



DINTER 0008

Document No: ICW/98/06
Distribution: General
Date: September 30, 1998

**International Centers Week 1998
October 26 - 30
Washington D.C.**

Shaping the CGIAR's Future

CGIAR System Review Report

99302

Attached is the report prepared by the CGIAR System Review Panel, together with the transmittal letter from the CGIAR Chairman to CGIAR Members. This report will be discussed under agenda item 2, *CGIAR System Review*.



September 29, 1998

Dear Colleagues:

Attached is a copy of the report of the third CGIAR system review. I extend our collective gratitude and appreciation to panel chairman Maurice Strong, his distinguished colleagues and associates, for committing their time to this effort and for sharing their wisdom with us. Our formal thanks will be recorded at International Centers Week (ICW98).

I want to thank, as well, all those in the system and outside it who in one way or another supported the work of the system review, and members of the stakeholder group that informally previewed a draft of the report in Washington. Discussion of the report and decisions on its implementation are the responsibility of the system as a whole.

The challenge and opportunity to shape the system's future is ours. Let us devote as much time and effort as we need at ICW98 to confront the challenge, and grasp the opportunity. What is at stake is not only the future of the CGIAR but the destiny of millions who most need the impact of science on their lives.

We can be justifiably proud that the system review report fully endorses what the CGIAR has achieved in the past and confident that it has much to offer and achieve in the future. As the reports puts it: "There can be no long-term agenda for eradicating poverty, ending hunger, and ensuring sustainable food security without the CGIAR. "

But if the best is yet to be, we need to follow the system review panel's exhortation that we should strive for progress and relevance by "building on past strengths and grappling with past weaknesses." To help us do that, the panel has presented us with twenty-nine carefully crafted recommendations. Many ideas – some of them complex, some of them likely to be controversial -- are offered for discussion and implementation.

These are not cold, formalized prescriptions. They are a call for a global effort to champion the poor and champion the environment; a call, as Maurice Strong has said, that is underpinned by a compelling moral and ethical imperative. They are consistent with our defining commitment to mobilize the best in science to serve the needs of the poor.

The system review report challenges us to be nimble and decisive as we seek to reach closure on such profoundly crucial matters as our mission, our science, our recommitment to the production of public goods, our participation in the scientific and information revolutions taking place all around us, our partnerships, the universality of our membership, the way we do business, and our funding.

Let us approach all these issues in the CGIAR spirit that encourages full discussion, respect for differing viewpoints and, most of all, concern for those whose lives will be touched by what we decide.

So I suggest that we should all review the system review report carefully and thoughtfully, so that at ICW98 we can assess each recommendation in relation to the single question: What is best for those whose future we are pledged to nurture? With that approach we can be confident of bringing to our implementation of the report the same sense of commitment inherent in the report itself.

With best wishes for a successful ICW98.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ismail Serageldin', written in a cursive style.

Ismail Serageldin
Chairman



CGIAR SYSTEM REVIEW SECRETARIAT

Mr. Ismail Serageldin
Chairman, CGIAR
The World Bank
Washington DC
Date 30th September 1998

Dear Ismail:

Third System Review of the CGIAR

On behalf of the CGIAR System Review Panel, I am pleased to transmit to you the report of the third system review of the CGIAR. In doing so, my fellow panel members and I wish to thank you and your colleagues for the trust and confidence you placed in us when you asked us to review the working of the CGIAR and recommend measures by which the system could position itself for the 21st century.

We consulted widely, and benefited greatly from the invaluable insights and support of numerous people and institutions both within and outside the CGIAR, the dedicated resource persons representing a range of perspectives who constituted our sub-panels, and the indefatigable system review secretariat. We are most grateful to all of them.

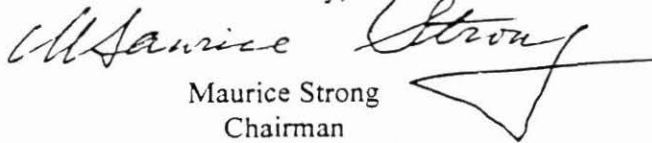
Today, the interlocked problems of poverty, food insecurity, and environmental degradation challenge international development community to mount a major global effort to combat them. Agricultural research is a crucial component of this effort because transformed and sustainable agriculture is the first step on the ascent from poverty for most of the world's poor countries.

The role of the CGIAR in a global effort is to achieve a more secure and sustainable future for the poor of the world. There can be no long term agenda for eradicating poverty, ending hunger, and ensuring sustainable food security without the CGIAR. No other organization has the credibility to undertake the multiple tasks of scientific research, international negotiation, resource mobilization, and constituency building that are required. We are confident that our recommendations will enable the CGIAR to carry out this role effectively. Our recommendations call for decisions and priority action in a number of areas including science and strategy, knowledge sharing, governance, funding, and public awareness.

We will be available at International Centers Week to help CGIAR members in their consideration of our report, and in developing a program of implementation. Beyond that, we will continue to support the CGIAR as you seek to ensure that the best in science serves the needs of the weakest and most vulnerable in the human family.

With best regards,

Sincerely,



Maurice Strong
Chairman
CGIAR System Review

The International Research Partnership for Food Security and Sustainable Agriculture

Third System Review of the Consultative Group on International Agricultural Research (CGIAR)

September 30, 1998

CGIAR SYSTEM REVIEW SECRETARIAT

ACKNOWLEDGMENTS

This report of the Third Review of the CGIAR System is the product of an extensive and broadly inclusive process. We sought and received counsel from those with the most extensive experience in and knowledge of the System. The heads of the four co-sponsoring agencies, despite their own heavy schedules, gave us generously of their time and their insights. So did the heads of private foundations, Center Directors and Center Board Chairs, Members of the CGIAR System and CGIAR partners in North and South.

We have reached out as widely as possible to CGIAR stakeholders and other relevant parties throughout the Review process. Several of the Panel's meetings were held at CGIAR Centers, where extensive interaction with research and management staff as well as National Agricultural Research Institutes, non-governmental organizations, private sector firms, farmers and regional and local organizations took place. We believe that this process has provided us with the opportunity to receive and consider the views and concerns of a widely representative cross-section of the CGIAR stakeholders.

We benefited greatly from the experience and knowledge of our sub-panels members: Graham Blight, Mayra Buvinic, Gelia Castillo, Bernard Chevassus-Au-Louis, Mohamed El-Ashry, Jacqueline McGlade, Pat Mooney, Antonio Quizon, Francisco Salamini, Jozef Schell, and Ren Wang.

And we were helped immeasurably by the system review secretariat: Mahendra M. Shah (Executive Secretary), Bo Bengtsson, Michel Griffon, Vo-Tong Xuan, Karin Perkins and Barbara Shear. We thank them all, and we emphasize that the Review Panel is solely responsible for the contents of this report, including its recommendations.

Our recommendations are designed to ensure that cutting edge agricultural science serves the entire human family: the poor will not be excluded, the hungry will not be ignored, the environment will not be assailed, and ethical considerations will not be subverted. For these goals to be reached, the CGIAR must serve as both catalyst and participant in a global mobilization. We are convinced that the CGIAR has the expertise, the capacity, and the will to function effectively in these roles.



Maurice Strong, Chairman
Bruce Alberts
Kenzo Hemmi
Klaus Leisinger
Yolanda Kakabadse
Whitney Macmillan
Bongiwe Njobe-Mbuli
Emil Salim
M.S. Swaminathan

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

EXECUTIVE SUMMARY

RECOMMENDATIONS

1.	INTRODUCTION	1
2.	THE CONTEXT AND MISSION OF THE CGIAR	4
2.1	Food Security Remains a Pressing Concern	4
2.2	The Revolution in Science and Technology	5
2.2.1	The gene revolution	5
2.2.2	The information technology revolution	6
2.3	Management Sciences	6
2.4	Poverty, Food Insecurity and Environment	7
2.5	Global Environmental Problems	8
2.6	Globalization of Trade and Economy	8
2.7	Donor Commitment and Support	9
2.8	A Paradigm Shift for the CGIAR	10
3.	CGIAR STRENGTHS, WEAKNESSES AND GOALS	12
3.1	Building on Strengths	12
3.2	Overcoming Weaknesses	13
3.3	Goals for the CGIAR	14
3.4	Conclusion	14
4.	RESEARCH PRIORITIES AND STRATEGIES	17
4.1	Cultivating Strategic Advantages	17
4.2	The Subsidiarity Criterion	17
4.3	Generating More Synergy from the CGIAR as a System	17
5.	INTEGRATED GENE MANAGEMENT	19
5.1	A Review of the New Science	19
5.1.1	A renewed approach to selective breeding	19
5.1.2	A more sensitive assessment of environmental and social impacts	20
5.1.3	Providing a functional basis for a new agronomy	20
5.2	Genetic resource conservation	20
5.3	Convention on Biological Diversity and Farmers' Rights	21
5.4	Intellectual Property Rights	22
5.5	An Integrated Gene Management Initiative	24
5.6	The Need for a Larger, System-wide Effort	25
5.7	Shifting System Resources to Address New Priorities	26

6.	INTEGRATED NATURAL RESOURCE MANAGEMENT	28
6.1	Needed Research Approaches	29
6.2	Linking Local to Global Management of Environmental Problems	30
6.3	Current CGIAR Efforts on NRM	31
6.4	Formation of a Network	33
7.	A GLOBAL KNOWLEDGE SYSTEM FOR FOOD SECURITY	35
7.1	Providing Scientific and Technical Databases Free to the Developing World	35
7.2	Special Websites Focused on Communicating with the Developing World	36
7.3	A Geographic Index of Projects to Coordinate Agricultural Research and Development	37
8.	POLICY RESEARCH	38
9.	STRENGTHENING NARS: CAPACITY BUILDING	42
9.1	A Continuing Emphasis on Proven Capacity Building Programs	42
9.2	New Capacity Building Efforts that Need More Emphasis	44
9.3	Production of Web-based Education and Training	45
10.	ERADICATION OF POVERTY, WITH A SPECIAL FOCUS ON WOMEN	47
11.	A PRIORITY FOR SUB-SAHARAN AFRICA	49
12.	PARTNERSHIPS AND NETWORKING	54
12.1	National Agricultural Research Systems	54
12.2	Advanced Research Institutions	55
12.3	Science Academies	56
12.4	The Private Sector	56
12.5	Producers' Organizations	57
12.6	Indigenous and Other Local Communities	57
12.7	NGOs	58
12.8	Media	58
12.9	Conclusion	58
13.	CONSOLIDATION OF CENTERS/CENTER ACTIVITIES	60
14.	GOVERNANCE: OVERALL ASSESSMENT	61
14.1	Introduction and Purpose	61
14.2	Principles and Criteria of Governance	62
14.3	Appropriateness of Current Key Principles	62
14.3.1	Consensus decision-making	65
14.3.2	Non-political character	65
14.3.3	Informal character	66
14.4	Determining Vision, Strategy, Priorities, and Resource Allocation	66
14.5	Monitoring, Evaluation, Review, and Impact Assessment	67
14.5.1	Current strengths	67
14.5.2	Current weaknesses	68

14.5.3 Conclusion	69
15. FUTURE GOVERNANCE	72
15.1 Proposed Formal Organization	72
15.2 Proposed Model of Governance	73
15.3 Members of the CGIAR	75
15.4 CGIAR Chair	76
15.5 Committees	76
15.6 Co-sponsors	79
15.7 Global Forum on Agricultural Research	80
15.8 CGIAR Meetings	81
15.9 Secretariat	82
15.10 Conclusions	82
16. CENTER-LEVEL GOVERNANCE	84
16.1 Linking CGIAR and Center Governance	84
16.2 Role and Performance of Center Boards	85
16.3 Governance of Eco-regional and Inter-Center Initiatives	86
17. FINANCING THE SYSTEM	89
17.1 Financial Outlook	89
17.2 Potential for Private-sector Finance	91
17.3 Financing Issues	92
17.3.1 Predictability of funding	92
17.3.2 Modality of funding	93
17.3.3 Stability of funding	94
17.3.4 Disbursement practices	95
18.4 Financial Planning and Management at the System and Center Levels	95
18.5 Role of the World Bank	96
ANNEX I: OVERVIEW OF CGIAR COMMITTEES	98
ANNEX II: BRIEF ANALYSIS OF THE EFFECTIVENESS OF CGIAR COMMITTEES AND SOME ASPECTS OF GOVERNANCE	102
ANNEX III: SOME STATISTICAL NOTES ON CGIAR MEETINGS	106
ANNEX IV: SOME FEATURES OF RECENT FUNDING OF THE CGIAR	107

