non-national workers; the major suppliers of labor for the workforce of these oil exporters with small populations are Egypt, Jordan, Lebanon, Pakistan, Syria, and Yemen. As well, the majority of the 5.3 million people from WANA living in Europe are workers from Turkey and North Africa. These are only small proportions of WANA's population, however. Economic disparities will continue to fuel such migration, resulting in serious social and political consequences.

### Food Consumption and Production

Plant sources—mainly cereals, and some pulses—provide most of the calories and protein in human diets in the region. In sharp contrast, people in industrial countries obtain protein predominantly from animal sources, as shown in Figure 2. Diets have improved in most of WANA over the last two decades, but still lag well behind in quantity and quality of protein. Dairy and poultry production are rising, but are still far behind those of industrial countries. Micronutrient deficiencies in the diets of women and children are a serious concern because they can have permanent negative effects on the quality of life.

**Figure 2. Sources of Protein in the Human Diet**



Source: FAO (1993).

A net exporter of food some 40 years ago, the WANA region now is the largest food importing region in the developing world. The grain gap in 1995 for twenty-three WANA countries (excluding Turkey, which is the only food exporter in WANA, and Cyprus and Eritrea) was about 35 million metric tons. This is anticipated to grow to 83 million metric tons by 2020, assuming that the rate of production growth can be sustained at 2 percent per year. These figures are optimistic. Assuming a price of \$100 per metric ton, bridging the grain gap would cost \$8.3 billion, or almost twenty-eight times the current budget of the entire CGIAR system per year.

Narrowing this grain gap requires either a reduction in population growth, a rise in agricultural production, or both. All of the evidence in development shows that the provision of better education, income, food security, and employment opportunities for women is the key to reducing population growth. Since agriculture in WANA employs up to 50 percent of the workforce, and women contribute about half of the agriculture labor, the benefits will have to be provided from within the agricultural sector. The second option, therefore, becomes imperative: increase agricultural production.

Here, as well, there are two options: increase land area used for agriculture, or increase output per hectare. The first option, that of increasing the area under cultivation, is getting difficult, and is dangerous. In the developing countries of the Mediterranean basin, about 12 percent of the land is arable. Attempts to bring marginal land under cultivation cut into the supply of pasture—itsself a food resource—and destroy the natural vegetation, which includes the biodiversity needed to breed future food and feed crops. A prime example is the steppe, with rainfall between the 100 to 200 millimeter isohyets. Attempts to grow rainfed cereals there fail perhaps seven years out of eight; and after such an attempt, the ground is useless for pasture and subject to wind erosion. If the land does recover, it will take up to fifteen years. Better results can be achieved by clearing land that is marginal because it is stony, but even this results in the loss of pasture and biodiversity. As there is less and less of such land left, the answer must be found in increasing productivity, not in expanding land area under cultivation.

There is real potential for the second option, that of increasing the productivity of crops. For example, in 1991, Syria, the breadbasket of the ancient world, became self-sufficient in wheat for the first time since the 1950s. Since 1989, production has virtually doubled to 3.6 million metric tons per annum, due to new technology, increasing national income by an estimated \$414 million annually. This was achieved

mainly by increasing productivity; yield, 0.6 metric ton per hectare in the 1950s and early 1960s and 1.5 metric tons per hectare in the late 1980s, climbed to 2.6 metric tons per hectare by 1993.

Egypt has also had real success. Egyptian wheat production is 125 percent higher today than it was in the early 1980s. It has risen from 2 million metric tons to 4.5 million metric tons per annum. Average wheat yields grew from 3.6 metric tons per hectare to 5.4 metric tons per hectare between 1981-1983 and 1990-1993, growing at a rate of 4.7 percent per annum. This dramatic improvement resulted from a combination of new wheat technology, effective technology transfer, and a series of bold reforms by the Government of Egypt to get the market moving.

Although the CGIAR played a part in both of these successes, it is, nevertheless, keenly aware that increasing productivity can bring dangers of its own. It is easy to look at the figures for Syria and Egypt and conclude that WANA will feed itself, with no problem. However, increases in productivity have sometimes threatened the natural resource base. Use of water for irrigation has resulted in dramatic drops in the water table, severe water salinity, and, thus, horribly damaged soil. Cereal monocropping has led to unbroken cycles of pests and diseases, and to soil drained of nutrients. The challenge for agricultural research is to provide technologies that will increase productivity while preserving the natural resource base.

The grain importing WANA countries face a formidable task indeed: how to increase production; how to achieve income growth sufficient to fill the remaining grain gap with imports; and how to do both while sustaining the natural resource base.

The same challenges apply to livestock production. Dairy products from sheep and goats are an essential part of both urban and rural diets. Per capita consumption of animal derived protein has generally risen. In Tunisia, for example, per capita consumption of animal derived protein rose from 11.1 grams per day in 1969-1971 to 19.8 grams per day in 1988-1990. In Syria, the corresponding figures are 12.5 to 18.5; in Jordan, 16.4 to 20.9. This has been achieved through a rise in the number of livestock. Measured in tropical livestock units, or TLU (one TLU is taken as 250 kilograms liveweight), Syria's livestock population rose from 1.1 million TLU to 2 million TLU over about the same period; Algeria's from 2.2 million to 3.5 million TLU; Iran's from 8.8 million to 12.6 million TLU; and Jordan's from 0.3 million to 0.6 million TLU.

A few countries, however, including Turkey, Yemen, and Morocco, have seen a decline in livestock numbers over that period. This trend may spread, as the

supply of feed continues to decline, largely from overgrazing of the steppe. The more the carrying capacity of this land is exceeded, the smaller that capacity becomes, as loss of biodiversity inhibits the ability of the land to regenerate itself. As the rangeland area has shrunk, the number of sheep and goats grazing on it has risen. Researchers think that the stocking rate on arid zone rangelands has increased from one to four sheep and goats per hectare in the last 45 years, and that the area of those rangelands has been reduced by 50 percent over roughly the same period. Once again, it is easy to look at the figures for rising animal protein consumption and conclude that production is keeping pace with demand. It is not. On the steppe, as in arable areas, WANA is sitting on an environmental time bomb. If it goes off, the region will not simply fail to produce enough food; it may fail to produce much of anything at all.

### Crops and the Genetic Base

Much has been learned from the successes and failures of the green revolution, in particular, how to harness biodiversity for crop breeding. This means that not only landraces—farmers’ varieties of crops—but the wild relatives of the crops should be used to breed new improved lines that will be adapted to the stresses they will meet in farmers’ fields. Over the millennia since crops were first domesticated, the region’s farmers have seen the advantages of maintaining diversity within their fields—buffering themselves against the vagaries of the climate and the environment. This approach gives yield stability and food security under the harsh environments of the dry areas.

In order to follow the farmers’ example, ICARDA is increasingly departing from the conventional crop breeding model. Under this model, to make plant breeding and seed distribution economical, breeders need a product that can be grown under a range of environmental conditions. What the breeder gets from this process is a variety that will grow over a diverse area, provided it receives plenty of inputs—water, fertilizer, and perhaps labor. For developed countries with large-scale farmers who can afford such inputs, that is fine. However, ICARDA is not breeding for that type of farmer. Its most important target group is subsistence farmers, who accounts for 60 percent of the farmers in the world and who grow about 15 to 20 percent of the food, mainly in developing countries. These farmers do not use many (or often any) inputs. This is only partly because inputs are expensive or not available. It is also because, in harsh environments like those in the WANA region, the high risks discourage farmers from using fertilizer and other costly inputs. Therefore, farmers do not adopt modern high-yielding varieties.

*On the steppe, as in arable areas, WANA is sitting on an environmental time bomb. If it goes off, the region will not simply fail to produce enough food; it may fail to produce much of anything at all.*

Conventional plant breeders are all too ready to blame this on weak seed production systems, poor extension services, and conservative, uninformed farmers. Actually, farmers in the low-yielding environments of WANA dry areas know that varieties bred for high inputs are not only useless to them, but also that material originating in a high-yielding environment may actually do far worse than their own “old fashioned” landraces when grown on a low-yielding site.

In the early 1980s, ICARDA started to work with this “old fashioned” material in Syria. It tested a large number of barley landraces collected in Jordan and Syria in 1981—140,000 seeds from 7,000 spikes. Individual testing revealed very broad diversity in growth characteristics and pest and disease resistance. ICARDA identified three lines that were subsequently released for use by farmers—Tadmor, Zambaka, and Arta. Developed from a spike collected in a field near Sweda, about 100 kilometers east of Damascus, Arta has consistently outperformed existing landraces by up to 70 percent in farmers’ fields all over Syria. It has been doing so because it was developed from a landrace, selected in the target environment.

In 1996 ICARDA, together with German and Syrian partners, took this approach a step further with a project called Farmer Participation and Use of Local Knowledge in Breeding Barley for Specific Adaptation. It is a collaborative project between ICARDA, Syria’s Ministry of Agriculture and Agrarian Reform, and the University of Hohenheim in Germany.

Farmers at eight locations in Syria are testing over 200 new lines and comparing these with their own, under their own field conditions. Although the sites all have low rainfall, there are wide variations among them. The lines are also grown at ICARDA’s research station. Every year, only the best lines are selected for further evaluation by farmers during the following season. After three years, it is expected that the participants—and their neighbors—will have adopted some of the best lines, and that farmers will have given plant breeders clear indications of what they want from a new barley variety.

What is emerging from ICARDA’s work on barley is a farmer-participatory, multidisciplinary approach to crop breeding that will result in crops which are adapted to meet the needs of farmers.

## I n t h e F o o t s t e p s o f F a m i n e

In 1984 to 1985, the world was shocked by the sight of mass starvation in Ethiopia and Sudan. Since then, both countries have made enormous progress in

productivity and food security. It would be unwise to think that famine will not strike the region again, but the chances have been reduced. Sudan, for example, has just about attained self-sufficiency in lentil. It is also getting much nearer to self-sufficiency in wheat, through collaborative research and technology transfer efforts with CIMMYT and ICARDA.

The success of Sudanese agriculture is largely based on the adoption of improved varieties of crops and appropriate management practices, combined with appropriate government policies. These have provided increased yields and profit for poor farmers in traditional growing areas, and promoted the expansion of agriculture into neglected or previously uncultivated areas.

ICARDA's Nile Valley and Red Sea Regional Program links Sudan in an effective partnership with Egypt, Ethiopia, Eritrea, and Yemen. Collaboration has focused on four vital food crops: faba bean, lentil, chickpea, and wheat. The work is targeted to increase the incomes of smallholder farmers and improve food production in the country. ICARDA provides germplasm (seeds) for evaluation and for breeding new cultivars, fosters human resources development through training, and works closely with the national agricultural systems to identify and solve farm-level production constraints and to transfer suitable technologies to extension personnel and farmers. ICARDA's other five regional programs (named earlier) use the same approach in working with the partners in the countries they seek to serve.

Although traditionally grown in the north of Sudan, wheat has expanded southwards, where land is more abundant and water is more easily supplied through gravity irrigation systems, as opposed to the small pump irrigation used in the north. However, as winter temperatures increase greatly as one moves south, producing wheat profitably under such harsh environments used to be a major challenge. By breeding high temperature tolerant wheat cultivars and developing appropriate agronomic practices to overcome this environmental constraint, wheat has become the most attractive crop option south of Khartoum. It has few competitors for labor during the periods of peak demand and, in addition to its cash importance, it is a leading import substitute crop at the national level. Domestic self-sufficiency has been a goal over the past three decades and is now in sight.

With encouraging government policies, the spread of new wheat technologies has been remarkable, leading to the expansion of wheat in traditional production areas and its introduction into many large-scale irrigation schemes.

**T**he WANA region contains three of the eight centers of crop origin identified by Nikolay Ivanovich Vavilov in the early part of the century.

For example, almost all farmers in Gezira and Rahad—two large irrigation schemes which grow about 72 percent of Sudan’s wheat—have adopted improved cultivars and mechanical sowing. Many also use recommended tillage practices and timely sowing. The area currently under wheat, about 360,000 hectares or one-fifth of the total crop area under irrigation, has more than doubled compared with 1985 to 1986. Total production rose from about 200,000 metric tons per annum to a current average of over 600,000 metric tons per annum. The greater increase in production than in area reflects continual yield improvement. The average yield across the country in the period 1976 to 1985, 1.18 metric tons per hectare, increased to 1.45 metric tons per hectare in 1986 to 1994. In the 1991 to 1992 season, when the weather was favorable, Sudan produced about 840,000 metric tons of wheat—about enough to meet domestic needs. Over time, yields in both demonstration plots and commercial production have increased, and the yield gap between these two levels has narrowed. Self-sufficiency in wheat has been increasing since the mid-1980s, from 13 percent to the present level of over 60 percent.

There are many other crops and areas within and outside of WANA in which great progress has been made through collaboration between CGIAR centers and national programs. These include the breaking of the “genetic bottleneck” in South Asian lentil, which was done by ICARDA with South Asian NARS using germplasm from WANA; the use of WANA faba bean germplasm from ICARDA to produce determinant lines for intercropping in China; the potential doubling of chickpea yield through winter sowing technology in the lowland Mediterranean region, jointly developed by ICARDA, ICRISAT, and national programs; the development of hessian fly resistant wheat by the Moroccan national program, a collaborative venture with CIMMYT and ICARDA; and the modification of forage crops to make them less vulnerable to grazing at the flowering stage.

## The Genes of Future Food

The WANA region contains three of the eight centers of crop origin identified by Nikolay Ivanovich Vavilov in the early part of the century. Of ICARDA’s mandate crops, barley, bread wheat, durum wheat, lentil, and vetch were all domesticated in western Asia, mostly in the so-called Fertile Crescent. The wild progenitors and relatives of these crops occur in the region to this day.

Genetic diversity—biodiversity—is as finite a resource as land and water. The fact that this resource is threatened only made headlines with the 1992 United

Nations Conference on Environment and Development in Rio de Janeiro, but scientists had been quietly alarmed about it for some time. It is estimated that up to 60,000 plant species—about 25 percent of the world's total—might be lost if the present rate of plant genetic erosion, through destruction of habitat, replacement of landraces, overgrazing, and other factors, continues.