ACRONYMS AND ABBREVIATIONS

ARI	advanced research institute
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AVRDC	Asian Vegetable Research and Development Center
CBC	Committee of Board Chairs
CBD	Convention on Biological Diversity
CCER	Center-Commissioned External Review
CDC	Center Directors' Committee
CEO	chief executive officer
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
CORAF	Conference de responsables de recherche agronomique africains
COP	Convention of Parties
CGIAR	Consultative Group on International Agricultural Research
DNA	deoxyribonucleic acid
ECART	European Consortium for Agricultural Research in the Tropics
EPMR	External Program and Management Review
ESDAR	Environmentally and Socially Sustainable Development-Agricultural Research and Extension Group
FAO	Food and Agriculture Organization
FC	Finance Committee
GFAR	Global Forum on Agricultural Research
GIS	geographic information systems
GMO	genetically modified organism
GNP	gross national produce
GRPC	Genetic Resources Policy Committee
IAEG	Impact Assessment and Evaluation Group
IARC	International Agricultural Research Center
IBSRAM	International Board for Soil Research and Management
ICARDA	International Center for Agricultural Research in the Dry Areas
ICGEB	International Center for Genetic Engineering and Biotechnology
ICIPE	International Centre of Insect Physiology and Ecology
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
ICW	International Centers Week
IFAR	International Fund for Agricultural Research
IFPRI	International Food Policy Research Institute
IGM	Integrated Gene Management
IIMI	International Irrigation Management Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IPGRI	International Plant Genetic Resources Institute

IPR	intellectual property rights
IRRI	International Rice Research Institute
INBAR	International Network for Bamboo and Rattan
INRM	integrated natural resource management
ISNAR	International Service for National Agricultural Research
MTM	Mid-Term Meeting
MTP	mid-term plan
NARI	national agricultural research institute
NARS	national agricultural research system
NARS-SC	NARS Steering Committee
NGO	non-governmental organization
NGOC	NGO Committee
NRM	natural resource management
OC	Oversight Committee
ODA	overseas development assistance
OECD	Organization for Economic Cooperation and Development
PAA	Public Awareness Association
PARC	Public Awareness and Resources Committee
PGR	plant genetic resources
PSC	Private Sector Committee
QTL	quantitative trait loci
R&D	research and development
SACCAR	Southern African Centre for Co-operation in Agricultural Research
SADCC	Southern African Development Coordination Conference
SPAAR	Special Program for African Agricultural Research
SPFS	Special Programme for Food Security of the FAO
TAC	Technical Advisory Committee
TRIPs	Trade-Related Intellectual Property
UN	United Nations
UNCED	United Nations Commission on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPOV	International Union for the Protection of New Varieties of Plants
US	United States
USDA	United States Department of Agriculture
WARDA	West Africa Rice Development Association
WTO	World Trade Organization

EXECUTIVE SUMMARY

At a time when great advances in modern science and information and communications technologies provide the setting for a frontal assault on poverty, food insecurity and environmental degradation, the persistence of extreme hunger is indefensible. A compelling moral and ethical imperative underpins the need for a global research effort to harness the best of science to meet the needs of the poor in an environmentally sustainable manner. This is reinforced by economic, social and security imperatives.

According to the Food and Agriculture Organization (FAO), over 800 million people currently lack adequate food. By 2025, the food requirements of an additional 3 billion people will need to be met. Hidden hunger, such as protein and micronutrient deficiencies, are expected to become increasingly serious, particularly for women and children.

To feed this growing population and meet other needs that could be provided for by agriculture, such as for biomass energy and industrial materials, agricultural production will have to be greatly increased. Nobel laureate Norman Borlaug believes that average yields of all major food crops must increase by 50 percent by 2025, if food needs are to be met. The FAO estimates that, in the future, two-thirds of the growth in agricultural production will have to occur through intensified use of lands already under cultivation. Such ambitious productivity increases, difficult under any circumstances, will have to be achieved through sustainable production practices that balance yield increases with the protection of natural resources.

The Consultative Group on International Agricultural Research (CGIAR) is well-placed to address such issues. It was established in 1971 to support productivity-oriented research, in response to food needs of near-famine proportions in the South. The research objectives, partnerships, and institutional structure of the CGIAR have evolved over time, in keeping with the challenges confronted by the world's poor and disadvantaged. Today, productivity improvement and natural resource management are the twin pillars of CGIAR research on food crops, conservation of genetic resources (biodiversity), forestry and agroforestry, livestock management, aquatic resources, soil and water nutrients, water management, and agriculture-related policies, as well as in its endeavors to strengthen scientific capacity in developing countries.

The CGIAR has established a universally acknowledged record of success in international agricultural research. Indeed, investment in the CGIAR has been the single most effective use of official development assistance (ODA), bar none. There can be no long-term agenda for eradicating poverty, ending hunger, and ensuring sustainable food security without the CGIAR.

But no institution, however successful, can base its future purely on past performance. Progress and relevance come from building on past strengths and grappling with past weaknesses. Science and scientific excellence have been the truly defining characteristics of the CGIAR. The future effectiveness of the CGIAR System also lies in continuing to nurture scientific credibility, building on scientific strengths, and mobilizing scientific partnerships to meet the goals of eliminating poverty and hunger and protecting the environment.

The Panel has focused its attention primarily on the issues it considers of highest priority for setting the direction of the CGIAR System as it moves into the next century and for ensuring that it has the resources and capacities to fulfill its mission in an increasingly complex world. It is a world in which the System must be clearly focused on its fundamental mission and goals, yet flexible and adaptable in the means by which it pursues them.

- The Panel recommends a new mission for the CGIAR: “**to contribute to food security and poverty eradication through research promoting sustainable agricultural development based on the environmentally sound management of natural resources. This mission will be achieved through research leadership, partnerships, capacity building and policy dialogue.**”

Research Focus and Priorities

A complex and challenging set of issues confronting the CGIAR today relate to its response to the revolution in biotechnology and genetics, coupled with the simultaneous revolution in information and communications technologies. Together these rapid advances in science and technology are radically reshaping the future of the world's agricultural and food production systems. This will have profound social and political as well as economic implications.

The gene revolution, which permits manipulation of the genetic basis of living organisms—as well as the ability to use this understanding to develop new processes and products for agriculture, the environment, and for human and animal health—is now giving rise to fundamental shifts in the conditions affecting the production of and access to food. These developments promise further increases in productivity that could ensure that food supplies will continue to be more than adequate to meet aggregate needs. However, special measures will have to be taken to ensure that they contribute positively to the food security of the poor.

Breakthroughs are being achieved in this area primarily by the private sector. These advances arise from enormous investment and consequently carry an emphasis on protection of intellectual property rights. The CGIAR's challenge is to create a new form of public-private partnership that will protect intellectual property while bringing the benefits of this research to the poorest nations. Environmental and safety concerns as well as potential social impacts of these technologies must be addressed with equal vigor.

One way the CGIAR System can respond to the challenge of investing in these technologies is to acquire intellectual property rights to the technologies that result from the research of its Centers and ensure that these are used to contribute to the food security of the poor in accordance with the CGIAR's mission. This underscores the need for a more formal and strengthened structure for the centerpiece of the System, while maintaining the functional autonomy of individual Centers.

Another major challenge facing the CGIAR is to increase agricultural productivity in a sustainable manner. Emerging natural resource management (NRM) methods illustrate the paradigm shift that is occurring in agricultural sciences—from classical agronomy to ecological sciences; from analytical research to systems dynamics; from top-down to participatory approaches; and from factor-oriented management to integrated natural resource management. Ecosystems management in a wide sense—cropping systems, livestock systems, fisheries, forestry, agroforestry, the combination of organic and less chemical-intensive methods, and the interaction with the surrounding ecosystems—requires both NRM and policy management.

These types of management must work together to guarantee ecological and economic viability and sustainability, as well as the social acceptability of technical, economic, and institutional changes.

The CGIAR needs to further its capacity for integrated natural resource management work. It is at the cutting edge of the production of new plant varieties, which is a critical part of the complex of factors that can drive agricultural productivity forward. It has an unrivaled network of research sites around the developing world. It has generally close and good relations with National Agricultural Research Systems (NARS), which are broadly defined as the universities, local research non-governmental organizations (NGOs), relevant private-sector research organizations, and governmental agricultural research institutions in a nation, without which NRM improvements are unlikely to be developed and will almost certainly remain unused. The CGIAR also has the advantage of being international, especially where NRM problems cross national boundaries.

Linking advances in frontier sciences with the knowledge of agricultural communities is crucial to addressing the dual challenges of productivity increases and sustainable use of natural resources. The innovative talents of farming (and other food-producing) communities are an extremely important resource for both local and global food security. Significant advances have been made in developing synergies between traditional and organic farming and modern methods. This must be an important part of the CGIAR's research agenda in order to ensure that productivity gains are not accompanied by adverse environmental impacts, such as the damage caused by the overuse of chemicals.

The revolution taking place in information and communications technologies presents a tremendous new opportunity for the CGIAR to bring scientific knowledge and indigenous and local knowledge together to bear on global challenges, and to make this knowledge available to its constituents. These advances enable the systemic assimilation and dissemination of relevant and timely information, as well as a dramatically improved ability to gain access to the universe of knowledge and to communicate through low-cost electronic networks. The CGIAR must be at the forefront of harnessing these technologies to pursue its mission.

The Panel recommends the following priorities for the CGIAR:

- Launching a global initiative for integrated gene management that will conserve genetic resources (biodiversity), provide for the sustainable and equitable use of genetic resources, and ensure adherence with the equity and biosafety provisions of the Convention on Biological Diversity. The CGIAR collections of major crop species—some 10 percent of global collections—will be a centerpiece of this initiative.
- The establishment of a coordinating and servicing unit for biosafety, bioethics and biosurveillance that will make it possible for the latest developments in biotechnology to be applied in ways that are pro-poor and pro-environment. An accompanying program of public information should be developed to ensure transparency in research objectives and mechanisms.
- The creation of a legal entity for the CGIAR which could hold patents, and the development of "rules of engagement" (involving both the public and private sector) based on the premise that access to the means of food production is as much a human right as access to food.

- A global network for integrated natural resource management that will link productivity research with the environmentally sound management of natural resources. National scientists in developing countries and their international counterparts should work together in preparing and implementing bottom-up, demand-driven projects to manage agricultural ecosystems in a sustainable manner.
- Develop, in partnership with NARS, advanced research institutions (ARIs), NGOs, the private sector, FAO, the World Bank and other organizations, an effective global information and communications system for food security, via the World Wide Web. The arrangements proposed will make it possible for both traditional and frontier science research and technology to be accessible as free goods to scientists, NGOs and farmers.

To succeed, initiatives in agricultural research require an appropriate policy environment. The CGIAR's work since 1971 has shown that agricultural progress takes place only if mutually reinforcing packages of technology, services and public policies are introduced. Agricultural progress is retarded if a region has inadequate public policies in the areas of land reform, natural resource conservation and sustainable use, rural infrastructure development or pricing. The absence of producer-oriented marketing opportunities also greatly hinders progress.

- The Panel recommends that the CGIAR launch a special collaborative program to strengthen the capacity of NARS for policy research and formulation in countries where inappropriate public policy is the major cause of a wide gap between potential and actual agricultural productivity. Capacity building in policy research should not only cover economic policy-making, but also environmental, scientific and technological research policies.

An International Partnership

The successful mobilization by the CGIAR of the above opportunities will be possible only through leadership in creating and expanding partnerships. One of the great strengths of the CGIAR-supported Centers is their partnership with NARS. It is now essential that the range of this partnership be extended to more meaningfully include, among others, the private sector, with its heavy investment in biotechnology and genetic engineering; NGOs, which are a critical link to agricultural communities; regional- and sub-regional organizations; and advanced research institutes.

The CGIAR, like every complex multi-institutional organism, strives for balance between the need to create coherence and community within its own framework, and the need to relate to the widest possible range of creative partners sharing its goals. This is a particularly challenging task for a global scientific body dedicated both to cutting-edge science and to poverty alleviation. It is a tribute to the CGIAR, therefore, that it has continued to reach out to new constituencies and alliances.

- The Panel recommends that, where appropriate, the range of the CGIAR's partnerships be broadened to include other organizations with a shared commitment to the mission and goals of the CGIAR.

NARS, of course, remain at the heart of the CGIAR's partnerships. At the same time, the weakness of many NARS in adapting the research outputs of the CGIAR Centers to the national level has long been cited as a primary constraint on the CGIAR's impact. As the System adopts

an explicit dual focus on productivity and natural resource management, the increased complexity of research questions places even greater demands on NARS partners.

- The Panel recommends that the CGIAR increase emphasis on and broaden the range of capacity-building efforts essential for its work, particularly policy-making capacity in NARS. Where exceptionally strong NARS have emerged, Centers should pursue meaningful collaborative partnerships with them in areas of strategic research and encourage their internationalization and engagement in South-South collaboration. The CGIAR should also play a leading role in organizing, and if necessary producing, a large menu of Web-based, highly interactive distance education and training courses. The Panel further recommends that a new emphasis be placed on establishing national- and regional-level consultative processes for research and development, complementary to the efforts of regional and sub-regional organizations and others.

A Special Priority for Sub-Saharan Africa

Although there are a number of critical areas of food insecurity in South Asia, Latin America, and other parts of the world, inadequate progress in improving food production in several parts of Africa—in spite of the availability of extensive research know-how and national, bilateral, and international efforts—is a matter for special concern. Population growth in many African countries currently exceeds 3 percent per annum. Desertification is extensive, particularly in the Sahelian region. The CGIAR reports that it has been spending 40 percent of its resources in Africa. Despite these efforts, success has been limited, except in instances like the biological control of the cassava mealy bug and the spread of improved varieties of maize, wheat, barley, cassava, and a few other crops. According to current estimates, fully one-third of the population in Sub-Saharan Africa will be food-insecure in 2010. This, taken with the high percentage of Africans living below the poverty line, indicates the magnitude of the challenge.

In the Panel's view, a "more of the same" approach will not make much difference to the present situation, even if large new resources are deployed. The production constraints are often known and so are the remedies. What is lacking is a concerted drive to eliminate the constraints and stimulate accelerated agricultural progress.

- The Panel recommends a special priority on Africa that includes the establishment of an Inter-Center African Capacity Building Initiative for Sustainable Food Security; the appointment of a coordinating director; promotion of national and sub-regional consultative processes for agricultural research and development; emphasis on capacity strengthening through cooperative projects with African scientists and policymakers; two-way learning between scientists and agricultural communities; recognition of the importance of urban and peri-urban agriculture in addressing Africa's food needs; prioritization of relevant staple food crops; and cooperation among African NARS and stronger NARS from other regions. These initiatives must be complementary to and, where relevant, take place in collaboration with, the efforts of sub-regional organizations and bilateral and other multilateral institutions.

Synergies within the System

Achievement of the CGIAR's goals will require greater inter-Center cooperation. New methods of increasing System synergy through the integration of the complementary strengths and expertise of the Centers will have to be developed. Experience shows that such collaboration

works best when it is organized around specific projects that are large and ambitious enough to have the potential of having a major downstream impact, but small enough to be led by a few talented and highly motivated scientists with complementary expertise. Thus, much of the success of the CGIAR will depend on a skillful selection of projects and research priorities. These must be identified in close cooperation with the potential users of the results, so that a strong connection is made to the needs of poor farmers.

Despite challenges in governing and funding inter-Center and System-wide programs and other collaborative undertakings, such activities will be increasingly important as the CGIAR's mission broadens, as research questions become increasingly complex, and as the nature of funding changes. Synergies among Centers and between Centers and their partners must be exploited. Further, many of the Panel's recommendations on issues of science and strategy also call for intensified collaboration. In achieving this, effective mechanisms for governing, financing, and managing the CGIAR System and its partnerships must be developed.

Since the CGIAR is a small, though distinctive and highly strategic, actor in global agricultural research, it must be well focused. The new CGIAR should avoid duplication of efforts and unnecessary competition among Centers. The Panel entered into this System Review with the conviction that some consolidations were necessary. Our deliberations in this area have reinforced our initial impressions, and we recommend an in-depth management review and suggest key criteria that should guide such a review.

A New Model of Governance

The current CGIAR governance model has served the System reasonably well. Its informal character and highly participatory nature have proved to be effective in maintaining the collegiality and consensus decision-making which have contributed so much to the adaptability and successful performance of the System since its inception. In general, the CGIAR has sought to be responsive to changes in its external environment and to its own Agenda for Renewal. The system of governance continues to evolve as new needs are recognized.

However, as both the internal and external factors which bear on the effective functioning of the System become more complex, the disadvantages of the current model will become an increasing constraint. These disadvantages include high transaction costs, lack of timeliness and effectiveness in decision-making, and lack of a clear system of accountability.

The Panel is convinced that the CGIAR needs more focused programs, a culture that fosters innovation and risk-taking, conflict resolution techniques, the ability to adapt to external change, and non-bureaucratic governance. Among the goals should be stability in attracting and keeping the best scientists, higher visibility with key audiences, public awareness of international agricultural research, and reallocation of resources from old to new priorities.

- The Panel recommends that the CGIAR's governance continue to be based upon the principles of member sovereignty, Center autonomy and independent scientific advice. At the same time, the Panel recommends that the CGIAR's non-partisan/non-ideological nature, consensus decision-making and informal status, as they currently exist, be modified to enable the System to more effectively address the current and anticipated needs of the CGIAR and its stakeholders.

The Panel foresees a growing need for a more institutionalized capacity to secure and ensure proper stewardship of the intellectual property developed within the System, to secure funding from a broader variety of sources and to take positions on behalf of the System. All of these objectives could be more effectively carried out through a formally constituted central body. The Panel further believes that the constitution of such a body would provide an appropriate occasion for rationalizing and simplifying the current governance structure, reducing the number of committees and providing that their mandates be clearly established within the constitutional framework of the central body.

- The Panel recommends that the informal governance structure of the CGIAR be formalized through the creation of a legal entity that would serve as the new “central body” of the CGIAR. It would be incorporated as a non-profit public service organization in an appropriate jurisdiction. The new formalized governance mechanism would comprise CGIAR Chair, the central body with an Executive Committee and a Finance Committee, and a chief executive officer.

The CGIAR Chair has always been a Vice President of the World Bank. The current Chair has been exceptionally effective and decisive in providing leadership in and managing the process of renewal of the CGIAR and giving new direction and impetus to the System. As the chairmanship is becoming an increasingly demanding position, it may be desirable in the future for the chairmanship to become full-time.

- The Panel recommends that, while the World Bank’s primary leadership role and financial support to the CGIAR continue, a vice president of the World Bank (or a person of equivalent or higher stature within the World Bank) should continue to serve as Chair of the CGIAR. The Chair would be appointed by the central body in consultation with the World Bank. In the event that the CGIAR Chair requires a full-time effort, the Chair could also serve as chief executive officer.

When the CGIAR was established, the Technical Advisory Committee was the only advisory body and there were two Center committees—the Committee of Board Chairs (CBC) and the Center Directors Committee (CDC). Since the early 1990s, several new committees have been established. This rapid expansion of committees took place primarily during the period of financial crisis in the early and mid-1990s and has contributed to more active participation by CGIAR members than in the past. However, the proliferation of committees also carries significant inefficiencies and transaction costs. The *ad hoc* manner in which the committee structure evolved has resulted in a serious lack of clarity and efficiency. There is widespread agreement among CGIAR stakeholders that simplification, clearer definition, and enhanced coordination of committees are necessary.

- The Panel recommends that the current committee structure be streamlined to improve effectiveness and efficiency, and to ensure compatibility with other proposed changes in System-level governance.

For much of its past, the CGIAR was known as a “Club of Donors.” In 1972, it had 16 donors. In 1992, six developing countries contributed financially to the System. As of MTM98, the South-North ratio of member countries was 20 to 21. With the growth of members from, regional representation is more fully achieved through their direct membership in the CGIAR, thus it is no longer necessary to have separate regional representatives.

- The Panel recommends that the CGIAR broaden its membership over time by including more governments and other representative stakeholders. This would enable the CGIAR to become even more inclusive, as research becomes increasingly globalized and dependent on collaboration among a wider range of partners, including NGOs and the private sector.

The CGIAR's cosponsors—the World Bank, the Food and Agriculture Organization of the United Nations, the United Nations Development Programme and the United Nations Environment Programme—have played a critical and commendable role in the CGIAR System and this needs to continue. At the same time, the separate “cosponsor” status can now be better accommodated through participation in the proposed central body. In the future, the roles of these four multilateral organizations should be based upon much stronger programmatic linkages to the CGIAR. Financial support and the support provided in the form of the CGIAR and TAC Secretariats and impact assessment activities also continues to be indispensable. The Panel believes that the relationship between the CGIAR and these organizations needs to be updated to reflect changing circumstances and the recommended changes in the governance of the System.

- The Panel recommends that the status of “cosponsor” no longer be a separate category. The cosponsor role should instead be recognized by according the four cosponsoring institutions permanent seats on the proposed CGIAR central body and its Executive Committee.

The Panel is convinced that the proposed changes in System governance—establishing a central Board, setting the CGIAR up as a more formal organization, and streamlining the committee structure—would have many significant benefits to the System as a whole. The CGIAR members would be able to focus more on strategic policy and oversight, enhancing accountability for decisions (and ultimately impact of the System) while maintaining member sovereignty and Center autonomy. Difficult and sensitive issues would be dealt with more effectively, there would be greater transparency, and transaction costs would be reduced.

It is important that, in incorporating a formal legal body to replace the current informal governance structure, as many advantages of the informal system as possible be retained, particularly with respect to the CGIAR's representative and participatory character, and the professional, non-bureaucratic nature of its deliberative and decision-making process. The Panel also considers it of utmost importance to ensure that there be no fundamental change in the relationship between the central body and the Centers, although the modalities of these relationships will necessarily need to be revisited to some extent.

Financing the CGIAR

The CGIAR is a critical—though very small—component of Official Development Assistance (ODA), amounting to about 0.7 percent of ODA in 1996. In fulfilling its mission, the CGIAR will require financial resources on the order of US\$400 million annually by the turn of the century. As the CGIAR's financial needs grow, it would be unrealistic to expect this increase to be met entirely by traditional sources of financial support. The CGIAR must reach out to three important constituencies: the private sector; the rapidly growing philanthropic sector; and the development agencies. It would be equally unrealistic to believe that these increased needs will be met by new sources unless the CGIAR receives the strong and continued support of its traditional donors, particularly the World Bank.

- The Panel recommends that the international development community reverse the decline in for agriculture and agricultural research, tap other non-ODA public sector resources, and seek the commitment of all parties (all governments, international organizations, national research organizations, the civil society and the private sector) to coordinate their resources and efforts to combat the risk and threat of pervasive poverty, food insecurity and environmental degradation in developing countries. Given the challenges ahead, this is a time for greater financial commitment to the CGIAR.
- The Panel recommends that an overall policy for CGIAR collaboration with the for-profit sector be developed at the System level under conditions which contribute to and do not compromise the basic public interests and objectives of the CGIAR. Financial contributions from the for-profit sector should be accepted for research activities of mutual interest, in line with the CGIAR's mission statement, and directed towards the agreed research agenda.

The Panel believes that an active, professionally run foundation should be established to mobilize funding in support of CGIAR activities. The recent reactivation of the International Fund for Agricultural Research (IFAR) in Washington, DC by the CGIAR Secretariat is a positive development. This foundation could become the locus of a major fund-raising strategy for the CGIAR.

In the past, CGIAR funding was made available with few restrictions. In addition, the reporting requirements were limited to those of the CGIAR as a whole (mainly Annual Reports of Centers and the CGIAR Financial Report). This decade has witnessed a dramatic change in funding practices; nearly 40 percent of the total budget was provided as restricted funds in 1997.

Restricted funding limits the flexibility of Center management and requires more administration. The renewal process underlined a need for a general commitment by members to give financial support with minimal restrictions. The Panel believes that, as a general rule, restricted funds should comprise no more than 30 percent of a Center's budget.

The renewal process brought a shift to an agenda matrix and project-based funding, with a concomitant commitment from members to fund the indirect costs of doing research. Nevertheless, year after year, these costs are not being adequately funded. The Panel reiterates the Chairman's call at MTM98 for members to redouble their commitment to overhead cost recovery, as it is an indispensable aspect of Center operations.

For many years, the World Bank served as the indispensable "donor of last resort." Today, World Bank funds are allocated on a matching basis—that is, proportionate to contributions by other members. The World Bank's contribution of \$600 million over the period 1972-1997 mobilized over \$4 billion from like-minded institutions, national and international. This support, combined with overall leadership, adds up to an impressive record of effective intervention by the Bank on behalf of the poor and disadvantaged. Their liberation from hunger and poverty lies at the heart of the World Bank's mission.

The role played by the CGIAR cannot be fulfilled without sustainable support. The World Bank's continued involvement to the fullest extent is critical because it is the world's preeminent catalyst and financier of social change.

- The Panel recommends that the World Bank continue to provide financial and policy support and intellectual leadership to the CGIAR. This is indispensable to the future of the CGIAR as envisaged by the Panel.

Conclusion

The Panel was asked to consider whether the CGIAR System would still be needed through the early years of the next century, and if so, why? The Panel has answered with a resounding yes, while recognizing that the System needs to be changed substantially to meet the challenges of a changing world.

Today, the international community needs the CGIAR more than ever before. Despite the great advances that have been made, food security for all remains elusive. The yield gap and the food gap in many parts of the world both have to be closed. Agriculture has to be ecologically and socially sustainable. Natural resource management requires urgent efforts. Thus, the global food security situation will be even more challenging in the new millennium than it was in the 1970s. And the rapid commercialization of science threatens a diminution of the production of public goods in the broad area of agricultural research and development—a diminution that will hit the poor and hungry hardest. Through its scientific research, capacity building and knowledge dissemination, the CGIAR has a critical leadership role to play in the world.

RECOMMENDATIONS

RECOMMENDATION 1

The Panel recommends that the CGIAR's current mission statement—which is to contribute, through research, to promoting sustainable agriculture for food security in developing countries—be amended to read:

To contribute to food security and poverty eradication through research promoting sustainable agricultural development based on the environmentally sound management of natural resources. This mission will be achieved through research leadership, partnerships, capacity building, and policy dialogue.

We also recommend that each Center in the System modify its own mission statement to be consistent with the amended mission of the CGIAR. Center mission statements should be specific and focused enough to allow evaluation of the performance of each Center.

RECOMMENDATION 2

The Panel recommends that IARCs strive to serve as global Centers of frontier science and technology for sustainable food security, serving as a bridge that brings advanced science and technology to bear on the needs of the world's poor. They should become resource centers on frontier technologies, policy research, sustainable use of natural resources, capacity building, and networking. They will need to enhance their symbiotic scientific links with NARS, ARIs, the private sector, and NGOs in industrialized and developing countries. At the same time, they should help develop and disseminate environmentally sensitive technologies based on appropriate blends of traditional and modern methods, while placing more emphasis on work in low-potential areas.