ICARDA's genebank, with currently 110,000 accessions, is one of the largest in the CGIAR system. It was placed under the auspices of the Food and Agriculture Organization of the United Nations in 1994, as were the plant genetic resources collections of other CGIAR centers. ICARDA's collection continues to grow; up to mid-1996, ICARDA's Genetic Resources Unit had conducted seventy-one collection missions in forty-one countries. Such missions are collaborative ventures; before a mission leaves the host country, the seed collected is divided and half remains in the national genebank. The seed stored at ICARDA is available to any colleague in the world who needs it, regardless of location; about 27,000 samples are dispatched annually free of charge.

ICARDA, in collaboration with NARS of WANA, IPGRI, and the Arab Center for Studies of the Arid Zones and Dry Lands, has developed a project entitled Conservation, Management, and Sustainable Use of Dryland Biodiversity of the Near East. This project will help to implement the Convention on Biological Diversity. It will be coordinated by ICARDA, with national programs as the implementing agencies. The project covers four countries—Lebanon, Syria, Jordan, and the Palestinian Authority—with which ICARDA has growing links in agricultural research. The result should be the development, testing, and implementation of methodologies for *in situ* conservation, with emphasis on their worldwide transferability. The CGIAR regards *in situ* conservation as crucial, because plants stored in genebanks are not evolving to cope with changing climatic and pollution patterns.

## Water is Life

Arid and semi-arid areas are increasingly subject to water shortages. In many countries the amount of water allocated for agriculture—which accounts for 80 percent of the WANA region's water consumption—is continuously decreasing, due to increasing demand for domestic and industrial supply. The United States is said to have a freshwater potential of 10,000 cubic meters per citizen; Egypt has 1,100; Jordan has 260. Competition for limited shared water resources among countries in the region is causing some political tension. With high population growth and the need to raise living standards, there is a desperate need for additional water resources in WANA.

In the dry rainfed areas, breeding crop varieties for drought tolerance and/or drought escape has resulted in increased rainfall use efficiency in ICARDA's work on barley, durum wheat, lentil, and chickpea. One of the most effective ways to raise yields, however, is through irrigation. That is why irrigated areas now produce about 50 percent of the region's crops.

ICARDA's research has shown that water use efficiency is much higher in dry areas with supplemental irrigation than with full irrigation, particularly where irrigation water is in short supply; for example, 2.21 kilograms of wheat per cubic meter of water with supplemental irrigation versus 0.75 kilograms per cubic meter with full irrigation. However, it is not only a problem of water shortage; the unwise use of groundwater in some areas is resulting in large deposits of salt on fields. This has two consequences. First, the resulting soil salinity is too much for the crop. Second, the structure of the soil itself may be damaged. Treatment of such soil is not economical and, as a result, all too often the land is simply taken out of production. Supplementary, rather than full, irrigation, more water efficient plants, and other measures can reduce this threat, but it is best avoided by using rainwater captured through water harvesting.

Water harvesting is one option for making precipitation water more available to crops in the areas where rainfall is insufficient. It is based on taking precipitation from areas where it is too low or for other reasons is nonproductive, and using it to increase the amount of water available in an area where it can make a difference. It is defined as "the process of concentrating precipitation through runoff and storing it for beneficial use."

There is nothing new about this. The earliest water harvesting structures are believed to have been built 9,000 years ago in the Edom mountains of southern Jordan, to provide drinking water for people and animals. Today, indigenous systems survive. A good example is the *jessour* system of southern Tunisia—a series of retaining walls, or *tabias*, are built across areas of runoff to trap not only water, but soil; this is soil harvesting as well. However, the system requires maintenance, and outmigration has led to a decline in the skilled labor needed for this, resulting in the collapse of some *tabias* and consequent flood and soil erosion. Tunisian scientists are building on the *jessour* system to devise alternative, but related, methods, so that the indigenous techniques can be retained and updated for the modern world.

Generally, the existing ancient systems are those built for domestic use. These include collection ponds, cisterns, small masonry dams, and diversion canals. The importance of these systems declined, as they became unable to satisfy the high

demand for water generated by increasing populations and higher standards of living. They were also displaced by pressurized water supply networks for large and small settlements. Nevertheless, some systems are still operating in remote dry areas and less developed regions of the world.

Can the past hold the answer to more effective water husbandry? In the dry areas of Libya, for example, runoff irrigation supported sustainable farming systems for over 400 years during the Roman Empire. ICARDA believes that this principle can be modified and redeveloped. Part of the answer lies in water harvesting, and ICARDA is devoting more and more effort in this direction. An ambitious program of water harvesting in the dry areas was launched by ICARDA several years ago, and has recently been greatly enhanced. The program involves a partnership with national scientists in the region for exploiting this concept where appropriate. The latest phase is the ecoregional initiative, On-farm Water Husbandry in WANA, which covers several themes on water harvesting to be addressed across the various ecoregions of WANA. Through this work, ICARDA is using an ancient method and bringing it up to date.

The key factor in the success of any water harvesting system is the proper selection of the site and method. With the cooperation of the University of Karlsruhe in Germany and the General Organization for Remote Sensing in Syria, ICARDA has begun to develop methodology for identifying potential areas and suitable methods of water harvesting using satellite images. Different key parameters have to be considered to determine the suitability of any site for water harvesting and for various methods. Topography, natural vegetation cover, soil characteristics, drainage systems, rainfall characteristics, runoff potential, and crop water requirements are some among several other factors. Using conventional methods to plan water harvesting systems on a large scale is not economical. ICARDA's joint studies with the University of Karlsruhe revealed that remote sensing, used together with Geographic Information Systems, is much more efficient for investigating areas with limited information and infrastructure. The GIS information base can also be enlarged by including data on socioeconomic features related to land tenure systems in the area. This is invaluable for land use planning in general. One of the most interesting applications has been its use by Japanese scientists in a joint project with ICARDA, to identify areas of the steppe at risk of erosion.

### A n i m a l s   o n   T r i a l

The steppe of WANA is subject to a livestock stocking rate four times higher than it was in about 1950, and its extent has been reduced by around 50 percent,

giving at several places an eighth of the steppe area for grazing per head of livestock today than there was half a century ago.

The animal protein intake of the region's population is rising in most countries, but in countries where grazing land is now badly degraded, it is decreasing. Moreover, the topsoil in those degraded areas is being blown away by wind. Steppe degradation is a fast route to desertification. Blaming sheep and goats is an oversimplification. Overgrazing is a factor, but solving the problem of the steppe demands a more subtle approach.

**R**ecent estimates are that the steppe is being reduced by 1 percent annually due to a combination of desertification and improper cereal cropping.

Agriculture in WANA may be profitable in areas with rainfall of 200 to 250 millimeters and above, in which barley production predominates. Below about the 150 to 125 millimeter isohyets, rainfed cultivation is impossible. Somewhere in between lies the steppe, the domain of pastoralists. No doubt some of the steppe *can* support cereal production up to a point, but using it for this purpose is highly risky, because of the low and unreliable rainfall, and has long-term environmental consequences. Recent estimates are that the steppe is being reduced by 1 percent annually due to a combination of desertification and improper cereal cropping.

There is a further threat, that of fuelwood gathering. Research in Iraq and North Africa in the late 1960s suggested that a nomad tent of ten persons would consume 3.5 to 4 metric tons of dry wood a year. Set this against a contemporary above ground biomass in the rangelands of 200 to 500 kilograms per hectare and one is faced with a shortage of fuel and feed, as well as something even more sinister on a long-term basis. The changes brought about in the vegetation cover and soil composition of the steppe in this way may lead not only to a reduction in convective rainfall, causing local drought, but greater concentrations of carbon dioxide—with global climatic implications. At the moment, both of these are a matter of informed speculation, but there is justification for further research and strong action for rangeland protection.

There are other causes of rangeland degradation besides cereal encroachment; for example, the capacity to transport feed, often subsidized by government and relief agencies, and water into any rangeland and keep small ruminants *in situ* despite the shortage of grazing—a process once described as “transforming rangelands into open air feed lots.” This means that the vegetation does not have a chance to regenerate. In some areas, moreover, traditional controls over grazing were broken down as a result of political change, but have not been replaced. The steppe, it is alleged, is open for grazing to all! Indeed many commentators have

suggested that this is the key factor, but recent research has uncovered a more complicated picture.

## Steps Forward

Some rangeland restoration is possible. The following are some of the strategies that ICARDA is pursuing:

- authentic information on the state of rangeland, its biodiversity, vegetative cover, and current stocking rates, which is a prerequisite for any rehabilitation effort. GIS are helping with this, and with water harvesting, which could also play a role by stabilizing cereal yields on the margin of the steppe;
- strengthening the participatory aspect of all rangelands research. Misfires have occurred through its absence in the past. This need drives integrated rangeland management projects like those organized by ICARDA with the Syrian Steppe Directorate at Maragha and with the Central Research Institute for Field Crops at Ankara in the Central Highlands of Turkey. These are very different projects, but both have had encouraging results so far;
- establishing the root causes of overgrazing, and the constraints to their removal. This means research into property rights and other social aspects of range management. On this, ICARDA is working closely with IFPRI;
- small seeded native pasture legumes and indigenous species, which could play a role, especially with microwater catchments. ICARDA has developed a technique for establishing such microcatchments. It is also working on saltbush and other fodder shrubs;
- cereals as a complementary source of feed. Rotation of cereals with forage legumes could help stabilize cereal yields and provide another feed source. As well, the integration of crops and livestock into the nonsteppe farming system is important. ICARDA conducts collaborative research on this in Algeria, Syria, and Lebanon;
- establishing maximum safe stocking rates in the steppe and working out their application with farmers and pastoralists, which is essential; and

- realizing that tribal rules and land ownership are still very strong in many places on the steppe. There is not really open access. Much may be achieved by working within the pastoralist framework, rather than against it.

### **A Golden Road?**

At the end of the day, people want to consume meat and dairy products. In fact, it should long have been learned that environmental problems can be dealt with only in the context of people's real lives and needs. This is something that the CGIAR understands well, as it moves north to work in one of the greatest steppe areas of all—what used to be Soviet Central Asia. [See also page 32.]

The writer James Elroy Flecker referred to the Golden Road to Samarkand. Actually the gold was probably wheat. In the Soviet era, the region covered by the five Central Asian republics—Kazakstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan—was essentially a commodity producing component of a larger system, importing inputs from elsewhere and exporting its produce back. It now faces the challenge of developing a “stand alone” economy, a process that will require enormous diversification of agricultural production. For environmental and economic reasons, this will be a good idea.

Although Central Asia faces potentially serious problems, it also has strengths. In particular, it has a long history and enormous intellectual resources in agricultural research. There are many institutes and research farms, often very large; for example, the Karakul Sheep Institute in Samarkand. The NARS in Central Asia are experienced and long established; however, the scientists in them have been cut adrift, to some extent, by the dismantling of the former Soviet Union's central research system.

The land area of Central Asia is enormous; the five republics comprise over 400 million hectares, of which some 80 percent is farmland. This area accounted for 30 percent of total land area in the former Soviet Union. Wheat and cotton are important, as are livestock. About 70 percent of the farmland is permanent pasture. Fifty-one percent of the population is rural. The environment is not so different to WANA—low rainfall, extremes of temperature, and a mixture of mountain, desert, and steppe.

As the CGIAR builds contacts with the newly independent nations of Central Asia, it can be argued that, because of its geographic continuity, the region falls

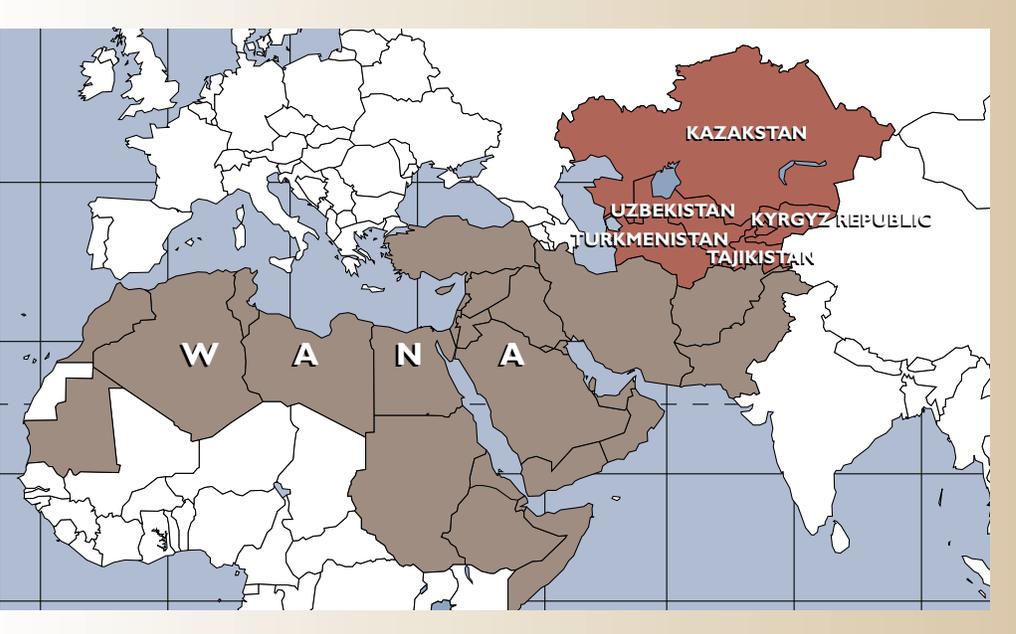
*Although Central Asia faces potentially serious problems, it also has strengths. In particular, it has a long history and enormous intellectual resources in agricultural research.*

within ICARDA's mandate [see Figure 3]. Also like WANA, Central Asia has diverse agriculture. A brief comparison of the five republics demonstrates this.