RECOMMENDATION 3

The Panel recommends that IARCs concentrate on topics relevant to improving sustainable food security and the generation of greater opportunities for rural income. This dual strategy will require:

- greater inter-Center collaboration;
- new methods of increasing System synergy;
- new and expanded partnerships;
- IARCs, in conjunction with regional and sub-regional organizations, acting as neutral convenors of all the actors in the research-development continuum in each region, while providing access to assets and resources and filling gaps by providing what others cannot do as competitively; and
- the CGIAR to use its moral force and its scientific credibility to get the type of cooperation and coordination established that makes optimal use of available resources.

RECOMMENDATION 4

The Panel recommends an integrated gene management approach based on:

- patenting processes and new varieties, and entrusting their use under free licensing;
- a legal entity which could hold CGIAR patents;
- the conservation of agrobiodiversity and its sustainable and equitable use;
- research on genomics and molecular breeding for the purpose of supporting NARS to enhance the productivity of major farming systems in an ecologically, economically, and socially sustainable manner;
- strict adherence to the equity and biosafety provisions of the Convention on Biological Diversity and national government regulations;
- a central coordinating and servicing unit for advising both IARCs and appropriate NARS;
- a widened food security basket through inclusion of minor and underused millets, grain legumes, tubers, and other crops;
- the use of molecular and Mendelian methods of breeding in an integrated manner;
- an effective public information and communication system and total transparency and accountability in relation to work in the field of biotechnology; and
- a System-wide review of plant breeding efforts, with the aim of freeing up resources for new priorities while accelerating the introduction of modern marker-assisted breeding and bioengineering technologies.

RECOMMENDATION 5

The Panel recommends that the CGIAR enhance its research methodology by adopting an integrated natural resource management approach. Further, the organization of an International Network for Integrated Natural Resource Management will link productivity research with the environmentally sound management of natural resources. The network should be based on, among other things:

- Centers that are retooled with sciences needed to manage the viability and sustainability of ecosystems;
 - a definition of the corresponding methods at different spatial scales, particularly at local levels;
 - adoption of precision farming techniques in relation to tillage, irrigation, nutrient supply and pest and post-harvest management;
 - development of indicators for measuring sustainability;
 - development of sustainable systems of management for aquatic resources;
 - joint preparation of national agricultural research strategies by respective NARS and a consortium of IARCs; and
- development of more bottom-up, demand-driven projects.

RECOMMENDATION 6

The Panel recommends that, the CGIAR, in partnership with FAO, the World Bank, NARS, ARIs, and NGOs, the CGIAR develop an effective Global Knowledge System for Food Security. This would be a central element in the CGIAR's future capacity building efforts. ISNAR and IFPRI should be considered as the convening Center for this initiative. This initiative should:

- benefit NARS, NGOs, civil society organizations, and the media;
- pay attention not only to frontier science and technology but also to traditional wisdom;
- be built on a decentralized management scheme for its various components;
- make international research databases available as free goods to developing nations;
- produce Web sites of special relevance to the developing world through a highly skilled central screening and coordinating unit;
- promote the organization, spread, and understanding of traditional knowledge systems;
- facilitate direct contact via e-mail between developing-country scientists and individual experts throughout the world, beginning with the organizing of young professionals and IARC alumni; and
- promote cooperative activities through a geographically indexed Web database containing projects of all organizations performing agricultural research and development in each region.
- take account of existing relevant databases

RECOMMENDATION 7

The Panel recommends that:

- greater emphasis be placed on social and management sciences in order to address issues of local policy-making, conflict resolution related to natural resource management, participatory research approaches, and research policy;
- policy analysis research be strengthened;
- policy formulation and analysis be carried out with selected developing countries;
- the CGIAR organize System-wide Dialogues for Policymakers at regular intervals;
- in collaboration with other appropriate IARCs, NARS, and relevant bilateral and multilateral development institutions, IFPRI launch a special program to strengthen the capacity for collaborative policy research and formulation in countries where inadequate public policy support is the major cause of a wide gap between potential and actual yields in farmers' fields; and
- capacity building in policy research cover economic policy-making and environmental and science and technology research policies.

RECOMMENDATION 8

The Panel recommends that:

- the CGIAR continue to emphasize the capacity building efforts that have been successful in the past;
- the CGIAR strengthen partnerships with bilateral and multilateral development agencies providing technical assistance and support in capacity building
- there be an increased emphasis on broadening the range of capacity-building efforts that the CGIAR considers essential for its work, particularly policy-making capacity in

NARS;

- new emphasis be placed on establishing national-, regional-, and sub-regional-level consultative processes for research and development;
- the CGIAR play a leading role in organizing, and if necessary producing, a large menu of Web-based, highly interactive distance education and training courses;
- Centers pursue meaningful collaborative partnerships with strong NARS in areas of strategic research;
- the CGIAR encourage the internationalization of certain strong NARS, thereby facilitating more South/South research collaboration; and
- a stepped-up CGIAR public awareness program is needed to promote awareness of CGIAR/NARS collaboration and the importance of research to developing-country governments.

RECOMMENDATION 9

The Panel recommends that CGIAR organize an International Network for the Technological Empowerment of Women in Agriculture. The network should promote a common platform for action at the country level by national, bilateral, international, non-governmental, private-sector, and women's organizations. IRRI could serve as the coordinating Center for the Network, based on its experience with the Women in Rice Farming Network in Asia.

RECOMMENDATION 10

The Panel recommends a special collaborative focus on Africa that incorporates the following elements to create an effective strategy for African agriculture and that complements the efforts of other organizations, including sub-regional associations:

- Promote national/regional consultative processes for agricultural research and development in order to facilitate the integration and increase the efficiency of the efforts of all actors.
- Set up an African Capacity Building Initiative for Sustainable Food Security as a major inter-Center initiative. It should help train a cadre of African leaders who can assist the political leadership in their countries to remove policy constraints and develop a well-conceived strategy for sustainable food security.
- Under the leadership of the director of the proposed African Capacity Building Initiative, set up a task force with the Centers, TAC, the CGIAR Secretariat, FAO, the World Bank, UNDP, the U.N. Environment Programme (UNEP), and other relevant organizations, including sub-regional associations, to develop a special focused program for African food security.
- Launch a well-planned Lab to Land Program to take the benefits of the best available technologies to farmers and to promote on-farm participatory testing, breeding, and research.
- Develop research programs in urban and peri-urban agriculture in cooperation with relevant organizations, including AVRDC.
- Emphasize modern ecological farming methods, taking into account the poor infrastructure and low use of external inputs.
- Set priorities on staple or relevant food crops, such as cassava, yams, cowpeas, plantain, and other "indigenous" African food crops.
- Promote partnerships between strong NARS from various parts of the world and strategic African NARS.

RECOMMENDATION 11

The Panel recommends that:

- where appropriate, the range of the CGIAR's partnership be broadened to include other organizations with a shared commitment to its mission and goals;
- in relevant areas, the CGIAR enter into Memoranda of Understanding with partners that contain a Voluntary Code of Conduct;
- IARCs should not enter into partnerships that will lead to the monopolistic and exclusive use of the research results;
- the CGIAR establish a Media and Communications Unit; and
- the Chair convene a high-level meeting with CEOs of interested representative agribusiness to exchange views and consider opportunities for new partnership relationships, including with farmers' cooperatives and seed growers' associations.

RECOMMENDATION 12

The Panel recommends that the CGIAR's governance continue to be based on the principles of member sovereignty, Center autonomy, and independent scientific advice. While we fully endorse the principle of member sovereignty, we stress the necessity for individual member governments to harmonize their own national policies and speak with one voice in all international fora and negotiations relevant to CGIAR business, particularly on genetic resources and intellectual property rights.

RECOMMENDATION 13

The Panel recommends that the CGIAR's consensus decision-making, non-political nature, and informal status be updated and modified to enable the System to address the current and anticipated needs of the CGIAR and its stakeholders effectively.

RECOMMENDATION 14

The Panel recommends that:

- the CGIAR establish a special task force, including TAC and Center Directors, for improving the efficiency of the evaluation processes;
- the EPMR site visit be reduced in scale so as to require no more than one week of each reviewer's time;
- the CGIAR institute Review Workshops for each major type of CGIAR activity, both to improve the review process and to reduce the amount of time and effort required for EPMRs and CCERs;
- Centers be financially compensated by donors that wish to conduct their own reviews of Center projects;
- EPMRs give greater attention to Board governance; and
- the present IAEG be replaced with a more pragmatic unit, possibly located within TAC.

RECOMMENDATION 15

The Panel recommends that the informal structure of the central mechanisms of the existing CGIAR System be transferred to a new central body to be incorporated as a non-profit public service organization in an appropriate jurisdiction, to be established after consideration of legal and other factors relevant to its effective functioning. The body would have the following specific characteristics:

- It would consist of the CGIAR Chairperson, a central body and Executive Committee, and a chief executive officer. (A full-time CGIAR Chair could also serve as chief executive officer.)
- Membership of the central body would be drawn from the stakeholders of the CGIAR. Based on a principle of rotation, all Members would have the possibility of serving on the board. Regular meetings should be held once a year. In addition to the Chair, the body would contain representatives of or individuals from the following categories: Members from the South (up to 6 persons), the North (up to 6), the private sector (up to 3), the NGO community (up to 3), institutions and foundations (up to 3), and co-sponsors (4). The total would be up to 26 persons. The central body would be elected by its members, with the number of seats to be allocated to each stakeholder group being elected by the members of such group, so as to ensure balanced and representative character.
- Central body members would serve on staggered, three-year terms, and would be eligible for re-election for up to a period of six years. There would be no alternates. Each category would elect its members on the body, using the following criteria: funding exceeding US\$ 500,000 annually and during the full period of membership; "vision" and knowledge about global agricultural research; "vision" and knowledge about agricultural research in the South; and ability and willingness to consult with other relevant actors. The chairs of TAC, the Committee of Board Chairs (CBC), and the Center Directors Committee (CDC) would be ex-officio, non-voting members of the body.
- Acting on behalf of the central body, an Executive Committee would meet up to three times a year and be chaired by the CGIAR Chair. It would perform the current tasks of the Oversight Committee. The Executive Committee would exercise the powers of the central body when not in session, subject to the terms as agreed by the central body. The Executive Committee would be composed of three members each from the categories of the North and the South, and one member each from the private sector, NGOs, and institutions, plus the co-sponsors. In all, it would have 14 members (including the chairs of TAC, CBC, and CDC as non-voting, ex-officio members).
- The Finance Committee would become a committee of the central body.
- A portion of the agenda support funds would be at the disposal of the central body/Executive Committee in order to ensure stable and guaranteed support for Centers in such important areas as training, maintenance of gene banks, and indirect cost recovery.

RECOMMENDATION 16

The Panel recommends that the CGIAR broaden its membership by over time including more governments and other stakeholders to enable the CGIAR to become even more inclusive, as research becomes increasingly globalized and dependent on collaboration among a wider range of partners. Specifically:

- Membership in the CGIAR should be broadened to include the private sector and the NGO community, as both play increasingly important roles in the international research-development continuum. The basis of membership should be not only financial, but a shared commitment to the mission and goals of the CGIAR and a representative character of the parties concerned.
- The minimum, annual contribution should be US\$1 million for all Members. However, for Members from the South with a per capita GNP of less than US\$750, the current annual minimum contribution should remain unchanged for the next 5–7 years.
- In-kind contributions should be officially recognized by the CGIAR.
- As the membership base broadens to include new sectors, ethical ground-rules for collaboration with new partners will need to be developed.
- Regional representatives should be eliminated.

RECOMMENDATION 17

The Panel recommends that while the World Bank's primary leadership role and financial support to the CGIAR continue, a vice president of the World Bank (or a person of equivalent or higher stature within the World Bank) should continue to serve as Chair of the CGIAR. The Chair will be appointed by the central body in consultation with the World Bank. The position of CGIAR Chair may require a full-time effort in the future. In this case, the Chair could also serve as chief executive officer.

RECOMMENDATION 18

The Panel recommends that the current Committee structure be streamlined to improve effectiveness and efficiency, and to ensure compatibility with other proposed changes in System-level governance. Specifically:

- The functions of the Oversight Committee should be assumed by the Executive Committee of the proposed central body.
- The Finance Committee should become a committee of the proposed central body.
- The scientific capacity of TAC needs to be strengthened and its independent scientific advice maintained. TAC should be reorganized to include the TAC Chair and two or three strategic thinkers or "visionaries," who together would constitute the TAC nucleus. They would assist the proposed chief executive officer in formulation of a CGIAR Strategy, and would serve renewable three-year terms. The TAC Secretariat should remain at the FAO in Rome.
- The IAEG should cease to exist in its current form. The central body should establish an impact unit in cooperation with TAC. This unit may be incorporated within TAC.
- The important tasks of public awareness and public relations, including PARC and the "Future Harvests" campaign, should be taken over by a new Media and Communications

unit that is closely linked with the proposed central body and chief executive officer. It should be supplemented with a media consultation each year at ICW.

- An independent committee similar to GRPC remains necessary. Such a Policy Committee should be attached to the proposed CGIAR central body. Alternatively, it may be attached to TAC as a permanent sub-panel.
- The NGO Committee and the Private Sector Committee should be replaced with wider consultative processes with representatives of each sector during each ICW. These representatives would be invited to participate in relation to relevance of the issues being considered. The two committees should continue to exist in the interim until such consultative processes are implemented.
- The input of the CDC and CBC should be sought and valued.

RECOMMENDATION 19

The Panel recommends that:

- "co-sponsor" status be replaced with permanent seats on the central body and its Executive Committee;
- a World Bank representative continue to chair the Finance Committee, as long as the World Bank's leadership and financial support continues;
- joint programmatic efforts between the CGIAR and these four agencies receive high priority, particularly in the area of strengthening NARS;
- collaborative efforts between the FAO's Special Programme for Food Security and the CGIAR should be further explored to facilitate more intensive collaboration at the national level; and
- these agencies should play a more consistent role in strategic issues through coherent efforts during major meetings related to the mission and work of the CGIAR.

RECOMMENDATION 20

The Panel recommends that the CGIAR support the convening of a Global Forum every three years, confined to a general meeting on future global agricultural research issues and involving all major stakeholders. Further, the CGIAR should monitor GFAR's development and viability, as well as the implications of GFAR with respect to the work of CGIAR Centers, particularly ISNAR.

RECOMMENDATION 21

The Panel recommends that there be one annual business meeting at ICW. MTM should be held every third year, with possible elimination over the longer term. Additional ad hoc meetings could be held around the Executive Committee meetings as necessary. A triennial MTM would be complementary to TAC's three-year planning cycle; the recommendations of the Finance Committee currently given at MTM would be circulated in writing. Further, the size of all kinds of delegations to CGIAR business meetings should be restricted.

RECOMMENDATION 22

The CGIAR Secretariat should expand and strengthen its human resources services to ensure that the Centers are able to identify and attract the very best scientists and managers, including young professionals.

RECOMMENDATION 23

The Panel recommends that a special task force of key CGIAR stakeholders, with supporting staff, be established to develop a planned process of implementation of the governance changes recommended in this report.

RECOMMENDATION 24

The Panel recommends that Boards of Trustees of individual Centers maintain much closer relationships between themselves and the central body. We recommend establishment of a special task force to develop a strategy to delineate the nature and modalities of the relationship between Center Boards of Trustees and the proposed central body. This task force should consist of a small number of Center Directors, Board Chairs, and CGIAR Members.

RECOMMENDATION 25

The Panel recommends that:

- Relevant System-wide programs be provided sufficient funding on a long-term basis (at least five years), as they can be a useful complement to the CGIAR through improved coordination;
- since eco-regional activities are part the strengthening of NARS, a workshop examines and assesses past practical experiences, issues, and potentials involving all relevant actors in a region, with a proposal for further actions to be discussed by the CGIAR in 1999, at the latest;
- Members and Centers place high priority on ensuring funding of collaborative research activities, including ecoregional and other System-wide programs as well as other inter-Center initiatives that are important to the CGIAR mission;
- eco-regional activities be managed by the NARS and regional and sub-regional organizations, with the political and financial support of both the NARS and any bilateral donors; and
- a special task force composed of key stakeholders be established to formulate specific plans and modalities to improve the governance and financing of System-wide programs.

RECOMMENDATION 26

The Panel recommends that the international development community reverse the decline in ODA for agriculture and agricultural research, tap other non-ODA public sector resources, and commit all parties (all governments, international organizations, national research organizations, NGOs, and the private sector) to coordinate their resources and efforts to combat the risk and threat of pervasive poverty, food insecurity, and environmental degradation in developing countries. Given the challenges ahead, this is a time for greater financial commitment to the CGIAR.

RECOMMENDATION 27

The Panel recommends that an overall policy for CGIAR collaboration with the for-profit sector be developed at the System level under conditions that contribute to and do not compromise the basic public interests and objectives of the CGIAR. Financial contributions from the for-profit sector should be accepted for research activities of mutual interest, in line with the CGIAR mission statement, and directed toward the agreed research agenda. Further, a foundation should be the locus of a major fund-raising strategy to mobilize funding from the private sector.

RECOMMENDATION 28

The Panel recommends that:

- three-year financial commitments to the agreed research agenda be encouraged;
- as a general rule, no individual center should have less than 70 percent "unrestricted" funding of its annual budget;
- the project based approach to center planning should remain and, together with the CGIAR Financial Report, should provide Members with excellent financial information and accountability;
- the use of the agenda matrix is most likely the best approach for the present CGIAR Governance model, although caution should be taken to avoid a complete dependence resource allocation by the free market in the longer run;
- donors improve their current disbursement practices so that Centers receive all funds at the beginning of the fiscal year; and
- Members ensure funding for indirect costs and areas in which the CGIAR has a global responsibility, such as germplasm collections and training, with funds at the discretion of the proposed central body possibly used to ensure sufficient support for these budget items.

RECOMMENDATION 29

The Panel recommends that the World Bank continue to provide the financial and policy support and intellectual leadership which is indispensable to the future of the CGIAR as envisaged by this Review.

CHAPTER 1. INTRODUCTION

The Consultative Group on International Agricultural Research (CGIAR) was established in 1971 to support productivity-oriented research, in response to specific food needs of near-famine proportions in the South. The research objectives, partnerships, institutional mechanisms, and effectiveness of the CGIAR have evolved over time, in keeping with the challenges confronted by the world's poor and disadvantaged. Today, productivity and natural resource management are the twin pillars of CGIAR research on food crops, conservation of genetic resources (biodiversity), forestry and agroforestry, livestock management, aquatic resources, soil and water nutrients, water management, and agriculture-related policies, as well as in its endeavors to strengthen scientific capacity in developing countries.

The CGIAR has established a universally acknowledged record of success in international agricultural research. The initiative taken nearly 30 years ago by the U.N. Food and Agriculture Organization (FAO), the U.N. Development Programme (UNDP), and the World Bank, together with the Ford and Rockefeller Foundations, has paid handsome dividends. The founders have been joined over the years by numerous others—Members of the Consultative Group, international scientists, and a broad range of partners—in a sustained commitment to meet the original goals. Investment in the CGIAR has been the single most effective use of official development assistance (ODA), bar none. There can be no long-term agenda for eradicating poverty, ending hunger, and ensuring sustainable food security without the CGIAR.

These results have been possible because the CGIAR has been totally focused on agricultural science, engaged in a long-term commitment—recognizing that research can take as many as 20 years to show results in farmers' fields—dedicated to scientific excellence, and involved in the production of public goods.

But no institution, however successful, can survive purely on past performance. Progress and relevance come from building on past strengths and grappling with past weaknesses. Science and scientific excellence have been the truly defining characteristics of the CGIAR. The future effectiveness of the System also lies in nurturing scientific credibility, building scientific strengths, and mobilizing scientific partnerships to meet the goals of eliminating poverty and hunger and protecting the environment.

The most complex and challenging set of issues confronting the CGIAR today relate to its role in and response to the revolution in biotechnology and genetics, coupled with a simultaneous revolution in information and communications technologies. Together these will radically reshape the future of the world's agricultural and food production systems. This will have profound social and political as well as economic implications, particularly for developing countries. The CGIAR System has itself played an important role in this revolution through its development and dissemination of new varieties of foodgrains that are largely responsible for the

unprecedented increases in food production that have enabled world supplies to keep well ahead of population growth.

The revolutions in science and technology are giving rise to fundamental shifts in the conditions affecting production of and access to food, as well as access to necessary genetic resources and scientific and indigenous knowledge. While promising further increases in productivity that could ensure that food supplies in the aggregate will continue to be more than adequate to meet needs, special measures will have to be taken to ensure that these developments contribute positively to the food security of the poor.

The accelerated movement toward translating scientific advances into private intellectual property could have the effect of moving important food crops from being freely available as public goods to private ownership and control. One way the CGIAR System can respond to this challenge is to acquire intellectual property rights to the technologies that result from the research of its Centers and ensure that these are used to contribute to the food security of the poor in accordance with its mission. All of this underscores the need for a more formal and strengthened structure for the centerpiece of the System, while maintaining the functional autonomy of individual Centers.

The Panel believes that one of the highest priorities of the CGIAR System in the period ahead will be to ensure that the food security of the poor is enhanced and not impaired by the science and information revolution. This will not only influence the research priorities of the System, it will also require it to take positions on these issues that will often be highly controversial.

The second major challenge facing the CGIAR is to increase agricultural productivity in a sustainable manner. The conservation and sustainable use of natural resources is vital for achieving sustained advances in agricultural productivity. Enhancement of crop productivity without damage to the ecological foundations of farming is the pathway to sustainable agriculture. Technical changes in production systems, as well as social, economic, and institutional changes, will have to be seen as modifications of the whole system in which they are included, not simply as independent introductions. Integrated approaches to the study of system change will be needed.

The revolution taking place in information and communications technologies is enabling rapid growth in the systemic assimilation and dissemination of relevant and timely information, as well as a dramatically improved ability to gain access to the universe of knowledge and to communicate through low-cost electronic networks.

In principle, the advances in information technologies and biotechnologies—when coupled with improvements in management science and governance—greatly increase the power of a scientific approach to genetic improvement, agronomy, the integrated management of natural resources and ecosystems, and the management of local and regional development policies. Both scientific revolutions seem to be proceeding at an ever-increasing pace, with most of the action taking place in a few places in industrialized nations. The CGIAR needs to be agile and resourceful if it is to harness this enormous potential for the developing world.

In fact, the CGIAR is ideally positioned to catalyze international and national research in the twenty-first century. It has a unique opportunity to be at the core of a scientifically credible network of partners that will be critically important in mobilizing the political will and real

commitment needed to promote food security, poverty eradication, and sustainable agricultural development in developing countries. The CGIAR should serve as the flagship of a global movement of science for sustainable food security and poverty eradication.

This Review Panel has focused its attention and its work primarily on these issues it considers of highest priority for setting the direction for the CGIAR System as it moves into the next century and in ensuring that it has the resources and capacities to fulfill its mission in an increasingly complex and changing world. It is a world in which the System must be crisply clear and focused on its fundamental mission and goals, yet infinitely flexible and adaptable in the means by which it pursues them.

In addressing some of these issues that we regard as fundamental to the future of the CGIAR, we have framed our recommendations mainly in terms of setting the direction we believe the System should move rather than attempting to define in detail the specific steps it should take in implementing these recommendations and suggestions. An acceptance of our recommendations will therefore in most cases require the setting up of task forces or similar mechanisms to develop detailed plans and modalities for implementation.

It will also be evident that in concentrating on certain key issues, there are others that in the longer term may be of equal importance but to which we have given less attention. Thus the review process that we have been a part of must be a continuing one.

CHAPTER 2. THE CONTEXT AND MISSION OF THE CGIAR

2.1 Food Security Remains a Pressing Problem

The present world population of nearly 6 billion is expected to stabilize in the second half of the next century at more than 10 billion. To feed this large population and also meet other needs through agriculture, such as for biomass energy and industrial materials, agricultural production will have to be greatly increased. New arable land is limited, water is in short supply in many regions, and the fertility of some soils is threatened. Meeting the nutritional needs of the human population therefore remains one of the most important challenges for the future.

According to the Food and Agriculture Organization (FAO), over 800 million people currently lack adequate food. By 2025, the food needs of an additional 3 billion people will need to be met. Hidden hunger, such as protein and micronutrient deficiencies, are expected to become increasingly serious, particularly for women and children. South Asia will remain a "hot-spot" of poverty and food insecurity in terms of the sheer numbers affected, and Africa will require a special focus and concerted efforts to confront increasingly inadequate food supplies; fully one third of those living in sub-Saharan Africa are predicted to be food-insecure by 2010.

As we approach the new millennium, there are apprehensions that an imbalance between human numbers and food needs may result in large-scale famines in many developing countries. The following are some of the major factors underlying such concerns:

- a steady decline in per capita availability of irrigation water and arable land as a result of a continuing rise in population, as well as soil degradation and the diversion of prime farmland to non-farm uses;
- an increase in food demand to meet the needs of the growing population, to overcome prevailing undernutrition among 800 million people, and to meet the additional food needs arising from greater purchasing power and an increased demand for animal products;
- degradation of natural resources;
- stagnation or even decline in marine fish production; and
- stagnation in technological change.

There is no room for complacency. The FAO World Food Summit of 1996 set a target for 2015 of halving the number of persons going to bed hungry, but several experts doubt whether even this modest target can be achieved. Presently, a third of the children born in South Asia and the Sahelian region of Africa have a low birth weight due to nutritional anemia in pregnant women. There is evidence that these children are handicapped in brain development, and the suspected decrease in average intelligence of a large segment of the population will severely handicap any society. This can be considered the cruelest form of inequity—especially since we are entering a "knowledge millennium," when information and knowledge will determine the pace and direction of economic growth and human well-being.

The persistence of extreme poverty and deprivation in the midst of unprecedented prosperity also destabilizes nations, promoting social disintegration and numerous conflicts and security threats. The international community cannot accept a future in which a large proportion of the world's population will remain poor and food-insecure. Even for industrialized countries, the economic, political, and ethical implications are severe.