Kazakstan has a population of 17.5 million. It is similar to much of WANA—more than 80 percent is steppe and desert. The climate is dry and continental with hot summers and very cold winters. Rainfall distribution is unequal; although the plains generally receive 300 to 400 millimeters, the rest of the country makes do with less than 100 millimeters. Total area is 271.3 million hectares, but only 35.7 million hectares are arable; 2.2 million hectares are irrigated. Important crops are wheat, barley, millet, rye, oat, potato, cotton, forage crops, and vegetables.

Uzbekistan, with just 44.8 million hectares, is geographically much smaller than Kazakstan, but has a similar population, at 21.1 million. Only 4.5 million hectares are arable; 4 million hectares are irrigated. The climate is dry and continental; desert or semi-desert covers 70 percent of the country. Rainfall is below 100 millimeters in 40 percent of the area and 80 to 200 millimeters in the plains. Mountains, however, receive 400 to 600 millimeters, and can have up to 1,600 millimeters of rainfall. The main crop is cotton; others are wheat, barley, rice, maize, potatoes, and food legumes, such as chickpea and lentil. Fruits and vegetables are also important crops. There is a need to augment forage production.

**Figure 3. The Central Asia Region**



The Kyrgyz Republic has a much smaller population of 4.5 million, but its total area is 48.8 million hectares, larger than Uzbekistan. Fifty percent of the country is situated at an altitude between 1,000 and 3,000 meters, one-third is over 3,000 meters, and 86 percent of the country is pasture. The climate is continental and dry. Rainfall ranges between 100 to 1,000 millimeters and is usually not sufficient for rainfed agriculture. Only 1.1 million hectares are arable; 1 million hectares are irrigated. Main crops are forage/fodder crops, barley, wheat, maize, potatoes, and cotton; vegetables are also important.

Tajikistan and Turkmenistan are also relatively small. Tajikistan, with a population of 5.9 million, is physically much smaller, at 14.3 million hectares. Its agricultural area is 4.4 million hectares, of which just 810,000 hectares are arable. Most of this—639,000 hectares—is irrigated. The area planted to cereals has continued to rise in recent years, although there are some signs that this is coming to an end. Wheat is much more important than barley, and cotton remains a key crop. However, diversification is taking hold. Apple and cottonseed area have increased substantially since 1990, as have, albeit to a lesser extent, peach, plum, watermelon, and apricot. Some tobacco is now being grown, and there is an increasing area devoted to oilcrops.

Turkmenistan's profile is similar to that of the Kyrgyz Republic, with a population of about 4 million and a land area of 48.8 million hectares. Of this, 32.4 million hectares are classified as agricultural area, according to FAO figures, but only 1.4 million hectares are arable, nearly all of which are irrigated. This suggests that the country may face problems typical of WANA, with the need to protect rangeland and guard against environmental problems that come with high irrigation. Turkmenistan is believed to have been hit particularly hard by the loss of inputs from the former Soviet Union. Nonetheless, cereal area and output have increased greatly in recent years. Wheat is very important, much more so than barley.

One thing all five countries have in common is they are facing a daunting challenge in terms of both agricultural production and the environment. The immense changes since the 1980s are in themselves a problem. Agricultural research and production were formerly directed by a centralized command economy. Both have been dislocated by the end of the Soviet Union and the change to market driven economies. The centralized research system and collaboration across borders has also disappeared, leaving some scientists very isolated—and anxious to learn new techniques. On the farm, privatization has not been an unqualified success, as the workforce is unprepared and the right equipment not always available. At the policy level, governments must be ready to take decisions which were previously made centrally.

Food imports from elsewhere no longer supplement production, and this has led to a drive for food security and a resulting concentration on cereals. This has been done by intensification, or by expansion of area; the first has caused monoculture with a lack of fertilizer that has damaged soil fertility, and the second has tended to reduce crop diversity. Uzbekistan has increased its wheat area by 25 percent since 1990, but it is now trying to diversify its production, and to increase feed and forage supply. Kazakhstan is fortunate in that it produces three times its domestic needs in cereals, but yields are low and, again, there is a need to diversify. The country aims to reduce cereal area while increasing yields, so that land can be planted to other crops.

Environmental damage has been aggravated by infrastructure problems. Some are new, some are not. There is nothing new about excessive monoculture; cotton is an example. Inadequate rotations bring reduced fertility and pests and diseases. As well, there is reduced availability of inputs, which, like food imports, often came from elsewhere in the Soviet Union. Turkmenistan and Tajikistan are especially affected by this. The importance of livestock, especially in Kazakhstan and the Kyrgyz Republic, has led to feed and fodder supply problems, and livestock numbers are declining in places. The seed sector cannot usually meet the demands on it. The latter is a subject that is receiving considerable attention from the CGIAR and from Germany. Seed supply is essential to effective agricultural development; before farmers can be persuaded to adopt new varieties, they must know that the seed will be available, affordable, and of reliable quality.

In December 1995, the CGIAR, with support from Germany, held a meeting in Tashkent with four of the five republics. The meeting, to define future needs and draw up a provisional program, was organized by ICARDA; other CGIAR centers were also heavily involved—CIMMYT, IPGRI, ISNAR, and IFPRI.

## Global Economic Integration and Food Security

Wise use of natural, human, and capital resources in each country will allow agriculture to make sustainable contributions to food security. Given the fluctuating nature of productivity in rainfed farming systems, optimizing the storage and importation of grain stocks will receive greater attention in the future.

WANA countries that are increasingly dependent on food imports will find their food bills rising as developed countries reduce production and export subsidies under the General Agreement on Tariffs and Trade. Greater integration

with world markets will become more urgent. Investments in human capital, natural resources management, research, and technological development are, therefore, essential.

The following are a few important areas where there is need for strategic research aimed at yielding knowledge and human capital for the sustained benefit of mankind, and on which ICARDA's mandate is focused:

**P***artnerships with and among the national agricultural research systems of WANA are a key to success, and essential for bringing resources and critical masses of research skill to bear on the issues. This will require the concerted efforts of NARS with international research centers.*

- conservation and enhancement of plant and animal genetic resources, essential to the future food production system, not only of WANA, but also of the whole planet;
- methods for determining the best agronomic practices—economically and environmentally—and for encouraging their adoption, essential for sustaining productivity and for improved water use efficiency;
- research on livestock management and nutrition, which should increase, given the current emphasis on national veterinary and animal breeding investments and the importance of livestock in the region;
- recognition that, where pastoralists and farmers are insecure tenants, they cannot be expected to take long-term responsibility for the natural resources they use. This issue is central to policy research; and
- informal seed sectors, which should be enhanced by strategic research on methods, followed up with well informed extension.

Partnerships with and among the national agricultural research systems of WANA are a key to success, and essential for bringing resources and critical masses of research skill to bear on the issues. This will require the concerted efforts of NARS with international research centers.

The challenges to the agriculture and natural resources of WANA are tremendous, and must be faced now, because agricultural development will not only fill future food consumption gaps in the region, but will also encourage overall development and job creation, so important to reducing poverty and conserving and enhancing natural resources vital for the future of people, both in the WANA region and around the world. 

*M*any challenges to sustainable agriculture and food security in the WANA region are being addressed by the CGIAR. Following are highlights of some of the research activities that CGIAR centers are conducting in the region.

### CIMMYT

Bread wheat is the principal food source for the majority of the population in WANA. WANA has the highest per capita consumption of wheat in the world, at 145 kilograms per year. Across the region, wheat growing area is highly variable in terms of rainfall, temperature, soils, diseases, and insect pests. CIMMYT and ICARDA have collaborated in a Bread Wheat Improvement Program to develop cultivars suitable to dryland environments. The program built on the high-yielding semi-dwarf wheats developed earlier by CIMMYT. Cultivars have been bred that combine high grain yield and stability, with tolerance to abiotic stresses such as terminal drought, cold, and terminal heat, and resistance to biotic stresses such as yellow rust, septoria, common bunt, sawflies, Hessian flies, Sunni bugs, and aphids. The joint efforts of CIMMYT and ICARDA have resulted in improved material being adopted by farmers.

### CIP

Potato is Egypt's third most important food crop, after wheat and rice. Egyptian potato production has increased at an annual rate of 5 percent during the past thirty years—one of the highest production growth rates for potatoes in the world. In 1991-1993 production reached 1.7 million metric tons, and yields averaged 21 metric tons per hectare. Farmers used to rely heavily on toxic pesticides, such as DDT and Parathion, to control the heavy losses caused by the crop's most damaging pest, the potato tuber moth. The moth damages the crop throughout the harvest season and destroys potatoes in storage. The dangers to human health posed by traditional pesticides, which also killed the moth's natural enemies, and the increasing pesticide resistance developed by the moth, pointed to the need for biologically safe alternatives to combat the moth. Collaboration between CIP and Egyptian scientists, farmers, and policymakers, particularly the Plant Protection Research Institute, resulted in two practical strategies: defensive practices; and, biologically safe controls. Farmers now plant earlier in the year, to avoid the hot months, which encourage moth reproduction. They also hill the soil around the potato plant and keep the ground moist to obstruct the moth's ability to access the crop. As well, farmers are using biologically safe alternatives to traditional pesticides, such as sprays and

powders that employ the granulosis virus (GV), which attacks only the tuber moth in larva, and *Bacillus thuringiensis* (Bt), which produces a bacillus protein lethal to the tuber moth. These new measures are being used by farmers to protect potatoes both in the field and postharvest, and are spreading rapidly.

### **ICLARM**

Egypt is one of the eleven founding member countries of the International Network on Genetics in Aquaculture, organized and coordinated by ICLARM. INGA was established in 1993 to foster the exchange of research expertise and experience in the application of genetics to fish breeding and aquaculture. International collaboration to enhance aquaculture genetics research in national breeding programs is important in order to increase fish productivity on a sustainable basis. The INGA Steering Committee held its third annual meeting in Cairo in June 1996, organized by ICLARM and the Government of Egypt and jointly hosted by the Central Laboratory for Aquaculture Research and the Egyptian National Agricultural Library. The meeting discussed in detail the progress of aquaculture genetics research in member countries, and planned future programs and ways for strengthening collaborative linkages and partnerships among network members. Special sessions were devoted to genetic improvement of carps, development of salt tolerant tilapia, and strengthening information exchange and communications. Egypt is also the site of ICLARM's new regional office in Abbassa. The Central Laboratory for Aquaculture Research facility was recently provided to ICLARM by the Government of Egypt. It will serve as the hub of ICLARM's collaborative research and training activities in Sub-Saharan Africa, and will be a site for upstream ecoregional and global research on selected topics.

### **ICRISAT**

Chickpea is the second most important pulse crop in the world. In the WANA region, Kabuli chickpea is traditionally sown in the spring. ICRISAT and ICARDA have collaborated to develop chickpea cultivars capable of tolerating freezing temperatures—winter-sown chickpea can produce 50 to 100 percent more yield than spring-sown chickpea—and resistant to ascochyta blight, the most destructive disease of chickpea in the region. ICRISAT and ICARDA evaluated more than 2,000 breeding lines for the desired traits, which they found in landraces and wild relatives of chickpea from WANA and Central Asia. From these, fifteen national programs released forty-two cultivars for winter-sowing across the WANA region.

On-farm evaluations showed an increase of more than 60 percent in yield and 100 percent in profits. Farmers began planting the new varieties in 1988, and by 1993 it was estimated that nearly 90,000 hectares were sown to winter chickpea, producing \$11 million a year in additional income.

## **IFPRI**

IFPRI and ICARDA have joined forces with farmers, researchers, and policy-makers in eight WANA countries, and representatives of NGOs and the private sector, to examine and find solutions to the complex environmental and social problems that are leading to the degradation of the fragile, arid land that lies between cultivated land and desert in the region. The degradation is occurring as the number of sheep and goats grazing on this land has increased to 80 million, and the area under barley cultivation has almost doubled. Problems throughout the region differ from country to country, but all involve competition between barley and rangeland for sheep production in areas that receive less than 300 millimeters of rainfall a year. A three-year project, begun in 1996, will integrate policy, institution building, and property rights research with technology research, to better examine sustainable resources management and social welfare in low rainfall areas. At the end of the project, participants expect to identify policies and technologies that will improve and stabilize the incomes of people living on this land, while preventing further degradation of this high risk environment and, where possible, improving the resource base.

Egypt is one of the largest per capita consumers of wheat in the world, and the second largest importer of wheat. Imports are needed to supplement domestic wheat production to help meet demand. The Government of Egypt heavily subsidizes the price of bread and wheat. IFPRI is working with collaborators in Egypt's Ministry of Agriculture and Land Reclamation and Ministry of Trade and Supply to reform the wheat market, better target the food subsidy system, and identify strategies to alleviate poverty and increase the incomes of the poor. As part of its work on market reform, IFPRI surveyed 2,000 traders, importers, and millers to better understand how the system is operating. IFPRI plans to survey wheat farmers to learn what constraints they face, how government reforms affect them, and how much of their production enters the wheat market. IFPRI will help the Egyptian Government to identify inefficiencies and leakages in the food subsidy system, to improve effectiveness and reduce costs, and identify ways to generate greater employment opportunities for the poor.

## IIMI

Today in Egypt water is moderately scarce, and there is enough water to meet the vast majority of needs. In the future, however, water supplies to agriculture are likely to be significantly reduced due to water transfers to competing demands, further development of new lands, and full utilization of agreed upon upstream riparian rights. If serious shortages occur, far clearer legal definitions of water rights and water services will be required. To help the Egyptian Government formulate a rational approach for sharing the costs of water services among beneficiaries, IIMI conducted a study which analyzed alternative approaches, and the impact of these alternatives on the agriculture sector. As part of its study, IIMI analyzed three options to recover costs and encourage efficiency in the provision and use of water. IIMI also used a modified IFPRI model of Egypt's agriculture sector to analyze the relationship between farm incomes and service charges. IIMI found that service charges would recover the full cost of the service, and that the level of service charges required—about \$52 per hectare or 4.5 percent of net farm income—was so low that its impact on cropping decisions by farmers would be minimal. The study also showed that volumetric charges, under prevailing conditions of supply, were unlikely to produce significant efficiency gains within the politically feasible range of charges, and were only marginally more successful in encouraging efficient water use than crop-based charges. IIMI concluded that the driving logic for establishing service definitions will be future water demands and the consequent water balance rather than cost recovery considerations.