We conclude that the mobilization of efforts against hunger and poverty must be revitalized. Providing the food security that will be needed to avoid the dire consequences just described is a major challenge for both scientists and policy-makers. Through its scientific research, capacity building, and knowledge dissemination, the CGIAR has a continuing leadership role to play in the world.

2.2 The Revolution in Science and Technology

Two major scientific revolutions are under way: the gene revolution—which provides a molecular understanding and manipulation of the genetic basis of living organisms, as well as the ability to use this understanding to develop new processes and products for agriculture, the environment, and human and animal health—and the information and communications revolution—which allows rapid growth in the systemic assimilation and dissemination of relevant and timely information, as well as a dramatically improved ability to tap into the universe of knowledge and communicate through low-cost electronic networks.

In principle, these two types of advances—when coupled with improvements in management science and governance—greatly increase the power of a scientific approach to genetic improvement, agronomy, the integrated management of natural resources and ecosystems, and the management of local and regional development policies. Both scientific revolutions seem to be proceeding at an ever increasing pace, however, with most developments occurring in a few places in industrialized nations. The CGIAR needs to be agile and resourceful if it is to harness this enormous potential for the developing world.

2.2.1 The gene revolution

The past 10 years have seen dramatic advances in our understanding of how biological organisms function at the molecular level, as well as in our abilities to analyze, understand, and manipulate DNA molecules, the biological material from which the genes in all organisms are made. The entire process has been accelerated by the Human Genome Project, which has poured substantial resources into the development of new technologies for working with human genes. The same technologies are directly applicable to all other organisms, including plants. Thus, a new scientific discipline of genomics has arisen. This discipline has contributed to powerful new approaches that can be used in agriculture as well as in medicine and has helped stimulate a vigorous new segment of the biotechnology industry.

Several large corporations in Europe and the United States have made major investments in adapting these technologies to produce new plant varieties of agricultural importance for large-scale commercial agriculture. The same technologies have equally important potential applications for addressing food security in the developing world. But the poor cannot pay enough to create a viable commercial market for these services. If the private sector is unlikely, then, to undertake research in the development and application of these technologies for the

major food crops of importance to the poor, the CGIAR-- as a unique provider of international public goods for agriculture -- must fill this important gap.

The key technological developments in this area with respect to the CGIAR are:

- genomics: the molecular characterization of species;
- bioinformatics: data banks and data processing for genomic analysis;
- transformation: introduction of individual genes conferring potentially useful traits into plants, trees, livestock, and fish species;
- molecular breeding: identification and evaluation of useful traits by use of marker-assisted selection, which greatly speeds up traditional breeding processes;
- diagnostics: identification of pathogens by molecular characterization; and
- vaccine technology: use of modern immunology to develop recombinant DNA vaccines for improved disease control against lethal diseases of animal and fish.

The international agricultural research centers (IARCs) must exploit these techniques and make them readily available for use by national agricultural research systems (NARS). In doing so, they will have to work closely with advanced research institutions (ARIs) in order to be able to rapidly import their continuous stream of useful innovations.

2.2.2 The information technology revolution

New communication and computing technologies will have profound implications in everyday research activities. Access to the Internet will soon be universal, and this can provide unrestricted low-cost access to information as well as highly interactive distance learning and other benefits. The Internet will not only facilitate relations between all researchers, it will also greatly improve their ability to communicate effectively with the potential users of their research knowledge. Computing also allows the processing of large-capacity databases (libraries, remote sensing and GIS data, gene banks) and the construction of simulation models with possible applications in ecosystem modeling and economics.

The software industry is continuously providing new tools that increase research productivity and create new opportunities for understanding complex systems of all kinds. Remote sensing and other space satellite outputs are providing detailed geographic information that facilitates land use planning and natural resources management.

The CGIAR must exploit these technologies more forcefully to promote its mission and also make them available to NARS.

2.3 Management Sciences

Decision-making theory has long been part of the economic sciences. Representing the economy through models of a neo-classical derivation has led to over-simplification of the search for efficiency. New depictions of reality and new tools are now being developed, such as artificial intelligence models for simulating decision effects, models that explore the viability of systems before trying to optimize them, strategic forecasting, negotiation models, and so on. For the most part, these new tools are intended to allow simulations and organize interactions among decision-makers, and in this way they are applications of strategic management sciences. "New management," then, is characterized by recognition of the often complex and systemic nature of public and private decisions, which often involve many players whose cooperation is essential.

Drawing on work in the social sciences and institutional economics, advances in management sciences can enhance the effectiveness of institutions, strengthen the needed systemic approaches to participatory agricultural and rural development, and facilitate a clear understanding of the modalities, strengths, and weaknesses of research networking and partnerships that will be central to the CGIAR's role in national and international agricultural research.

2.4 Poverty, Food Insecurity, and Environment

More than three fourths of the poor live in rural areas in developing countries. Poverty in these areas has multiple origins. It is often a historical legacy based in some cases on political discrimination against segments of populations. Poor agricultural producers and herders often do not have sufficient land from which to derive livelihoods. Some people have no choice but to settle in low-potential areas, where governments often have been either unable or unwilling to develop infrastructure. As a consequence, market economies cannot develop, and populations remain limited to subsistence economies with very constrained growth and development potential.

Low agricultural potential (agriculture on slopes, semiarid areas, infertile soil, flood-prone areas) and a subsistence economy lead to an immensely fragile aggregate of ecological, economic, and social systems. Any climatic disruption, such as drought or over-abundant rains, can immediately translate into food shortages. When the agricultural sector is more market-oriented, price fluctuations can also create equally serious risks for incomes. The relationship between wealth and health is important too. Productivity is limited by a work force that is malnourished or in poor health, and at the same time, health and welfare are limited by low productivity. This situation generates political dissatisfaction and social instability, which in turn prevent economic and social development.

In societies where poverty is rampant, market imperfections, inequity in price setting, and the absence of policies allowing for efficient distribution of income over a long period prevent the economic growth and development of marginal agricultural regions and social sectors.

In these contexts, agricultural populations frequently have no choice but to use natural resources (soil, water, forests, fisheries, grazing areas) beyond their replenishment capacity. This often results in a reduction in resources, ecological degradation, and, ultimately, greater poverty. Addressing this nexus of poverty, food insecurity, and environmental degradation is therefore a primary challenge for future research in agriculture and natural resource management (NRM).

The urban population now exceeds 50 percent in most industrialized countries. The United Nations projects that by 2025, some 57 percent of the population of less developed regions will inhabit urban areas. Experience has shown that urbanization leads to a diversification of food habits and greater demand for fruits, vegetables, and animal products. The U.N. Conference on Human Settlements held at Istanbul in 1996 stressed the need for greater attention to urban agriculture.

Alternative approaches are needed to help the world's growing cities and megacities develop a greater degree of local food self-reliance by increasing linkages within local foodsheds between farmers and city dwellers, as well as by expanding urban food production. IARCs can contribute to improving urban food security and agriculture in several ways. First, they can foster beneficial linkages between urban consumers and rural producers around cities and towns by promoting the

development of green belts. Depending on soil and growing conditions and the nature of urban demand, the green belt can involve horticulture, vegetable and fruit crops, nutritious grains such as millet to be distributed to the food processing industry, or production of animal products. The IARCs can develop models of green belts oriented toward urban food security using the information available from research on agroforestry and on crop and animal production. Such a movement in the villages surrounding cities and towns could also help improve the quality of the environment there.

In addition, the Global Knowledge System for Food Security described later in this report can help disseminate information focused on improving the opportunities for the production, processing, and marketing of fruits, vegetables, and food crops destined for urban areas. This system can also empower urban consumers with regard to food quality standards and thereby promote the cultivation of crops that are free of harmful contaminants. A great opportunity exists for strengthening the food security of both urban consumers and rural producers by linking them through markets.

2.5 Global Environmental Problems

World agriculture is linked to several environmental threats:

- water scarcity caused by increasing demands from both growing urban areas and the agricultural sector;
- soil degradation caused by such factors as salinization, nutrient depletion, and erosion;
- loss of global biological diversity through the disappearance of many species;
- the effects of global climate change and greenhouse gases, which could reduce high-potential agricultural areas of some deltas and plains if water levels rise as well as increase risks of drought and flooding in specific regions while possibly resulting in higher yields in northern European plains; and
- persistent trends of continental desertification, often linked to expansion of agricultural land and deforestation.

All these phenomena are compounded by the expansion of cultivated land and by farming intensification brought about by the growing demands of a rising population. The FAO estimates that, in the future, two thirds of the growth in agricultural production will occur through intensification and the remainder through the cultivation of new land. CGIAR research is thus inextricably linked to the ecological and environmental concerns arising from the increased use of land and resources.

2.6 Globalization of Trade and Economy

Major producing countries are redefining their agricultural trade strategies, which are likely to lead to a decline in production and export subsidies in an effort to enhance competitiveness. At the same time, an increasing concentration of firms might in the end create world oligopolies in agricultural input industries and trade. Small importing countries have no market power, and it is not easy for them to influence these developments, which have an important impact on them. Some of these countries seek to increase the volumes of the food aid they receive, and they thereby risk damaging local production. Others are trying to enhance the competitiveness of their domestic output. All will have to cope with a greater instability in market prices.

Agricultural negotiations under the World Trade Organization (WTO) will to a great extent influence the geographic location of output and trade flows. More and more, food security will also be affected by world trade patterns. It is likely, therefore, that the issues of food security and food aid will come under increasing debate within the WTO, as will issues relating to the social and environmental impact of agriculture.

The WTO will also be the forum for negotiations over the nature of intellectual property rights (IPR). The future value of the assets of the major international firms in the agri-food and farm input sector will depend on the powers conferred by the patents they hold. A significant debate will arise between these firms and farm producers' organizations, who will seek recognition of the work that generations of producers have put into genetic improvement, and will insist that producers retain the right to reproduce their seeds.

The WTO negotiations will therefore to a great degree define the context within which CGIAR and the IARCs have to operate in the future. Through its leadership role in agriculture, the CGIAR has an important role to play in enhancing the benefits of globalization while mitigating its adverse consequences.

2.7 Donor Commitment and Support

Official development assistance is changing. During the cold war, OECD donors provided large amounts of aid when unstable economic and social conditions threatened to drive a country into the camp of the Soviet Union. But ODA is now in steep decline. This is particularly the case in agriculture, where the impact of many projects has been deemed inadequate. This decline is occurring in the face of massive debt service in nearly all developing countries, leaving these nations with few resources for agriculture and infrastructure improvements.

In quantitative terms, total bilateral and multilateral assistance to agriculture in developing countries amounted to \$10.3 billion in 1995, some 20 percent below 1991 aid levels. In a world of increasing globalization, trade liberalization, and international concerns for the poor, these ODA levels should be compared with estimated agricultural subsidies of some \$335 billion a year in OECD nations and some \$10 billion in developing countries as a whole.

Yet new trends are appearing. Donors are providing assistance to decentralized initiatives in the form of locally oriented projects that can mobilize the human resources of non-governmental organizations (NGOs), producers' organizations, and local governments. The World Bank, having once promoted projects and then structural adjustment programs, is now offering Sectoral Investment Programs intended to deal with clearly targeted problems in the agricultural economy, in an attempt to generate the basis for new agricultural growth.

Agricultural research and the development of new technologies remain important areas for donor funding. The fact that donors are questioning the effectiveness of aid and aid policies should lead them to not only reinforce policy research and to focus on harnessing the best scientific and technical expertise to resolve development problems of a geographically localized nature, but also to use policy dialogue to encourage implementation of research results. It is becoming increasingly evident that aid will be called upon to help find solutions to critical local problems, such as conflicts over the use of scarce resources like water, land use conflicts between farmers and pastoralists in Africa, environmental disasters such as desertification, the loss of important biodiversity sites, zones facing permanent food shortages or recurrent flooding, and so on.

2.8 A Paradigm Shift for the CGIAR

When the CGIAR System was established, the mainstream strategy was to improve varieties and increase productivity of the staple food crops most important to developing countries, distribute them in favorable areas where rapid increase of yields could be expected, and promote appropriate stimulating policies based on subsidies, price stability, and public initiative in agricultural services. After some 30 years, the situation has changed, as the preceding sections have described. High-potential areas are facing yield plateaus, fertility disequilibria, and emerging environmental problems like chemical pollution and reduction of local biodiversity. Developing countries are unable to subsidize and stabilize prices. The challenge the CGIAR faces today is considerably more complex than in its early years.

The CGIAR has to make complex agricultural systems more productive in a sustainable way. Solutions must be developed for medium- and low-potential areas where a majority of the rural poor live. At the same time, high-potential areas—which are the source of cheaper food for the urban poor—are facing ecological challenges that threaten long-term sustainability. This requires that the CGIAR System work in a wider array of environments, with a broader range of commodities, often grown in mixed systems, and with concern for maintaining the resource base. The objective is to encourage forms of farming that greatly enhance productivity but that are environmentally friendly and take place under more liberal economic conditions.

Agriculture is becoming more and more knowledge-intensive. A symbiotic partnership between the public and private sectors will accelerate progress and will ensure the social and economic sustainability of new agricultural technologies. The value of such partnerships is already clear in frontier areas of science and technology such as biotechnology and information and communication technologies. The CGIAR should play a catalytic role in promoting symbiotic partnerships based on well-defined ethical principles that conform with its primary goals in the areas of food security and poverty eradication.

Linking advances in frontier sciences with the knowledge and practices of agricultural communities is crucial to addressing the dual challenges of productivity increases and sustainable use of natural resources. The innovative talents of farming (and other food-producing) communities are an extremely important resource for both local and global food security.

The challenge to the CGIAR and to its Centers is to mobilize the best of available science and technology and develop appropriate partnerships to address these problems. If it does, the CGIAR will contribute to the vision of a world where every person has access to enough food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient and effective food systems that are compatible with a sustainable use of natural resources. The difficulties that the System faces today suggests that there has not been a full recognition of the complexity and the magnitude of this challenge, leaving the CGIAR without an adequate strategy to address it.

RECOMMENDATION 1

The Panel recommends that the CGIAR's current mission statement—which is to contribute, through research, to promoting sustainable agriculture for food security in developing countries—be amended to read:

To contribute to food security and poverty eradication through research promoting sustainable agricultural development based on the environmentally sound management of natural resources. This mission will be achieved through research leadership, partnerships, capacity building, and policy dialogue.

We also recommend that each Center in the System modify its own mission statement to be consistent with the amended mission of the CGIAR. Center mission statements should be specific and focused enough to allow evaluation of the performance of each Center.

CHAPTER 3. CGIAR STRENGTHS, WEAKNESSES, AND GOALS

The CGIAR has developed into a well-recognized scientific body dealing with agricultural research in its broadest sense, including major crops, forestry, fisheries, and livestock relevant to developing countries. In a global sense, it is a small but effective group of 16 international Centers throughout the world with some 800 senior scientists and a total staff of some 11,000 persons. The independent international Centers work through networks and in partnership with a great number of different institutions in the South and the North. The CGIAR's strategy for the coming years should build upon the System's major strengths. Similarly, weaknesses must be identified and overcome.

3.1 Building on Strengths

The historical strengths and the comparative advantage of the CGIAR have derived from its committed and informed membership, informality and flexibility, and a well-focused agenda underpinned by the quality of the work of the Centers and the staff they have attracted and retained.

As the only effective and credible international agricultural research system, the CGIAR is uniquely situated to bring together key actors in the global agricultural R&D community to address its mission. The CGIAR's products and research are international public goods that have high applicability across countries and, in general, will not be produced at optimal levels by individual countries alone.

One major strength of the CGIAR and the Centers is their extensive *ex situ* collections of major crop species. As a whole, the CGIAR holds some 10 percent of the world's total *ex situ* collections, contributing substantially to global biodiversity protection. These collections are used for productive purposes through various multisite breeding techniques. On a much smaller scale, the IARCs conduct some breeding activities in fisheries and livestock and on multipurpose trees.

As is well known, the work of the IARCs has focused on solving major food security problems—mainly by increasing agricultural productivity—through research with an overall objective of poverty alleviation. The Green Revolution in wheat and rice began just at the time when, according to some experts, the world was expected to enter an era of widespread famines.

Even before the U.N. Conference on Environment and Development (UNCED) in 1992, the CGIAR made an early strategic policy decision to expand its work on environmental issues and the management of natural resources. This policy, which is aligned with the objectives of Agenda 21 adopted at UNCED, provides an excellent platform that helps to define the major research challenges of the future for the CGIAR.

The CGIAR is also relatively well positioned in the area of policy research. Policy is an important research area because without policies creating an enabling environment, research

findings cannot achieve maximum impact. In the mid-1970s, policy research was included in the CGIAR research portfolio through the establishment of IFPRI. Gradually, most Centers recognized a need for policy research, and CGIAR came to include Centers for the study of policies relating to forestry and water as well. Over the years, the feedback to the System from its policy research has helped CGIAR reorder its priorities and strategies.

Education and training programs at post-graduate, graduate, and technical levels have created a large international group of research alumni, many of whom are now in senior positions. Today they represent an important constituency for the CGIAR at both the research and policy level.

A rigorous system of external reviews of both the IARCs and of System function and priorities has played an important role in stimulating the definition of the most appropriate research strategies and in improving management. It has also created conditions for maintaining the scientific excellence and social relevance of the research and training programs of IARCs. The Technical Advisory Committee (TAC) has played an important role in this area.

3.2 Overcoming Weaknesses

From its early days in 1971, CGIAR has had a broad mandate and vision. The vision related to helping developing countries raise their rates of increase in food production above their population growth rates. In other words, the early thrust was on ensuring adequate availability of the food in the market. Criticism of CGIAR's early accomplishments was first heard in the mid-1970s from economists, environmentalists, and social scientists.

By the beginning of the 1980s it became clear that the CGIAR research agenda needed reorientation. Instead of concentrating on productivity improvements alone, there was a need to integrate the dimensions of ecological and social sustainability with that of economic viability. The IARCs started to undertake such a reordering of priorities with the help of TAC. The effort suffered from a mismatch between the available resources and the aims of the Centers, however. The goals were big, but resources were uncertain and shrinking. Under such circumstances, the introduction of new synergies into the System would have helped to compensate for the paucity of resources. Unfortunately, the greatly increased inter-Center cooperation and interaction that was needed did not materialize. System-wide and inter-Center programs were initiated only after many years, and it took time to mobilize the tools of modern technologies like molecular breeding, GIS mapping, and integrated farming systems research. The inadequate progress in further enhancing the yield potential of major food crops during this period was christened by the media as the "fatigue" of the Green Revolution.

Another weakness arising from inadequate resources was CGIAR's inability to respond effectively to the research needs of low-yield and high-risk areas, such as arid, semi-arid, rainfed, hill, and coastal regions. Centers were established to deal with the problems of arid and semi-arid areas, but hill and coastal areas as well as small islands could not receive the attention they needed. Thus CGIAR's accomplishments mainly occurred in irrigated, high-potential areas. Only new types of inter-Center collaboration supported by appropriate local and national partnerships can help overcome this deficiency.

The CGIAR and the IARCs have been slow to give appropriate attention to *in situ* collections in germplasm activities, and to recognize the full potential of biotechnology and molecular breeding to supplement conventional breeding. Partly, this relates to a lack of clear policy in dealing with

the private sector. It was not until the Lucerne Ministerial Meeting in 1995 that the CGIAR concluded that public and private-sector research in agriculture could supplement each other. Largely due to its non-political nature, the CGIAR's voice has received little attention in important political fora, such as the discussions on genetic resources in the Convention on Biological Diversity (CBD) and the FAO Commission on Genetic Resources for Food and Agriculture. Except for some recent actions, the CGIAR has been reluctant to deal actively with the acquisition and disposition of intellectual property and the use of proprietary science.

In spite of having been a leader in taking account of the environment and stressing natural resource management in its research agenda, the CGIAR has met with difficulties in elaborating a coherent research strategy. The eco-regional approach, which was intended to increase productivity and better manage natural resources in diverse locations, is still not conceptually clear.

Finally, at the level of the Centers, there has been a growing sense among scientists of a gradual shift in emphasis from science to administrative management. While management is important to enable each Center to perform well, it must not be forgotten that the purpose of the administration is to help scientists get their work done.

3.3 Goals for the CGIAR

The goals are set by the mission. The mission we have proposed involves integrated attention to food security, environmental protection, and poverty eradication. These are interrelated, since without environmental protection, sustainable agriculture cannot be fostered. Similarly, without poverty eradication, economic access to food cannot be achieved. The major challenge lies in including the excluded in terms of both farmers and farming systems. Both economically handicapped farming families and ecologically handicapped farming systems need a great deal of energy and attention.

The Centers have been able to generate effective interdisciplinary research when faced with finding solutions to important field problems. This strength should be preserved and enlarged to cover meaningful inter-Center collaboration that effectively addresses the CGIAR mission. And learning from the past, CGIAR should subject its technologies to environmental, social, and employment impact audits.

Since the CGIAR's budget is only a small fraction of the total global expenditure on agricultural research, it is important that the System play a catalytic role, particularly through building new partnerships and strengthening old ones.

3.4 Conclusion

The Panel was asked to consider whether the CGIAR System would still be needed through the early years of the next century and, if so, why. We have answered with a resounding yes, while recognizing that the System should be changed substantially. The changes that we recommend are highlighted at the end of most sections of this report. Here we want to emphasize that the CGIAR System is uniquely tasked with the critical function of serving as a bridge that brings the advanced science and technology of the industrialized world to bear on the needs of the world's poor. Thus, the CGIAR as a System must focus on discovering the true needs of those in poverty

with regard to their agricultural practices, and it must continually bring these needs to the attention of the scientists and engineers most likely to be able to meet them.

The CGIAR should focus on demand-driven, strategic/applied research—it simply cannot afford to focus on the newest basic research (the purview of universities and a few advanced laboratories) or on extension work (the purview of national systems). The System must be able to use the most advanced methods in its strategic applied work, must be able to communicate its strategic results to national systems, and must do relevant training in the process. But it cannot substitute for either end of the spectrum.

The niche to be covered by the CGIAR should be primarily upstream research using the most appropriate scientific methods to solve food security and agricultural problems faced by poor people in developing countries. The System should focus on research that is not being undertaken by either national public research institutions or the private sector. In using the most appropriate scientific methods, the System should fully exploit modern science, including bio-engineering and modern genomics when appropriate.

At one extreme, the bridging function requires that the System maintain a strong continuous connection to the world's advanced research institutes, so that the very best new science can be brought to the service of the poor (producing new animal vaccines, disease- and drought-resistant crops, farming systems, and so on). At the other extreme, it means that the CGIAR must also maintain a continuous direct connection to farmers.

Putting scientists with this unusually wide range of expertise inside of the same organization will greatly facilitate the connection between advanced science and poor farmers—a prerequisite if the real needs of those in poverty are to be addressed by the most appropriate science. This will require that each Center Director emphasize the creation of close, meaningful contacts between the entire staff of the Center. The world's scientists who are carrying out fundamental research on the cutting edge have developed effective mechanisms for communicating with each other (scientific journals, workshops, Internet networks, and so on). However, these scientists are generally unaware of the many ways in which their science could be used to improve agricultural practices on behalf of the poor. The CGIAR must see itself as the world's primary connection between these two very different cultures. Each IARC must therefore focus on forming an effective bridge between the advanced scientists in its area of expertise and those individuals in direct contact with the needs, skills, and resources of poor farmers. This can be achieved in part through its own demand-driven research and in part through its catalysis of new partnerships focused on specific problems.

Finally, as we emphasize later, all parts of the CGIAR must vigorously exploit the new communications technologies, focusing on forming a universally accessible global knowledge system that at long last is truly capable of spanning the immense distance between the world's most advanced scientists and the resource-poor farmers who badly need access to the most appropriate science and technology.

RECOMMENDATION 2

The Panel recommends that IARCs strive to serve as global Centers of frontier science and technology for sustainable food security, serving as a bridge that brings advanced science and technology to bear on the needs of the world's poor. They should become resource centers on frontier technologies, policy research, sustainable use of natural resources, capacity building, and networking. They will need to enhance their symbiotic scientific links with NARS, ARIs, the private sector, and NGOs in industrialized and developing countries. At the same time, they should help develop and disseminate environmentally sensitive technologies based on appropriate blends of traditional and modern methods, while placing more emphasis on work in low-potential areas.

CHAPTER 4. RESEARCH PRIORITIES AND STRATEGIES

4.1 Cultivating Strategic Advantages

The mission of the CGIAR suggested in Recommendation 1 is critical for the world's future. Moreover, it is nowhere near being fulfilled by the CGIAR or by others. The research efforts of the CGIAR are therefore badly needed. But because the resources available are small compared with the unmet needs, the System must choose carefully the projects and programs that it emphasizes. In doing so, it should consider its strategic advantages.

The concept of strategic advantage is well suited to the activities of the CGIAR and the IARCs. For more than 20 years the Centers have built up considerable scientific assets that give them major advantages in doing international agricultural research. As noted in the section on CGIAR's strengths, the main strategic advantages lie in germplasm collection, integrated natural resource management, and policy research. In addition, the CGIAR has access to the world's store of knowledge through a new emphasis on international knowledge collection and dissemination using the Internet.

Of course, the existence of these advantages does not mean that the CGIAR and the IARCs should go it alone in these fields. On the contrary, as discussed earlier, they must place stronger emphasis on exploiting synergies with the ARIs, the NARS, NGOs and the private sector.

4.2 The Subsidiarity Criterion

During the 1995 Ministerial-Level Meeting in Lucerne, it was proposed that one of the criteria that should be used to define the positioning of the CGIAR and the IARCs with respect to the NARS be that of subsidiarity. In a research system based on subsidiarity, the primary responsibility for a research activity should be devolved to the lowest level in the hierarchy, from global to regional to national, that can carry out the activity most appropriately and efficiently. In this way, locally specific problems are addressed by local institutions, to the extent possible, with regional or global institutions filling gaps. Similarly, research questions of a regional nature are addressed by regional or international institutions, and global issues are addressed by international organizations.