IIMI is developing tools that enable scientists, farmers, irrigation managers, and policymakers work on the mega problems of water more effectively. In conjunction with partners in the Netherlands and India, IIMI is using remote sensing from satellites to measure the performance of irrigation systems. By applying an advanced interpolation technique that measures evapotranspiration from crops by remote sensing, it is possible to identify crops under water stress. The Climate and Water Atlas of the World is another tool being developed by IIMI and its partners. It provides complete meteorological data up to the specificity of 2.5 kilometers, making it possible to scout for water and improve irrigation scheduling, among other things.

## IPGRI

The WANA region is home to some of the world's most important crops, including oat, rye, wheat, barley, figs, almond, olive, strawberry, pistachio, apricot, and

pomegranate. The diversity of many of these crops is under threat. The network in WANA, known as WANANET, links the plant genetic resources activities of national programs, research institutes, and others with common interests. It is sponsored by IPGRI, ICARDA, and FAO, and is coordinated by IPGRI's regional office located at ICARDA. The thirteen WANANET member countries have developed a regional platform for action based on their assessment of common problems and constraints hindering the effective conservation and use of plant genetic resources.

IPGRI is also collaborating with national programs in the region to collect and study almond and pistachio germplasm. Almond and pistachio are native to the WANA region, and have important commercial value in both internal and external markets. However, the survival of almond and pistachio genetic resources is being threatened. Information gathered in the course of the studies is being used to develop maps of the genetic diversity of both nut species. Accessions are stored in national genebanks throughout the region for evaluation and propagation. An *in vitro* collection of almond has been established using wild and domesticated germplasm collected from different ecogeographical areas in the region. The ultimate goal is to provide a broader and more reliable genetic base for breeding new varieties adapted to the region.

## ISNAR

ISNAR collaborates with countries in WANA to enhance the management capacities of partner institutions to improve their own performance. ISNAR has concentrated on providing support to the development of national agricultural research master plans (recently in Lebanon and Jordan), and to the planning aspects of human resources. ISNAR has helped countries in WANA build national teams, using new management instruments and sharing experience; assisted NARS in the sustainable use of new information technologies; supported NARS to develop national strategies for biotechnology; and, promoted and strengthened regional approaches through collaboration with the Association of Agricultural Research Institutions in the Near East and North Africa. ISNAR's most extensive cooperation has been with Morocco. Since 1984, the collaboration has spanned diagnostic reviews, advisory work, and training in areas as diverse as research planning, programming and budgeting, priority setting, human resources development, and management information systems.

# Development Perspectives

3

*front:* TRANSPLANTING  
RICE IN CIAT'S EXPERI-  
MENTAL PLOTS IN  
COLOMBIA. (CIAT)



*back:* IITA'S INTEGRATED  
STRIGA SPP. CONTROL  
PROGRAM COMBATS  
THE DEVASTATION TO  
CEREAL CROPS IN  
AFRICAN FARMLANDS  
CAUSED BY THIS  
PARASITE. (IITA)



Partnerships are key to the renewed CGIAR. This is clear, for instance, from the efforts of the CGIAR to turn itself into a fully South-North enterprise, the collaborative arrangements between CGIAR centers and NARS, the establishment of CGIAR partnership committees with NGOs and the private sector, and the involvement of the CGIAR in the growth of a thriving global agricultural research system.

While the strongest element of partnership is within the agricultural research community, the CGIAR seeks to establish and strengthen partnerships well beyond that circle of collaboration. The rationale for this approach has been clearly articulated by CGIAR Chairman Ismail Serageldin on many occasions. He has said:

*We approach the second quarter century of the CGIAR with confidence, ready to confront new challenges and fight new battles, with the ingredients of past successes distilled for a new century. Scientists in their laboratories and farmers in their fields have to reach out to each other and to learn to march in step, for they are in truth engaged in a common endeavor.*

*Economists emphasize the right prices. We need to be equally emphatic about the right roles of the multiple forces engaged in creating a new development paradigm. Herein lies the new beginning, the combined efforts of diverse actors—farmers, scientists, NGOs, policymakers, the private sector—in a convergence of past experience and future possibilities.*

*We cannot fight the battles against poverty and hunger alone. That calls for a combined effort by a Coalition of the Caring.*

In that spirit, this edition of the *CGIAR Annual Report* opened its pages to development perspectives from three outspoken members of a potential Coalition of the Caring.

- Noeleen Heyzer, Director, United Nations Development Fund for Women, assesses UNIFEM's role in cooperative efforts to translate the Platform for Action adopted by the Beijing Conference on Women into concrete measures at the national and regional levels; the importance of empowering women, particularly those in the poorest strata of rural society, and some of the means by which this can be realized; the need to increase women's access to land and other productive resources in order to achieve sustainable agriculture and natural resources management; and, how a gender perspective and changing

*Partnerships are key to the renewed CGIAR. While the strongest element of partnership is within the agricultural research community, the CGIAR seeks to establish and strengthen partnerships well beyond that circle of collaboration.*

perceptions of women are bringing about a revision in traditional development paradigms.

- Razali Ismail, President of the United Nations General Assembly and the first Chairman of the post-UNCED United Nations Commission on Sustainable Development, explores evolving world views toward development, the affects of globalization on developing countries, the commitment of the global community to meet a range of contemporary and future development challenges, and the future role of the United Nations as a catalyst of development.
- Jacques Cousteau, the world renowned oceanographer and environmentalist, spells out his views on the importance of protecting Mother Earth and her precious resources for future generations, and how this can be achieved.

Ms. Heyzer and Ambassador Razali were interviewed for the *1996 CGIAR Annual Report* by veteran foreign correspondent Thalif Deen of InterPress Service who specializes in the coverage of international development issues at the United Nations. 



## INTERVIEW WITH NOELEEN HEYZER

“From the grassroots to the global Internet, from village councils to national governments, from local banks to world trade, women are reaching new levels of participation and partnership with men. We are truly climbing to equality,” says Noeleen Heyzer, Director of the United Nations Development Fund for Women. She acknowledges, however, that there are major barriers that women continue to face in their fight to achieve economic and political empowerment and equality.

Ms. Heyzer, a native of Singapore, worked for twenty-five years in Asia and the Pacific before joining the United Nations in 1994. UNIFEM’s business of engendering systemic change is undertaken in four distinct contexts: working with governments at the country level; building the capacity of women’s organizations on the ground; exploring new synergies among diverse sectors, drawing especially on innovative and socially responsible private sector initiatives; and, playing a catalytic role within the UN system.

Asked whether lack of political will and funding are major constraints for UNIFEM, she said the fact that contributions to UNIFEM have increased over time is a clear indication of political support for gender issues. “We are also able to work extremely well with governments at the country level,” she added. Unlike many cash-starved UN bodies and agencies, UNIFEM is in robust financial health. When Ms. Heyzer took over in 1994, UNIFEM had an annual budget of about \$14 million. The contributions to UNIFEM rose to \$20.4 million in 1995, including a one-time contribution. In 1996, the budget stood at \$17 million. Despite a climate of cost-cutting and downsizing, Ms. Heyzer believes UNIFEM’s budget can be sustained, and says she plans to double it by the year 2000.

*The following are excerpts from the interview with Ms. Heyzer for the 1996 CGIAR Annual Report.*

**QUESTION:** Eighteen months after the Fourth World Conference on Women in Beijing, what do you think has been achieved internationally with respect to equity for women in development?

**MS. HEYZER:** Since the 1995 Conference on Women, the United Nations has been working with women’s networks, policymakers, and women at the grassroots level to develop strategic plans for the implementation and evaluation of the Platform for Action adopted in Beijing. The whole emphasis in Beijing was on action, not just on commitment. If I look at it from the point of view of UNIFEM, we have assisted sixteen governments, including India, Brazil, Kenya,



Noeleen Heyzer,  
Director, United Nations  
Development Fund for  
Women

*Women are reaching new levels of participation and partnership with men. We are truly climbing to equality.*

Chile, Jordan, and Syria, to come up with their own action plans on women and also to incorporate gender components in their national budgets. Although the Beijing Platform is not legally binding, more than 100 countries and most UN organizations have made formal commitments to develop implementation strategies with specific timelines, benchmarks for monitoring, and funding recommendations.

UNIFEM is working to facilitate the implementation of the PFA and to achieve our mandate to promote women's economic and political empowerment. For this, UNIFEM is using the following strategies:

- strengthening the capacity of women's organizations and networks to serve as advocates for women;
- supporting innovative programs and projects benefiting women;
- leveraging funds and support for innovative strategies dealing with critical issues affecting women;
- acting as a catalyst within the UN system and at the regional and national levels to advance women's empowerment; and
- documenting and disseminating best practices and lessons learned.

**QUESTION:** The CGIAR focuses on strategic and applied research to develop agricultural and natural resource management technologies. Priority clients are poor rural women. How can they be reached most effectively?

**MS. HEYZER:** There is a rich canvas of successful experiences from India in the effective mobilization of women. Landless and self-employed women from the informal sector, for instance, have been successfully mobilized for their socio-economic development. The common characteristics of these success stories are the involvement of organizations at the grassroots level to raise the consciousness of women, genuine involvement of women at the grassroots level in action to improve their situations, and development of support and information networks with other groups. The leaders of these organizations often see themselves as facilitators—as opposed to authoritarian and patronizing leaders—who have merely created the opportunity for women of the target group to come together around an issue of need, and who have encouraged dialogue from which new insights for action have been gained.

Many of these successful organizations, for example, the Self-Employed Women's Association and the Working Women's Forum, are involved not only with the mobilization of specific groups of women such as street vendors, bedworkers, and fisherwomen, but also the upgrading of their training and the provision of rural credit. Loans are given to women individually and collectively based on their needs, capability to repay, and ability to utilize the money in ways which generate regular income.

Every small step and action taken on behalf of women in the poorest strata of rural society can eventually add up to become the foundation on which more basic changes can be built. Interventions may only be a means of ensuring that the position of these women does not worsen, but this is better than having no intervention. Interventions can range from legislative change; sensitizing bureaucracies, the media, political organizations, and trade unions; building communications and information networks and linkages; consciousness raising; participatory strategies; changes in leadership and management styles; development of service centers; and, creating more responsive organizational structures and processes.

The development process, whether we like it or not, has already released many forces of change in society. It is crucial now to influence and intervene in the process to ensure that those forces create more opportunities than barriers for the poorest women to gain more control over their lives and to have more choices. This includes training women in skills which are in demand and which would allow them to be employed more productively, rather than concentrating on skills associated with homemaking. Such training should be linked to credit and marketing facilities to ensure success. There should be an increase in the intake of female extension staff in rural development agencies to ensure that poorer women have better access to state resources. There should at least be joint ownership of land between men and women to ensure some security for women. Also, rural organizations set up by the state should provide training to rural women, as well as men, in agricultural technology and innovation. Where necessary, training in the management of money should be conducted prior to the payment of compensation.

**QUESTION:** Has a focus on women in development and gender contributed to a revised development paradigm? If so, how?

**MS. HEYZER:** I think so. Definitely. Let us examine what revised development paradigm we are talking about. If we are talking of a development paradigm that focuses solely on economic growth, then obviously when the gender perspective is taken into account, that kind of paradigm will have to be shifted. I want to go a little

**T**he issue of concern is what kinds of institution building, training, and approaches to management and administration can assist women of the poorest strata of rural society to gain access to new economic resources, skills, and opportunities.

bit deeper than that. Increasingly, one talks not just of economic growth, but also of the pattern of economic growth. There is strong thinking now in the development community that says, “we are not against economic growth, but we are against certain types of economic growth,” particularly those types that are not sustainable because they will erode the ecological base, destroy the future, destroy the participation of people, and marginalize people. You also do not want an economic growth that destroys communities and the social fabric of living. Once you change your thinking, you are talking about a more people-and-human centered development, a development paradigm where social development is the basis for economic growth. It turns on its head former development theories of economic growth where equity was seen as a trade off. The argument now is that the equity issue begins to be the basis of economic growth. If there is lopsided growth or development, it cannot be sustained for longer than one generation because it will eventually collapse.

How does economic growth lead to human development? It is via households, via decisions made in households, and via employment. The links there are very, very central. Furthermore, it is not just focusing on women, it also depends on how the focus actually takes place and the nature of that focus. One very good example is the population issue. Family planning programs always focused on women. There was no decisionmaking and there were no choices. It was the 1994 International Conference on Population and Development in Cairo that changed this. Now women are being talked about, not as passive clients, but as women with empowerment. There was a total change in thinking on several issues, including the issues of decisionmaking and of reproductive and health rights. I think even the World Bank now talks of social investment. I was very pleased to discover that during the Microcredit Summit (in Washington in February) the Bank was talking even in terms of violence against women as a problem for development. That is something new.

**QUESTION:** A persistent barrier to women’s increased and sustainable productivity in agriculture and natural resources management has been their restricted and/or conditional access to land. What can be done to help increase women’s access to land and other productive resources?

**MS. HEYZER:** The issue of concern is what kinds of institution building, training, and approaches to management and administration can assist women of the poorest strata of rural society to gain access to new economic resources, skills, and opportunities. The issue is not simply of equity, but also of dignity and the development of women’s collective strength to influence the social processes that affect their lives.

New opportunities have been created for the rural poor in terms of cooperatives, rural credit, mobile banks, farmers' associations, village community organizations, training in the use of new technology, extension services, and new information, marketing outlets, and welfare schemes. These opportunities, however, are often molded and introduced into rural areas based on concepts and values of government departments, implementing agencies, and NGOs that often emphasize planning from the top. Few are really programs that have emerged out of a consultative process in which the target group and program personnel share their knowledge and resources and, therefore, create a better fit between needs and capabilities of the beneficiaries and the resources of the agency.

One outcome of this top-down approach is that most agencies plan as though only men support families, when in reality it is men together with women who do so, and often it is the women who are forced to do so alone. As a consequence, even if in theory resources are available to both sexes, in practice this seldom happens. One of the means of helping women to gain access to productive resources is through microcredit. Microcredit has become a powerful tool helping women transform their lives and the lives of their families and their communities. Microcredit is about much more than access to credit. It is about women gaining control over the means to make a living. It is about women achieving economic and political empowerment within their homes, and within their villages, town, cities, and countries.

UNIFEM recognized early on the importance of providing credit to women as an essential ingredient in building institutions at the grassroots level. We facilitated the formation of the International Coalition on Credit, which consists of thirty-two of the world's leading microcredit and business NGOs, with more than 200 affiliated organizations. Together they provide more than 3 million of the world's poor with funds to begin and sustain their enterprises. Due in part to this coalition's advocacy before and during the World Conference on Women, the Beijing Platform for Action embodies robust language on women's economic empowerment.

In an increasingly globalized economy, we must use innovative approaches to enable women entrepreneurs and producers to benefit from new market opportunities. One way could be to support a network of women community producers. This network would provide women producers better access to the global marketplace.

**QUESTION:** Your own experience has included a focus on women and natural resources management. What do you think are the most important issues with respect to women and the environment and natural resources management?

**MS. HEYZER:** What kind of world do we see from the perspectives of gender, environment, and development? The number of rural women living in absolute poverty has risen by 50 percent over the last two decades compared with a 30 percent increase for men. Feminized poverty is still very much a rural phenomenon. It also brings up the issue of access to land, credit, and technology. One of the criticisms is that much of the work of rural women is invisible and not socially recognized. They are seen as casual workers in national data. We are now trying to give a higher value and recognition for their work. With that comes access and control.

Women were first seen as victims of environmental degradation. Poor, rural women were pictured in major international magazines and television programs staggering under huge loads of wood or walking miles to fetch water. While this coverage highlighted real problems, it also presented a one-sided image.

Women were then recognized as managers of such resources as forests, water, and fuel, and as active participants in agriculture. Their knowledge about the environment began to be acknowledged and they came to be seen as part of any solution to energy and water problems. This led to the perception that women are resources themselves. But was it fair, as many critics asked, to make women responsible for the global clean-up, to add the burden of environmental caring to all their other caring roles? Was the recognition of women's environmental knowledge empowering or merely instrumental? How could women's rights to resources be highlighted at the same time as their knowledge and their responsibilities?

The public perception shifted with the emergence of such powerful examples as the Chipko movement in India to the image of women as protectors and defenders of the environment. Some attributed the commitment of women to environmental protection to their need for resources to sustain livelihoods, while other saw it as part of women's deeper understanding of and connection to nature.

There was also the view often called "ecofeminism." Women were seen by some to be in harmony with nature. It was part of a woman's essential being, in contrast to men, who were seen to be less involved with nature, and more prone to destroy than to nurture or protect. The strength of this position is that it promotes the idea of unity among women, but it fails to ask whether all women really have the same interests. It also overlooks such differences—often divisions—as class, race, and region, and urban versus rural backgrounds.

Lastly, the concentration on women and the population question. Many groups concerned with the environment assume that population exceeds resources. This, however, ignores such causes of degradation as the distribution of resources, consumerism, war, and growth policies. These have contributed significantly to the doubling of the number of poor rural women worldwide during the last two decades. The vast majority of the 1.3 billion people now living in extreme poverty throughout the world are women and girls, with some estimates of the proportion ranging as high as 70 percent.

As I said earlier, the climb ahead will be hard, but I believe women will reach the summit of equality. 



## INTERVIEW WITH RAZALI ISMAIL



Razali Ismail, President,  
United Nations General  
Assembly

*The Uruguay Round and the liberalization of world trade—the “recipe” for renewed partnerships in development—have not benefited the least developed countries.*

Ambassador Razali Ismail of Malaysia, President of the United Nations General Assembly, warns that the decline in development assistance is an “alarming trend” that has to be halted. A senior UN diplomat who has represented Malaysia as its Permanent Representative for over eight years, Mr. Razali was also the first Chairman of the United Nations Commission on Sustainable Development, created after the 1992 United Nations Conference on Environment and Development in Rio de Janeiro. A strong spokesman for the causes of the developing world, Mr. Razali has also warned of the impending dangers of excluding developing nations from sharing the benefits of technology.

*The following are excerpts from the interview with Mr. Razali for the 1996 CGIAR Annual Report.*

**QUESTION:** From your vantage point as President of the United Nations General Assembly, how do you see views on development issues evolving, as the world moves toward the new millennium?

**MR. RAZALI:** I am not optimistic. I am prepared to go on record to say that I am alarmed at the way views on development issues are evolving. The Uruguay Round and the liberalization of world trade—the “recipe” for renewed partnerships in development—have not benefited the least developed countries, despite their economies having to adjust to the new rules of the General Agreement on Tariffs and Trade. The Uruguay Round has heaped more problems on the poorest countries, beyond the already huge challenges of debt and structural adjustment.

At the same time, there has been no counter balance in terms of increased development assistance. Even the private sector—the new partner of governments in development—marginalizes those countries in Africa that do not attract quick profits. Foreign Direct Investment levels remain very low, with less than five percent of FDIs going to Africa. At the General Assembly, we adopted several resolutions on development issues, adding to the consensus already reached at global conferences; for example, the resolution entitled “Enhancing International Cooperation Toward a Durable Solution to the External Debt Problem of Developing Countries,” which focused on recent initiatives, such as those of the Bretton Woods institutions, that seek to bring the debt burden of the most indebted countries to sustainable levels.

These resolutions are significant but small steps which do not provide comprehensive solutions to the development crisis. The United Nations also has to raise its profile in mobilizing increased development assistance, even as it tries to factor its decisions into the Bretton Woods policies. The United Nations must be able to

make a legitimate claim to development funds in its own right, particularly as it undergoes reform and enhances its delivery capacity. I am not sure that this will happen, but the United Nations should nevertheless try, being the one institution that attempts to level the playing field; democratically allows the exchange of all views of all governments; is not donor driven; and, is the natural focal point for looking at global issues on development and marginalization. Unfortunately, development assistance in the United Nations is not always on the basis of dealing with root causes.

Development as a global issue, too, has changed. Humanitarian impulses are dying. Further assistance is predicated not only on results, but on how engaged citizens of donor countries are on certain issues. My other view on development is about how some developing countries view sustainable development. There is still a hot debate, regrettably, with many questions about sustained economic growth and sustainable development unresolved.

**QUESTION:** The ratio of Official Development Assistance to Gross National Product has dropped from 0.3 percent in 1994 to 0.27 percent in 1995, well below the 0.7 percent target for the environment and development adopted by the United Nations in 1970. Do you consider the decline as a trend, and, if so, how do you assess its significance?

**MR. RAZALI:** ODA is declining. The trend is alarming, and is linked with globalization, where governments have virtually abdicated their role and left it to the private sector and to FDIs. Much hope is being placed on the role of Japan, as Japan magnifies its commitment globally; for example, by playing special attention to Africa.

**QUESTION:** Globalization is very much part of today's development debate. Does the South stand to gain or lose from this phenomenon?

**MR. RAZALI:** There are winners and losers in globalization. The countries of East Asia, and some in Latin America and in Africa, can become winners, if they can handle the challenges of market forces and the private sector from a position of strength and acquired experience. East Asia benefited from development at a time when development assistance was available; for example, Malaysia benefited from the predictability of Japanese assistance.

Times have changed. There are many poor countries that will lose out in globalization unless there are global programs that especially benefit them and provide them with the opportunities to participate in a world that is fast globalizing. The

Special Program for Poor Countries, under which \$5 billion has been pledged to the world's poorest nations, is a good start, but not good enough. We still need to be able to leverage private sector pledges, in partnership with government and multilateral pledges, so that investments are made in the areas that private sector funds would not go if they were invested on their own. The United Nations has a special role to play in monitoring and balancing the effects of globalization in poor countries.

**QUESTION:** New information technology is at the heart of globalization. Are safeguards needed to ensure that this development will not result in “technology apartheid”?

**MR. RAZALI:** Information technology is the cutting edge of research and development, and will make a huge difference. However, if countries are excluded from it or not able to deal with information technology, the gaps will widen even further. Technology in this instance is a power apparatus that can virtually diminish sovereign rights. Technology has already made obsolete certain primary commodities of developing countries; for example, copper and tin. Biotechnology can also threaten the livelihoods of traditional farmers, without sustained efforts to ensure that the benefits of biotechnology are available to all.

**QUESTION:** The new information technology can influence development in a positive way, for instance in agriculture. How can these benefits be spread widely?

**MR. RAZALI:** Information technology can obviously influence development by leap-frogging the process of trial and error. Benefits can be immense, but what must be paid in return? Also, whoever controls information technology controls, in a sense, the development choices by keeping alternatives out.

**QUESTION:** Great strides have been made in food productivity since the 1960s, but millions remain poor and malnourished. To what extent is this paradox the result of mismanagement and unrealistic domestic policies?

**MR. RAZALI:** We religiously observe World Food Day and, certainly, much has been achieved in the quest for food security. The international community has, however, failed to free hundreds of millions of people from hunger in an era of human scientific achievement. There are many reasons for this, including bad governance. A major problem is the inability to critically examine the root causes of hunger and the need to find multiple solutions. The huge dimensions of hunger and food insecurity that we face today are closely linked to poverty and land tenure issues, unsustainable production and consumption patterns, property rights regimes

that erode the diversity of genetic resources, the impact of technology on small producers, the role of women in agrarian communities, and the multiple guises of power politics which use food as political and economic weapons in the globalized marketplace.

**QUESTION:** In an earlier decade, the United Nations was the focal point of several attempts to forge a new South-North relationship. Looking back on those efforts, what do you think they achieved?

**MR. RAZALI:** The experience was not entirely negative. In those days, the United Nations helped to define the North-South dialogue, even if it was purely prescriptive and done in the context of the ideological tussle of the Cold War. The North-South dialogue continues to be well-defined in UN global conferences, but the means of implementation remains elusive. Questions can be asked about the Uruguay Round and the World Trade Organization. Were these not initially UN inspired? However, now they have a life of their own, which in some ways does not promote a level playing field.

**QUESTION:** There is a great deal of “soul-searching” about the role of the United Nations in the post-Cold War world. Is it likely that as part of a reorientation, the emphasis will move from political to development issues? If so, in what way?

**MR. RAZALI:** Through the reform process, the United Nations must devise a coherent and feasible strategy, identifying priorities and mandates and securing resources that will allow it to play a leadership role, relevant and vital for the future. As the new Secretary General has said, the United Nations—both the governmental delegations and the Secretariat—must not be afraid to handle change. Clearly, a vital element of that change must be an improved capacity, with full legitimacy for the United Nations of the future, to deal effectively with the issue of development. It is not a question of moving away from the political to development, but the United Nations must address itself on both issues, including also social justice and the state of the planet.

**QUESTION:** “People at the center” has been a widely accepted principle at many recent world gatherings. What are your thoughts on what this really means in practice?

**MR. RAZALI:** The credo is readily accepted about “people-centered” development, and there is no dispute about the potential benefits of that. How far have we

*Through the reform process, the United Nations must devise a coherent and feasible strategy, identifying priorities and mandates and securing resources that will allow it to play a leadership role, relevant and vital for the future.*



really gone on this road? UNCED in 1992 talked about empowerment in the critical areas of decisionmaking, but how many governments have actually brought peoples and communities into decisionmaking?

**QUESTION:** Your own country, Malaysia, has benefited from policies that have resulted in a successful development effort. What are the lessons that the rest of the South can draw from this experience?

**MR. RAZALI:** In a nutshell, affirmative action programs to ensure equity and distributive justice, making people stakeholders to motivate them, an early emphasis on education and investing in skills, and a political leadership that is people-focused.

**QUESTION:** You have personally been at the center of international efforts, post-UNCED, to strike a balance between environmental protection and economic growth. What more needs to be done toward implementing Agenda 21?

**MR. RAZALI:** Even if the balance is not yet set, there is acceptance that economic growth needs to take into account environmental protection. The debate continues, and governments need to be constantly reminded about their commitments to Rio and intragenerational equity, so that they do not “hawk away” the future for the needs of the present. Agenda 21 will have to be looked at critically and with honesty at the next UN Special Session. There are many areas of Agenda 21 that have not been implemented and there is indecision on the means of implementation.

**QUESTION:** Finally, what advice would you give the international development community as it looks to the year 2000 and beyond?

**MR. RAZALI:** We must move from the defining and prescribing stage to one of meeting operational targets and enhancing delivery capacities. There is a need for agencies to understand the risks of competing with each other for resources which are always finite, without looking at the issue of development as a whole, and without establishing priorities in the context of the real needs of people in marginalized areas. The United Nations, as the international body that is democratic with full legitimacy and support, should attempt in the years ahead to enhance its right to development resources. Obviously, this means that the United Nations must first reform and increase its delivery capacity, if it is going to be accepted as an important player. 

# THE RIGHTS OF FUTURE GENERATIONS

## Fighting for the Future

The rights of future generations have long been a subject of passionate interest to me. One reason is that my incessant cruises and investigations throughout the world have shown me that wherever modern techniques penetrated, they were implemented by decisionmakers preoccupied with short-term profits, with no thought to the medium-, long-, or very-long-term consequences of enormous technological projects. Thus, the short-term ruled, catastrophically, for the environment.

The second reason that inspired my fight for future generations dates from astronaut Neil Armstrong's landing on the moon, an event which greatly accelerated the birth of a "planetary consciousness." That was twenty-six years ago. I swore I would consecrate my life to stopping the ignorance, the egoism, the greed, and the nearsightedness of decisionmakers, and the logical absurdities from damaging, soiling, ruining, and perhaps even destroying our extraordinary planet.

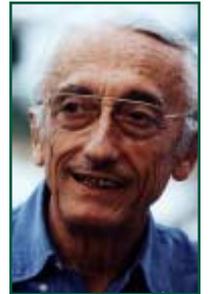
The Apollo mission awakened in humanity a global awareness. With it came an important warning: to ensure the very existence of humanity, civilization, and the marvels of biodiversity for which we are responsible, we must protect the future of those who will take over from us—the future generations.

After twenty years of an environmental mission, of utilizing the media, and of mobilizing a team of philosophers and scientists presided over by Dr. H. S. Thayer, we drafted a *Bill of Rights of Future Generations* in the hope that it will be endorsed by the United Nations General Assembly. It states:

*Article 1. Future generations have a right to an uncontaminated and undamaged Earth, and to its enjoyment as the ground of human history, of culture, and of social bonds that make each generation and individual a member of one human family.*

*Article 2. Each generation, sharing in the estate and heritage of the Earth, has a duty as trustee for future generations to prevent irreversible and irreparable harm to life on Earth and to human freedom and dignity.*

*Article 3. It is, therefore, the paramount responsibility of each generation to maintain a constantly vigilant and prudential assessment of technological disturbances and modifications adversely affecting life on Earth, the balance of nature, and the evolution of mankind, in order to protect the rights of future generations.*



Jacques-Yves Cousteau,  
Founder and Chairman,  
The Cousteau Society

*To ensure the very existence of humanity, civilization, and the marvels of biodiversity for which we are responsible, we must protect the future of those who will take over from us—the future generations.*

*Article 4. All appropriate measures, including education, research, and legislation, shall be taken to guarantee these rights and to ensure that they not be sacrificed for present expediencies and conveniences.*

*Article 5. Governments, non-governmental organizations, and individuals are urged, therefore, to imaginatively implement these principles as if in the very presence of those future generations whose rights we seek to establish and perpetuate.*

## **T H E P O P U L A T I O N T I M E B O M B**

We must urgently attend to our future. The fuse connected to a demographic explosion is already burning. We have less than ten years to put it out. We must reverse this trend and avoid the “population big bang.” Yet, there is a certain lack of clarity and purpose in tackling such a giant threat.

In the 1960s international scientists led by American geneticist Norman Borlaug succeeded in improving threefold the yield of basic crops—wheat, rice, and maize—a feat which led to harvests that were called the green revolution. This saved millions of people from famine in India, Pakistan, and China, and brought him the Nobel Peace Prize in 1970. In his acceptance speech, Mr. Borlaug suggested that we had only thirty years to harness the population explosion.

“Not only did they [world leaders] ignore the warning,” Mr. Borlaug told me a few years ago, “but they have never discussed, not even mentioned, the population explosion. Twenty-two years have passed and there may be only eight years left.” Mr. Borlaug was referring to the mischievous “law of silence” observed by all of the major politicians, and observed, as well, in discussions at the 1992 United Nations Conference on Environment and Development.

Developed countries acquire from poor countries, at very low prices, the raw materials needed to feed their industries. They sell at high prices to the same less-favored countries the products manufactured with these essential materials, which explains why the rich get richer and the poor communities get constantly poorer. In 1991, the balance of payments between the “haves” and the “have nots” reached \$20 billion transferred from the poor to the rich.

All of those inequalities are growing with the exponential population increase. Uncontrolled population growth aggravates all of the crucial problems of the environment: squandering, loss of biodiversity, climate change, exhaustion of the ozone layer, mediocrity of education, and pollution of air and water.

If we reach the forecasted 11 billion human beings, this population will be divided approximately into 2.5 billion fairly rich people busy getting richer and 8.5 billion outcasts, often starving and hopeless. There is no freedom in misery—no freedom to use choice, no freedom to exercise rights, and no freedom to indulge a sense of responsibility. The result is easy to foresee: jealousy and famine produce anger, then violence, and then a fight for survival—an unimaginable genocide.

### W H A T   S H O U L D   W E   D O ?

Knowing that birth control must remain voluntary, that all authoritarian methods have to be rejected, that rich countries will never make the necessary sacrifices, what should we do?

The first act is to provide drinking water to everyone on Earth. There are 1.3 billion people with no access to potable water. The result is appalling and is connected to overpopulation. The young girls of the family are sent to bring back buckets of potable water—sometimes ten miles away from their home—instead of going to school. Today almost 35 percent of young girls in developing countries do not go to school, while their brothers do. The cost of making clean water available to all has been estimated at \$100 billion over five years, which means that, just for potable water, we need \$20 billion a year.

The second act, if we do succeed in sending girls to school, is to build new schools because there are not enough, and to pay for teachers, books, pens, and paper. This is estimated at \$200 billion over five years, which means \$40 billion a year.

Finally, one of the main reasons for overpopulation is that, in developing countries, especially the smaller ones, not only is there no social security, but there are also no pension plans. Parents want many children to ensure their old age. Girls do not count, so in order to have three boys they must have six children, and hope that one of the three boys will be nice enough to take care of their aging parents. Creating a pension for aged people in all developing countries would cost \$200 billion for the first year and grow year after year to \$300 billion. If you add a little percentage for waste, the total cost would amount to at least \$400 billion a year.

Today we are very far from the 0.7 percent of Gross National Product for the environment and development asked for at the Rio Conference. We must realize that, if we want to be efficient and get some results, that is the kind of money we have to find. Where can we find these formidable amounts of money? There are only two reasonable ways: from military expenditures or from the drug trade. The

*We have seen that almost all of our social evils, famines, shocking differences between rich and poor communities, desertification, decreases of biodiversity, increases in the number of hereditary taints, and even the warming of our planet, originate in the population explosion.*

amount of money that the military spends every year worldwide is about \$1 trillion. One-third of that would practically solve our problem. Drug commerce reaches between \$300 billion and \$500 billion a year.

### Refusing the “Law of the Jungle”

We have seen that almost all of our social evils, famines, shocking differences between rich and poor communities, desertification, decreases of biodiversity, increases in the number of hereditary taints, and even the warming of our planet, originate in the population explosion. That explosion is due to the fact that our new set of antinatural values—generosity, solidarity, and pride in our first medical victories over traditional evils—had been enthusiastically applied long before we developed their logical counterpart, birth control.

Our lack of synchronism between part and counterpart shows that we have been very slow to understand that our revolutionary new course, replacing harsh natural rules with our own ideals of equality, fraternity, and justice, implied new duties and perils. From victims of nature, we became relentless protectors of nature. By refusing for ourselves the “Law of the Jungle,” we committed ourselves to making sure that the natural vegetal and animal kingdoms around us would still benefit from the very “Law of the Jungle” they cannot survive without.

Our recent divorce from nature is irreversible. For modern man the overwhelming burden is to invent a behavior that is at the same time acceptable biologically and satisfying for our moral ambitions. If we want our precarious endeavors to succeed, we must convince all human beings to participate in our adventure, and we must urgently find solutions to curb the population explosion that has a direct influence on the impoverishment of the less favored communities. Otherwise, generalized resentment will beget hatred and violence.

Our rejection of the “Law of the Jungle” came from our minds, not from our genes. The moral laws and principles that we have invented, preferred, and adopted will take a long time to conquer our genetic heritage. We realize now that the subtle trail of our original wildcat nature has been saved, has grown, and has finally blossomed in the liberal economy. This liberal economy is by far the most efficient system, as evidenced by the collapse of communism.

However, once the East-West competition is over, a closer look leads to unanswered problems. Efficiency? What for? To boost the wealth of the rich fifth and sacrifice the poor four-fifths of humankind? Efficiency to favor the currency specula-

tors? Efficiency to increase unemployment, to create millions of poor and homeless in the richest countries? To waste resources here that are lacking elsewhere? Efficiency to provide youngsters with only one moral ideal: to get rich? As long as the free market economy will not be far more severely controlled and submitted to our new set of moral values, it will be as cruel, as unjust, and will kill as often as the “Law of the Jungle.”

### M e e t i n g   t h e   C h a l l e n g e

The world can no longer survive without the help and total commitment of all of us. Isolationism is unacceptable. Scientists are absolutely vital to translate highly technical issues to all those who will choose decisionmakers. Citizens of the world must understand the consequences of, and the alternatives for, every course of action. Factual knowledge is insufficient by itself. There are moral and ethical issues which cannot be ignored. The success of the Rio revolution is in our hands. We are millions of human beings, inspired by the Rio spirit and ready to serve as apostles to improve the habitability of Earth.

Threatened as we are by the imminence of disasters caused by uncontrolled and accelerated population growth, education has become our last recourse, especially the education of women and girls. Can we meet this formidable challenge? Is it feasible to train children from all origins without severely harming the precious diversity of cultures all over the world?

Today 800 million children lack adequate education, or even any kind of education. To provide one pencil to all those kids would cost \$6 million. To provide one very cheap schoolbook to each would cost \$200 million. The schools themselves must be built, and there are not enough teachers. Electronic devices are out of the question. If the affluent communities were to decide to make the enormous sacrifices necessary, we would also be obliged to face the fact that the population explosion would in thirty years bring the number of children needing help from 600 million to 1.2 billion! Let us not forget that what is at stake is who will win the race between an orderly human community or chaos. We can only win if we have the courage to face such realities without flinching.

To contribute to this indispensable endeavor the Cousteau Society is dedicated to the following program:

- to have the *Bill of Rights of Future Generations* approved by the United Nations General Assembly;

- to create Cousteau schools in Russia, Romania, Germany, France, and South America, where young people can be involved in the physical and social environment in which they will live;
- to distribute our magazine for young people, *Cousteau Junior*, in Europe, North and South America, Japan, and Korea;
- to continue inviting television audiences throughout the world to understand the ecosociological climates in which diverse populations live through our *Rediscovery of the World* series;
- to develop a new ecology that will study the underlying causes of pollution and destruction, to seek the disease, not just treat the symptoms; and
- to create an academic network to teach *Ecotechnie* so that the decisionmakers of tomorrow will know how to consider the consequences of their decisions, not just in the short-term, but in the medium-, long-, and very-long-term.

Finally, we are introducing a new program, “The Human Voice.” Africa, the continent of oral tradition, of memory, and of wisdom, has things to say to future generations. We know the influences of African tradition on twentieth-century art, from jazz to Picasso. Even beyond borders, African musicians bring a great deal to the “world music” that today is spread by young people everywhere. We want to give voice to Africa, to its history, its heritage, its creations, its hopes, and the hopes of future generations. 



## Reflections on Partnerships

I have talked with our people here at the Bank to see how it is that we can make better use of the remarkable achievements of this remarkable organization, because for us, the CGIAR's work is absolutely pivotal. It is remarkable in many ways. It is remarkable because it is perhaps the most successful partnership in the history of development.

—James D. Wolfensohn, World Bank Group President,  
at the celebration of the CGIAR's twenty-fifth anniversary, ICW96

Agricultural research, if it is to be relevant and realistic, must be built in collaboration with farmers and farmer organizations. In addition to such farmer-scientist partnership, there must be public sector-private sector partnership, so that all available assets are tapped in a united effort to generate public goods of benefit to the poorest. There also must be partnership between national and international agencies, rich and poor countries, and formal and informal sector institutions of civil society.

—Ismail Serageldin, CGIAR Chairman,  
at the Global Forum on Agricultural Research, ICW96

As the CGIAR system moves toward a partnership mode in a world of interdependence, where no one is too poor to give and no one too rich to receive, we also begin to recognize that, even in an era of globalism, individuals do make a difference.

—Gelia Castillo, Professor Emeritus, University of the Philippines  
at Los Baños, and the first woman Chair of a CGIAR center,  
at the celebration of the CGIAR's twenty-fifth anniversary, ICW96

Sustainable agriculture is feasible at the local and community levels when people and institutions cooperate. But for these experiences to become the norm rather than the exception, they need to be supported by a conducive national policy environment and by international development agencies.

—Maurice F. Strong, delivering the  
1997 Sir John Crawford Memorial Lecture at ICW96

Africa's problems must be solved by scientific solutions which have been applied with success in other continents. The greatest need is to build partnerships. Partnerships must be forged at all levels—at the local level within countries; among NARS of individual countries coming together to form subregional research organizations and eventually regional research organizations; and, with CGIAR centers, advanced research institutions, public sector research institutions, and other international organizations. Existing partnerships must be strengthened first, and then broadened.

—Joseph Mukiibi, Chairman of the Association for Strengthening  
Agricultural Research in East and Central Africa,  
at the Global Forum on Agricultural Research, ICW96

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*front:* SOIL MOISTURE  
TESTING IN SRI LANKA.  
(IIMI)



*back:* ANHER  
CULTURE, USED BY  
WARDA IN THE WIDE  
CROSSING OF AFRICAN  
AND ASIAN RICE SPECIES  
TO DEVELOP PROMISING  
NEW RICE VARIETIES.  
(WARDA)



[Names listed are as of date of publication.]

## **CGIAR Chairman**

Ismail Serageldin

Vice President, Environmentally and Socially Sustainable Development  
World Bank

## **Cosponsors and Their Representatives<sup>1</sup>**

Food and Agriculture Organization of the United Nations  
United Nations Development Programme  
United Nations Environment Programme  
World Bank

Henri Carsalade  
Roberto Lenton  
Franklin G. Cardy  
Michel Petit

## **CGIAR Executive Secretary**

Alexander von der Osten

## Standing Committees<sup>2</sup>

### **Finance Committee<sup>3</sup>**

World Bank, Chair  
Australia  
Canada  
Egypt  
European Commission

Germany  
IFAD  
India  
Japan  
Sweden

### **Oversight Committee<sup>4</sup>**

Andrew Bennett, Chair (United Kingdom)  
Fernando Chaparro, Vice Chair (Colombia)  
Mervat Badawi (Arab Fund)

William Dar (The Philippines)  
Teresa Fogelberg (The Netherlands)  
John Van Dusen Lewis (United States)

## Advisory Committees

### **TAC Chair**

Donald Winkelmann

### **TAC Executive Secretary**

Shelleemiah Keya

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<sup>1</sup> Departing as cosponsor representatives in 1996 were: Timothy Rothermel for UNDP, and Jaime Hurtubia and Carlos Zurberti for UNEP.

<sup>2</sup> Standing Committees consist solely of members of the CGIAR.

<sup>3</sup> Finance Committee members the Netherlands and the United Kingdom were replaced at ICW96.

<sup>4</sup> Paul Egger (Switzerland), Robert Herdt (Rockefeller Foundation), Johan Holmberg (Sweden), Manuel Lantin (The Philippines), and Cyrus Ndiritu (Kenya) departed the Oversight Committee in 1996.

### **TAC Members<sup>5</sup>**

Jacques Faye  
Richard Harwood  
Ted Henzell  
Keiji Kainuma  
Justin Lin  
Magdy A. Madkour

Cyrus G. Ndiritu  
C. Hanumantha Rao  
Sir Ralph Riley  
P. M. Tigerstedt  
Lucia de Vaccaro  
Maria José de Oliveira Zimmermann

### **Genetic Resources Policy Committee**

M. S. Swaminathan, Chair  
Bo Bengtsson  
Jurg Benz  
Robert Bertram  
Adel El-Beltagy

Geoffrey C. Hawtin  
Norah Olembo  
Setijati Sastrapradja  
Maria Jose de Oliveira Zimmermann

### **Impact Assessment and Evaluation Group<sup>6</sup>**

W. James Peacock, Chair  
Eugenia Muchnik de Rubinstein  
Tim Healy (Operations Manager)

## **Partnership Committees**

### **NGO Committee<sup>7</sup>**

Miguel A. Altieri, Chair  
Kamla Chowdhry  
Bernd V. Dreesmann  
Yolanda Kakabadse  
Jeffrey A. McNeely

Jeanot Minila Mfou'ou  
Carlos A. Perez  
Didier Pillot  
Ranil Senanayake

### **Private Sector Committee**

Andreas Buchting, Co-Chair  
Alejandro Rodriguez Graue, Co-Chair  
Prמוד K. Agrawal  
Assia Bensalah Alaoui  
Carol Amaratunga  
Bernard P. Auxenfans

R. N. Sam Dryden  
Mohamed Adel El Ghandour  
Mohamad Hasan  
Dinguri Nick Mwaniki  
John M. Preston

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<sup>5</sup> Andre Berkaloff, E.A. Huismann, Richard Sylvester Musangi, and Ammar Siamwalla departed TAC on March 31, 1997.

<sup>6</sup> Eleanor Chelimsky departed the IAEG in 1996.

<sup>7</sup> Robert Blake and Alicia Barcena departed the NGO Committee in 1996.

## CGIAR Members

### Countries

Australia	Egypt	Kenya	Russian Federation
Austria	Finland	Korea	South Africa
Bangladesh	France	Luxembourg	Spain
Belgium	Germany	Mexico	Sweden
Brazil	India	The Netherlands	Switzerland
Canada	Indonesia	Nigeria	Syria
China	Iran	Norway	United Kingdom
Colombia	Ireland	Pakistan	United States of America
Côte d'Ivoire	Italy	The Philippines	
Denmark	Japan	Romania	

### Foundations

Ford Foundation  
Kellogg Foundation  
Rockefeller Foundation

### International and Regional Organizations

African Development Bank  
Arab Fund for Economic and Social Development  
Asian Development Bank  
European Commission  
Food and Agriculture Organization of the United Nations  
Inter-American Development Bank  
International Development Research Centre  
International Fund for Agricultural Development  
Opec Fund for International Development  
United Nations Development Programme  
United Nations Environment Programme  
World Bank

### Regional Representatives<sup>8</sup>

Africa	Burkina Faso and Zimbabwe
Asia and the Pacific	Malaysia and Nepal
Europe	Estonia and Slovenia
Latin America and the Caribbean	Paraguay and El Salvador
Middle East and North Africa	Egypt and Syria

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<sup>8</sup> Departing as Regional Representatives in 1996 were: Ghana for Africa; the Czech Republic for Europe; Chile for Latin America and the Caribbean; and Iran for the Middle East and North Africa.

**CGIAR Chairmen, 1971-1996**

Ismail Serageldin	1994-
V. Rajagopalan	1991-1993
Wilfried Thalwitz	1990-1991
W. David Hopper	1987-1990
S. Shahid Husain	1984-1987
Warren Baum	1974-1983
Richard H. Demuth	1971-1974

**CGIAR Executive Secretaries,  
1972-1996**

Alexander von der Osten	1989-
Curtis Farrar	1982-1989
Michael Lejeune	1975-1982
Harold Graves	1972-1975

**TAC Chairs, 1971-1996**

Donald Winkelmann	1994-
Alex McCalla	1988-1994
Guy Camus	1982-1987
Ralph Cummings	1977-1982
Sir John Crawford	1971-1976

**TAC Executive Secretaries,  
1971-1996**

Shelleemiah Keya	1996-
Guido Gryseels <sup>9</sup>	1995-1996
John Monyo	1985-1994
Alexander von der Osten	1982-1985
Philippe Mahler	1976-1982
Peter Oram	1971-1976

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<sup>9</sup> Officer-in-Charge.

## CGIAR Centers

### Centro Internacional de Agricultura Tropical—CIAT



(International Center for Tropical Agriculture)

Headquarters: Cali, Colombia  
Board Chair: Robert Havener  
Director General: Grant Scobie  
Founded: 1967  
Joined the CGIAR: 1971

Focus: To contribute to the alleviation of hunger and poverty in tropical countries by applying science to the generation of technology that will lead to lasting increases in agricultural output while preserving the natural resource base. Research is conducted on germplasm development of beans, cassava, tropical forages, and rice for Latin America and on resource management in humid agroecosystems in tropical America, including hillsides, forest margins, and savannas.

### Center for International Forestry Research—CIFOR



Headquarters: Bogor, Indonesia  
Board Chair: Bo Bengtsson (until February 28, 1997)  
Gillian Shepherd (from March 1, 1997)  
Director General: Jeffrey Sayer  
Founded: 1992  
Joined the CGIAR: 1992

Focus: To contribute to the sustained well-being of people in developing countries, particularly in the tropics, through collaborative strategic and applied research in forest systems and forestry, and by promoting the transfer of appropriate new technologies and the adoption of new methods of social organization for national development.

### Centro Internacional de Mejoramiento de Maiz y Trigo—CIMMYT



(International Center for the Improvement of Maize and Wheat)  
Headquarters: Mexico City, Mexico  
Board Chair: Louisa van Vloten-Doting (until April 18, 1996)  
Walter Falcon (from April 19, 1996)  
Director General: Timothy Reeves  
Founded: 1966  
Joined the CGIAR: 1971

Focus: To help the poor by increasing the productivity of resources committed to maize and wheat in developing countries, while protecting the environment, through agricultural research and in concert with national research systems.

### **Centro Internacional de la Papa—CIP**



(International Potato Center)  
Headquarters: Lima, Peru  
Board Chair: Martha ter Kuile  
Director General: Hubert Zandstra  
Founded: 1971  
Joined the CGIAR: 1973

Focus: To contribute to increased food production, the generation of sustainable and environmentally sensitive agricultural systems, and improved human welfare by conducting coordinated, multidisciplinary research programs on potato and sweet potato, by carrying out worldwide collaborative research and training, by catalyzing collaboration among countries in solving common problems, and by helping scientists worldwide to respond flexibly and successfully to changing demands in agriculture.

### **International Center for Agricultural Research in the Dry Areas—ICARDA**



Headquarters: Aleppo, Syria  
Board Chair: Alfred Bronnimann  
Director General: Adel El-Beltagy  
Founded: 1977  
Joined the CGIAR: 1978

Focus: To meet the challenge posed by a harsh, stressful, and variable environment in which the productivity of winter rainfed agricultural systems must be increased to higher sustainable levels, in which soil degradation must be arrested and possibly reversed, and in which water use efficiency and the quality of the fragile environment need to be ensured. ICARDA has a world responsibility for the improvement of barley, lentils, and faba bean, and a regional responsibility in West Asia and North Africa for the improvement of wheat, chickpea, forages, and pasture. ICARDA emphasizes rangeland improvement, small ruminant management and nutrition, and rainfed farming systems associated with these crops.

### **International Center for Living Aquatic Resources Management—ICLARM**



Headquarters: Metro Manila, The Philippines  
Board Chair: John L. Dillon (until January 25, 1997)  
Kurt J. Peters (from January 26, 1997)  
Director General: Meryl J. Williams  
Founded: 1977  
Joined the CGIAR: 1992

Focus: To improve the production and management of aquatic resources, for sustainable benefits to present and future generations of low-income producers

and consumers in developing countries, through international multidisciplinary research in partnership with national agricultural research systems. The declining state and threatened sustainability of fisheries due to overfishing exacerbated with poverty and pollution, and the potential for increases in aquaculture production, call for research which includes understanding of the dynamics of coastal and coral reef resource systems and of integrated agriculture–aquaculture systems, investigating alternative management schemes in these systems, and improving the productivity of key species.

### **International Centre for Research in Agroforestry—ICRAF**



Headquarters: Nairobi, Kenya  
 Board Chair: David B. Thorud (until April 11, 1997)  
 Yemi M. Katerere (from April 12, 1997)  
 Director General: Pedro A. Sanchez  
 Founded: 1977  
 Joined the CGIAR: 1991

Focus: To mitigate tropical deforestation, land depletion, and rural poverty through improved agroforestry systems. Trees in farming systems can increase and diversify farmer income, make farming systems more robust, reverse land degradation, and reduce the pressure on natural forests. ICRAF carries out research with national agricultural and forestry research systems, non-governmental organizations, and other research partners, and is focused on two major thrusts: finding alternatives to slash and burn agriculture in the humid tropics; and, overcoming land depletion in subhumid and semi-arid Africa.

### **International Crops Research Institute for the Semi-Arid Tropics—ICRISAT**



Headquarters: Patancheru, Andhra Pradesh, India  
 Board Chair: Eric H. Roberts (until March 31, 1996)  
 Hans-Jorgen von Maydell (April 1, 1996-  
 March 9, 1997)  
 R. S. Paroda (from March 10, 1997)  
 Director General: James G. Ryan (until June 30, 1997)  
 Founded: 1972  
 Joined the CGIAR: 1972

Focus: To conduct research leading to enhanced sustainable food production in the harsh conditions of the semi-arid tropics. ICRISAT's main crops—sorghum, finger millet, pearl millet, chickpea, pigeonpea, and groundnut—are not generally known in the world's more favorable agricultural regions, but they are vital to life for the one-sixth of the world's population that lives in the semi-arid tropics. ICRISAT conducts research in partnership with the national agricultural systems that encompasses the management of the region's limited natural resources to increase the productivity, stability, and sustainability of these and other crops.

### **International Food Policy Research Institute—IFPRI**



Headquarters: Washington, DC, United States of America  
Board Chair: David Bell (until March 31, 1997)  
Martin Pineiro (from April 1, 1997)  
Director General: Per Pinstrup-Andersen  
Founded: 1975  
Joined the CGIAR: 1980

Focus: IFPRI was established to identify and analyze alternative national and international strategies and policies for meeting the food needs of the developing world on a sustainable basis, with particular emphasis on low-income countries and on the poorer groups in those countries. While IFPRI's research is specifically geared to contributing to the reduction of hunger and malnutrition, the factors involved are many and wide-ranging, requiring analysis of underlying processes and extending beyond a narrowly defined food sector. IFPRI collaborates with governments and private and public institutions worldwide interested in increasing food production and improving the equity of its distribution. Research results are disseminated to policymakers, administrators, policy analysts, researchers, and others concerned with national and international food and agricultural policy.

### **International Irrigation Management Institute—IIMI**



Headquarters: Colombo, Sri Lanka  
Board Chair: Les Swindale (until December 31, 1996)  
Zafar Altaf (from January 1, 1997)  
Director General: David Seckler  
Founded: 1984  
Joined the CGIAR: 1991

Focus: IIMI's mission is to foster improvement in the management of water resource systems and irrigated agriculture. IIMI conducts a worldwide program to generate knowledge to improve water resource systems and irrigation management, to strengthen national research capacity, and to support the introduction of improved technologies, policies, and management approaches.

### **International Institute of Tropical Agriculture—IITA**



Headquarters: Ibadan, Nigeria  
Board Chair: Pierre Dubreuil  
Director General: Lukas Brader  
Founded: 1967  
Joined the CGIAR: 1971

Focus: IITA conducts research and outreach activities, with partner programs in countries of Sub-Saharan Africa, to help those countries increase food production on an ecologically sustainable basis. IITA seeks to improve the food quality, plant health, and postharvest processing of its mandated crops—cassava, maize, cowpea, soybean, yam, and banana and plantain—while strengthening national research capabilities.

### **International Livestock Research Institute—ILRI**



Headquarters: Nairobi, Kenya  
Board Chair: Neville Clarke  
Director General: Hank Fitzhugh  
Founded: 1995  
Joined the CGIAR: 1995

Focus: To increase animal health, nutrition, and productivity (i.e., milk, meat, traction) by removing constraints to tropical livestock production, particularly among small-scale farmers; to protect environments supporting animal production against degradation by tailoring production systems and developing technologies that are sustainable over the long-term; to characterize and conserve the genetic diversity of indigenous tropical forage species and livestock breeds; and to promote equitable and sustainable national policies for the development of animal agriculture and the management of natural resources affected by animal production, encouraging, in particular, those policies that support strategies for reducing hunger and poverty, for improving food security, and for protecting the environment.

### **International Plant Genetic Resources Institute—IPGRI**



Headquarters: Rome, Italy  
Board Chair: Wanda Collins  
Director General: Geoffrey Hawtin  
Founded: 1974  
Joined the CGIAR: 1974

Focus: To encourage, support, and engage in activities to strengthen the conservation and use of plant genetic resources worldwide, with special emphasis on developing countries, by undertaking research and training and by providing scientific and technical information.

### **International Rice Research Institute—IRRI**



Headquarters: Manila, The Philippines  
Board Chair: Emil Javier (until April 11, 1996)  
Roelof “Rudy” Rabbinge (from April 12, 1996)  
Director General: George Rothschild  
Founded: 1960  
Joined the CGIAR: 1971

Focus: To improve the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes, by generating and disseminating rice-related knowledge and technology of short- and long-term environmental, social, and economic benefit and by helping to enhance national rice research.

### **International Service for National Agricultural Research—ISNAR**



Headquarters: The Hague, The Netherlands  
Board Chair: Charles Edward Hess (until December 5, 1996)  
Amir Muhammed (from December 6, 1996)  
Director General: Christian Bonte-Friedheim (until February 23, 1997)  
Stein Bie (from February 24, 1997)  
Founded: 1979  
Joined the CGIAR: 1980

Focus: To help developing countries bring about sustained improvements in the performance of their national agricultural research systems and organizations. ISNAR does this by supporting their efforts in institutional development, promoting appropriate policies and funding for agricultural research, developing or adapting improved research management techniques, and generating and disseminating relevant knowledge and information.

### **West Africa Rice Development Association—WARDA**



Headquarters: Bouaké, Côte d'Ivoire  
Board Chair: Just Faaland  
Director General: Eugene R. Terry (until November 30, 1996)  
Kanayo F. Nwanze (from December 1, 1996)  
Founded: 1970  
Joined the CGIAR: 1975

Focus: WARDA's work is aimed at strengthening the capability of agricultural scientists in West Africa for technology generation to increase the sustainable productivity of intensified rice-based cropping systems in a manner that improves the well-being of resource-poor farm families and that conserves and enhances the natural resource base. Research covers rice grown in mangrove swamps, inland valleys, upland conditions, and irrigated conditions.

# CGIAR CONTRIBUTIONS TO THE AGREED RESEARCH AGENDA BY MEMBER, 1972-1996

CGIAR Contributions to the Agreed Research Agenda by Member, 1972-1996 (in \$ million)

Country/Organization	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total		
<b>Industrial Countries</b>																												
Australia	0.0	1.0	1.2	1.7	1.8	2.6	2.7	3.0	3.3	3.3	3.8	4.1	4.0	4.2	4.5	2.9	3.1	3.7	3.8	3.2	4.4	4.2	4.8	4.8	5.6	6.5	80.7	
Austria	0.1	0.6	0.4	0.6	1.7	2.3	2.7	3.1	3.3	2.4	1.9	1.9	1.7	2.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	13.7
Belgium	1.2	1.8	4.7	4.3	5.4	6.8	7.4	7.5	6.9	7.5	8.3	9.9	10.0	9.7	10.7	11.8	13.8	14.4	15.4	15.7	17.6	15.8	15.3	2.5	3.6	4.9	5.8	60.3
Canada	0.3	0.2	0.4	0.4	0.5	0.8	0.8	1.0	1.2	1.1	1.0	1.0	1.2	1.1	1.7	2.3	2.5	2.6	3.4	3.4	4.9	4.8	7.3	10.0	16.2	71.9	246.3	
Denmark																												
European Comm.																												
Finland																												
France	0.1	0.4	0.5	0.4	0.5	0.4	0.3	0.7	0.9	0.8	0.9	1.0	0.9	1.2	2.1	3.2	3.3	3.6	4.1	4.1	4.9	3.2	3.9	4.7	4.7	4.7	50.0	
Germany	1.8	3.0	3.9	4.5	5.4	6.8	8.5	10.1	8.4	7.8	7.9	6.7	6.2	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Ireland																												
Italy	0.1	0.2	0.3	0.7	1.2	2.5	3.5	4.8	7.0	8.1	8.9	9.1	9.7	11.1	15.9	16.0	20.2	19.9	23.2	23.7	26.9	32.6	36.4	38.9	36.3	36.4	36.4	
Japan																												
Luxembourg																												
Netherlands	0.4	0.4	0.6	1.2	1.5	1.7	1.8	2.4	2.6	3.0	3.2	3.6	3.3	3.8	6.7	5.6	6.3	5.5	6.9	6.5	7.6	8.3	11.5	12.8	15.6	122.8	0.3	
New Zealand																												
Norway	0.8	0.2	0.4	0.8	1.1	1.5	1.9	2.0	2.0	1.9	1.9	2.2	1.9	2.3	3.1	3.2	3.9	4.1	4.7	4.7	5.8	4.7	5.4	6.1	6.1	6.1	72.7	
Russian Federation																												
Saudi Arabia																												
Spain																												
Sweden	1.0	0.2	1.5	2.3	2.3	2.2	2.7	3.1	3.4	3.3	3.2	3.1	3.1	3.0	3.0	4.2	4.9	5.4	5.5	6.2	6.1	8.6	6.2	7.3	8.5	105.6	1.1	
Switzerland	0.4	0.1	0.5	0.9	1.2	1.4	1.9	2.5	2.6	2.8	2.8	4.9	6.7	5.2	7.1	7.7	9.6	9.4	10.2	10.6	9.2	12.9	11.9	17.5	146.7	146.7	0.3	
United Kingdom	0.7	1.1	1.9	2.4	2.9	3.5	4.8	6.4	6.8	6.0	6.3	5.9	5.7	6.3	8.4	10.3	11.5	10.8	11.6	11.6	11.1	9.4	9.8	9.9	10.8	175.2	0.3	
USA	3.8	5.4	6.3	10.8	14.3	18.1	21.1	24.8	29.0	35.0	40.8	44.6	45.3	45.3	45.3	40.2	42.2	44.1	45.1	45.6	48.1	40.5	32.3	31.1	30.6	792.9	0.3	
Subtotal	8.2	12.3	21.2	29.6	40.2	51.6	60.0	72.8	84.0	89.4	97.6	112.7	114.4	115.8	139.9	146.9	156.8	165.7	176.3	176.5	185.7	173.8	185.5	191.5	218.6	2334.5		
<b>Developing Countries</b>																												
Brazil																												
China																												
Colombia																												
Cote d'Ivoire																												
Egypt																												
India																												
Indonesia																												
Iran																												
Kenya																												
Korea																												
Mexico																												
Nigeria																												
Philippines																												
Subtotal																												
<b>Foundations</b>																												
Ford Fdn.	5.3	3.7	3.0	2.8	2.0	1.6	1.0	1.0	1.3	1.3	0.8	1.3	1.0	0.9	0.9	0.9	0.8	0.8	0.9	1.2	1.8	2.3	3.1	2.5	3.4	45.6	0.0	
Kellogg Fdn.	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Kresge Fdn.	0.8																											
Leverhulme Trust																												
Rockefeller Fdn.	4.0	4.5	3.5	2.9	2.2	1.6	1.3	1.2	1.6	1.0	0.8	0.5	0.5	0.8	0.9	0.9	0.9	0.9	1.9	1.7	1.5	0.9	1.3	1.7	2.4	41.3	0.1	
Sasakawa Fdn.																												
Subtotal	10.2	8.5	6.8	6.0	4.5	3.5	2.6	2.2	3.4	2.9	2.3	3.2	2.6	2.3	2.5	1.8	1.7	2.7	2.7	2.1	3.2	3.1	4.6	4.2	6.2	95.8		
<b>International &amp; Regional Organizations</b>																												
ADB																												
AFDB																												
Arab Fund																												
GFC																												
IDB																												
IDRC	0.2	0.3	0.6	1.0	1.8	1.3	1.0	0.8	1.5	1.0	1.2	1.8	1.0	1.3	1.2	0.8	0.6	0.8	0.5	0.4	0.6	0.7	1.3	1.2	1.3	9.5	0.2	
IFAD																												
Opac Fund																												
Others																												
UNDP	0.9	1.0	1.5	2.2	1.9	3.5	4.4	4.0	4.6	5.2	6.2	6.9	8.1	7.5	8.4	8.7	9.0	7.5	6.3	6.6	6.9	7.3	9.5	8.4	6.1	142.4	0.7	
UNEP																												
World Bank	1.3	2.8	2.4	3.2	6.5	7.9	8.7	10.2	12.0	14.8	16.3	19.0	24.3	28.1	28.4	30.0	30.0	33.3	34.3	35.1	37.6	40.0	50.0	50.0	50.0	44.9	570.8	0.0
Subtotal	2.3	4.1	6.5	11.4	15.6	19.5	20.6	23.6	28.6	35.5	41.8	48.8	51.6															

# CGIAR CONTRIBUTIONS TO THE AGREED RESEARCH AGENDA BY CENTER, 1972-1996

CGIAR Contributions to the Agreed Research Agenda by Center, 1972-1996<sup>1</sup> (in \$ million)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
CIAT	4.3	6.1	5.5	6.0	6.3	9.5	11.7	13.4	15.0	16.2	18.6	21.7	23.5	21.2	22.0	24.1	24.4	28.4	27.7	27.9	26.9	25.3	28.9	26.8	31.0	441.3
CIFOR																					3.2	5.1	5.8	7.7	8.7	21.8
CIMMYT	5.0	6.3	6.1	7.6	8.7	10.1	12.7	14.9	16.6	18.4	18.3	17.5	20.7	19.4	21.3	23.3	25.9	27.9	27.1	26.6	26.1	23.1	27.2	26.4	27.4	437.2
CIP	0.5	1.3	2.2	2.7	4.1	5.6	5.4	7.1	7.7	9.0	9.6	10.1	9.7	10.2	13.3	12.8	17.8	18.6	16.9	17.1	15.3	14.7	18.8	19.9	22.7	250.5
ICARDA					1.5	4.6	7.5	10.1	11.8	13.1	15.0	19.7	21.0	17.8	18.0	18.3	17.3	18.4	18.7	19.5	17.9	16.2	18.3	18.7	21.1	303.4
ICLARM																					4.5	3.8	4.8	7.6	10.0	20.7
ICRAF																					11.1	11.2	15.5	16.2	17.4	53.9
ICRISAT	0.3	2.7	3.8	6.1	6.8	9.8	12.6	11.8	12.3	13.0	15.9	21.0	21.0	20.3	25.0	26.2	26.0	30.1	31.5	29.4	27.3	26.0	27.6	26.0	27.4	432.6
IFPRI				0.3	0.8	1.2	1.6	1.9	2.5	2.8	3.1	3.8	4.3	4.4	4.9	6.0	8.7	8.8	9.1	8.9	8.3	8.1	9.3	9.7	16.0	108.2
IIMI																					6.4	6.1	7.3	7.2	9.0	27.0
IITA	6.4	6.1	6.7	8.5	9.4	10.7	14.9	15.7	15.5	15.5	18.8	19.9	20.9	20.4	21.1	19.9	21.1	22.0	22.5	22.4	21.7	20.8	24.1	22.2	22.4	407.5
ILRI			1.0	3.7	8.9	11.9	15.2	16.2	18.9	18.5	16.9	19.8	21.9	22.5	25.8	25.7	29.1	33.7	33.8	32.9	28.4	22.2	25.0	24.3	24.8	456.4
IPGRI				0.5	0.9	1.3	1.7	2.4	3.0	3.0	3.6	3.6	4.0	4.2	5.1	5.5	5.9	7.1	7.0	8.1	10.8	10.4	14.0	12.6	16.4	114.7
IRRI	3.0	3.1	6.0	8.5	9.7	12.0	12.4	13.8	15.9	17.2	19.5	20.2	19.7	21.0	24.2	24.9	26.5	26.6	29.8	29.8	28.6	26.3	28.2	27.2	28.7	453.9
ISNAR									1.1	2.2	2.3	3.0	3.3	3.7	4.5	5.5	6.8	7.5	7.0	7.6	7.0	6.1	6.4	6.4	10.7	80.4
WARDA			0.5	0.6	0.8	1.3	1.9	1.8	2.5	2.0	2.2	2.8	2.0	2.5	3.1	4.2	5.4	6.1	6.2	6.7	5.6	5.4	6.7	8.1	8.6	78.3
Subtotal <sup>1</sup>	19.5	25.7	31.7	44.4	58.0	77.9	97.6	109.1	122.8	130.9	143.9	163.0	172.0	167.6	188.4	196.3	214.9	235.2	237.4	236.7	249.2	230.6	268.1	267.1	302.1	3,688.0
Stabilization Fund												1.7	1.0	2.6	3.8	5.3	-3.4	-10.7	-2.5	-4.7	-1.9	4.1		2.5	0.7	-2.3
Total	19.5	25.7	31.7	44.4	58.0	77.9	97.6	109.1	122.8	130.9	143.9	164.7	173.0	170.2	192.2	201.6	211.5	224.5	234.9	232.0	247.3	234.7	268.1	269.6	302.8	3,685.8

<sup>1</sup> Figures shown for 1972-1980 are total expenditures (operations/capital) and may be higher or lower than the contributions for that year (due to the accounting convention followed in the seventies).

<sup>2</sup> Formerly ILCA and ILRAD.

<sup>3</sup> Formerly IBPGR and INIBAP.



*While none of us can feel confident in predicting the future, all of us must prepare for it. Despite the daunting nature of the challenges which confront us in meeting the world's food needs in the twenty-first century, I remain an optimist. Pessimism, of course, would be self-fulfilling and counterproductive. But to succeed we must accelerate the transition to sustainable agriculture. It will require a degree of common purpose and cooperation among nations, institutes, and people, beyond anything we have yet achieved.*

—Maurice F. Strong, delivering the Sir John Crawford Memorial Lecture at the celebration of the twenty-fifth anniversary of the CGIAR, International Centers Week, October 28, 1996, Washington, DC.

 **front:** CATTLE IN ETHIOPIA. LIVESTOCK RESEARCH HELPS TO PRESERVE ANIMAL DIVERSITY FOR FUTURE GENETIC IMPROVEMENT. (ILRI)

**back:** SELF-SUFFICIENCY IN WHEAT IN SUDAN IS NOW OVER 60 PERCENT, DUE TO IMPROVED VARIETIES, APPROPRIATE AGRONOMIC PRACTICES, AND ENCOURAGING GOVERNMENT POLICIES. (ICARDA)