4.3 Generating More Synergy from the CGIAR as a System

The actual effectiveness of the IARCs in the movement toward sustainable agriculture depends on the extent to which they feel that they are truly part of a collaborative System, which quite naturally seeks to find the best people from the pool of all 16 IARCs, as well as other partners, when addressing a problem or project. Because the annual competition for funds among IARCs works against their close collaboration, the System must put energy into providing the opportunities and incentives for a different kind of behavior. In short, the CGIAR "System" must work hard to become more of a true system. We believe that the 16 Center Directors are best

positioned to provide wise advice on specific mechanisms that might achieve greater inter-Center synergy and accountability.

Achievement of the CGIAR's goals will require greater inter-Center cooperation. New methods of increasing System synergy through the integration of the complementary strengths and expertise of different IARCs will have to be developed. In addition, the task requires bringing in new partners who have the expertise that the CGIAR System lacks. Experience shows that such collaborations work best when they are organized around specific projects that are large and ambitious enough to have the potential of having a major downstream impact, but small enough to be led by a few talented and highly motivated scientists with complementary expertise. Thus much of the success of the CGIAR will depend on a skillful selection of projects. These must be identified in close cooperation with the potential users of the results, so that a strong connection is made to the needs of the poor farmers.

RECOMMENDATION 3

The Panel recommends that IARCs concentrate on topics relevant to improving sustainable food security and the generation of greater opportunities for rural income. This dual strategy will require:

- **greater inter-Center collaboration;**
- **new methods of increasing System synergy;**
- **new and expanded partnerships;**
- **IARCs, in conjunction with regional and sub-regional organizations, acting as neutral convenors of all the actors in the research-development continuum in each region, while providing access to assets and resources and filling gaps by providing what others cannot do as competitively; and**
- **the CGIAR to use its moral force and its scientific credibility to get the type of cooperation and coordination established that makes optimal use of available resources.**

CHAPTER 5. INTEGRATED GENE MANAGEMENT

As noted in Chapter 2, the gene revolution has had dramatic effects in several areas that affect the CGIAR: it has enabled new scientific approaches in genetics, pest management, and agronomy; it has expanded the concept of conservation of genetic resources; it has given rise to new complications with regard to intellectual property rights; and it has posed new questions with regard to both biosafety and ethics. All these diverse new aspects will require the CGIAR to acquire new skills if the System is to manage them in a coherent way. This provides the underlying rationale for the concept of integrated gene management (IGM).

5.1 A Review of the New Science

Three different aspects of the new science deserve a brief review: a renewed approach to selective breeding, a more sensitive assessment of environmental impacts and safety risks, and the provision of a functional basis for a new agronomy.

5.1.1 A renewed approach to selective breeding

Effective selective breeding has three main components:

- the existence of sufficient genetic variability in the initial population for subsequent selection. Instead of relying on indirect statistical methods to estimate genetic variability, polymorphic molecular markers now offer new tools for the monitoring of genetic variability in selection schemes. In addition, if new variability is to be added, transgenesis provides a new and efficient way to accomplish single gene transfers.
- The ability to assess the genetic value of an individual or a group on the basis of phenotype. Through "marker assisted selection," the heritability of a desired trait can be made much more efficient by the use of molecular markers linked to the genes supporting that trait, including those contributing to quantitative variation (quantitative trait loci, or QTLs).
- the ability to make crosses between the appropriate individuals or groups, so as to maximize useful heterosis effects. For this purpose, molecular markers can now be used to estimate the genetic distance and the expectation of heterosis effects between groups.

In summary, breeders will have available a set of tools that improve the efficiency of their selection schemes considerably: they can make a more accurate choice of the genotype to be selected, they can increase the number of genotypes analyzed by marker-assisted selection while growing in fields only 10–20 percent of them, and they can reduce the time needed for genetic improvement of a given character through the direct assessment of the genetic value of a genotype without requiring progeny testing.

5.1.2 A more sensitive assessment of environmental and social impacts

Biotechnologies supply new tools for a more precise monitoring of the impacts of human activities on biodiversity. Even if a species or a population does not seem to be threatened from a demographic point of view, it can suffer from genetic disequilibrium, such as a reduction of allelic diversity or a deficit of heterozygosity, and this can be revealed by molecular markers. This approach can be useful for assessing, for instance, the long-term effect of agricultural practices on the biodiversity of insects or soil micro-organisms.

The impact of transgenic crops, fish, or animals on the environment is another subject that must be studied carefully and extensively before promoting any large-scale use of transgenesis for the genetic improvement of agricultural species. Tropical ecosystems are often more ancient, more complex, and less well understood than temperate ones, and they deserve special care. Biotechnologies provide tools for monitoring these potential impacts, allowing the precise tracking of gene flows within and between species, as well as the consequences.

There are many uncertainties and potential risks associated with biotechnologies and bioengineering, including: adverse social and economic impacts; risks to human and animal well-being; risks to the environment; adverse food safety impacts; and risks to ethical beliefs and value systems, challenging deeply held ideas on humankind and its relationship with nature. The potential risks of biotechnology must be taken into account and weighed against the opportunities presented by these technologies for impacting food security among the poor. In harnessing the gene revolution in pursuit of its mission, the CGIAR must be aware of the risks involved and take all necessary steps to minimize negative effects. It is therefore important that anticipating and averting such risks be given high priority and be built into the research process from inception.

5.1.3 Providing a functional basis for a new agronomy

Scientists can now study the reaction of an organism to a given environmental stimulus (either biotic or abiotic stimulation, including temperature, salinity, light, attack by insects, and attack by micro-organisms) at the level of its genome (expression of specific genes, changes in protein levels, and so on). The selected genes can then be eliminated or modified in a targeted attempt to alter phenotypes in a desired way. In this manner, it will be possible to build up progressively more sophisticated functional models of plants and animals, based on a precise understanding of their biology and ecology.

Even if the operational development of this new agronomy does not arise in the short term, this development is a necessary complement to a strategy of conferring a maximum added value to seeds.

5.2 Genetic Resource Conservation

Genetic resources have been generated through time by producers' communities, private breeding companies, and public research. This has covered traditional landrace varieties, folk varieties, and new varieties and breeding lines. Farmers have always had the right to produce their own seeds. Until very recently, researchers in the public sector throughout the world have been exchanging genetic material freely. The idea that genetic material is one of humanity's common assets had prevailed for a long time.

The Convention on Biological Diversity, which came into force in 1993, has recognized the genetic resources occurring in a country as the sovereign property of that nation. The CBD also stipulates that access to genetic resources should be on the basis of the prior informed consent of the communities conserving them and that exchanges between countries should be on mutually agreed terms.

The 600,000 acquisitions kept and stored in *ex situ* conditions by the IARCs are not included in the CBD accord, and have been placed under the auspices of FAO. Their future status depends on further negotiations of the Conference of the Parties of the CBD. The major issue now under discussion relates to the implementation of the ethics and equity provisions of the treaty. The need for equity in benefit sharing was promoted in the form of farmers' rights in FAO fora. It may be useful to summarize briefly the background to this issue.

The concept of farmers' rights developed in the International Commission on Plant Genetic Resources of FAO (now the Commission on Genetic Resources for Food and Agriculture) has undergone considerable refinement during the last 10 years. As proposed originally, farmers' rights meant acknowledging the invaluable contributions of farm women and men to the conservation and improvement of plant genetic resources (PGR) by selection for characteristics such as agro-ecological adaptations, resistance to biotic and abiotic stresses, and improved culinary qualities, as well as knowledge addition through information on desirable traits. Knowledge addition is of particular value in the case of medicinal plants. Several books, such as the U.S. National Academy of Sciences publications The Lost Crops of the Incas and The Lost Crops of Africa, bring out clearly the crucial role played by indigenous and rural families in selecting and conserving plants of significance to the food and health security of human and farm animal populations.

Before the advent of well-structured government-sponsored methods of *in situ* conservation and *ex situ* preservation, the dominant method of conservation was *in situ* on farms by local communities. This resulted in numerous folk varieties and rich intra-specific variability. The more than 100,000 rice strains preserved cryogenically in gene banks, like the one at IRRI in the Philippines, are the products of the *in situ* on-farm conservation traditions of farm families. *Ex situ* and *in situ* conservation methods are widely supported from public funds, since they are regarded as "public good" activities. Unfortunately, one important component of this system—*in situ* on-farm conservation—is yet to be recognized as an activity of supreme public interest. Indigenous and rural families are thus conserving genetic variability for public good at personal cost. The concept of farmers' rights seeks to end the inequity inherent in the current recognition and reward systems.

5.3 Convention on Biological Diversity and Farmers' Rights

The CBD is a significant landmark among international agreements since it incorporates, for the first time, the principles of ethics and equity in both access to genetic wealth and sharing of benefits. Article 15(1) recognizes the sovereign rights of nations over the genetic resources occurring in their respective countries. Article 15(5) stipulates the need for prior informed consent in the use of genetic resources, while article 15(4) proposes that access be on mutually agreed terms. Several articles of the CBD stress the need to recognize and conserve traditional knowledge and wisdom. The treaty also draws attention to the critical role of women in the conservation and improvement of genetic resources.

The CBD is legally binding, while the FAO undertaking on plant genetic resources is not. The FAO Commission on Genetic Resources for Food and Agriculture has therefore been discussing how to get a suitable protocol incorporated in the CBD that will capture the principles and commitments underlying FAO's undertaking. This was discussed at the Fifth Extraordinary Session of the FAO Commission in Rome from 8–12 June 1998. The major difficulty arises from the fact that the contributions are often made by entire communities and therefore cannot be attributed to individuals. Thus procedures are needed to recognize and reward community contributions to genetic resources conservation and selection. In order to make progress, the Commission has requested that FAO carry out an analytical financial study on possible formulas for the sharing of benefits for each country and region.

Considering the importance of the issues involved, it showed great foresight for the CGIAR to set up a Genetic Resources Policy Committee (GRPC) in 1994. Since its establishment, GRPC has been actively advising CGIAR Members on developments in this field.

As decisions resulting from international negotiations will have important implications for CGIAR's work in genetic improvement, the CGIAR and the IARCs must participate in the decision-making and policy-setting process and play a role that reflects their importance in the field. They should present themselves on the international scene as a united body and speak with one voice. At the same time, it is equally important that Members of the CGIAR representing their respective governments assist in ensuring that their government representatives take a consistent stand at fora like FAO, the Conference of the Parties of the CBD, and WTO.

5.4 Intellectual Property Rights

The debate about the future status of genetic resources has been focused on "classical resources"—that is, genes or genotypes resulting from traditional varieties, wild relatives, or improved varieties resulting from conventional selective breeding (in the case of the International Convention for the Protection of New Varieties of Plants [UPOV]). Biotechnologies create a new type of "genetic resources" consisting of cloned genes with an associated biological function. These genes coming from micro-organisms, plants, or animals can be introduced in a large set of species and confer properties difficult to obtain through selective breeding. The new "genetic resources" will certainly have in the future a much larger strategic interest than the "classical" ones and will mainly result from the activities of private companies.

Consequently, the concept of "genetic resources" (within-species diversity) and the broader concept of "biodiversity" (which includes between-species diversity) deserve convergent approaches. The genes of interest for the improvement of a given species could be taken in the future from a very remote species with no present agricultural interest. The global preservation of biodiversity is thus part of a strategy for a sustainable agriculture.

The Multilateral Trade Agreement came into force in January 1995, embodying provisions on Trade Related Intellectual Property (TRIPs). Under TRIPs, all countries must allow for the patenting of all inventions (processes and products) by 1999. Where plants are concerned, this may be achieved by patents, an effective individual system, or a combination of both (for example, a UPOV system).

In the long term, most new varieties may include patented genes, at least for the world's main crops. This applies to all areas of agriculture, including livestock and fisheries. Genetically modified organisms (GMOs) can be patented in the United States. The use of these processes and transformed varieties by others for further breeding could therefore be blocked for up to 20 years. Thus the process of genome privatization has begun.

European countries have opted for plant variety protection under the UPOV Convention. The purpose of this treaty is to recognize and ensure an intellectual property right to the breeder of a new plant variety. The Member States of UPOV grant such a right in accordance with the provisions of the Convention under their national legislation.

In April 1998, UPOV had 37 members. The 1991 Act of UPOV, which strengthens breeders' rights, came into force on 24 April 1998. To be eligible for protection, varieties have to belong to one of the botanical genera or species on the national list of those eligible for protection. They should be distinct from commonly known varieties and should be sufficiently homogeneous and stable. Protected varieties remain available for use as a source of variation for the development of other varieties.

IARCs cooperate with their NARS partners in getting suitable material and new varieties approved for release in developing countries. The TRIPs agreement will come up for review in 1999. If by then an internationally agreed Multilateral System of Exchange comes into force for crops of importance to food security, the progress in plant breeding can continue in a dynamic fashion.

The coexistence of different types of intellectual property rights in a unified international market will probably lead to international negotiations within the framework of the WTO. If the U.S. patent law becomes an international standard, a small number of private corporations are likely to be the primary patent holders. Will public research institutions be able to remain scientifically competitive? Because their future is at stake, the CGIAR and the IARCs have no other choice but to patent the varieties that they have genetically transformed. The public nature of the patents held by the CGIAR could be maintained by allowing the use of these patented varieties under a free license. This patenting is thus of a defensive nature, being needed to maintain a strategic place for public research directed towards the reduction of poverty. Patenting can create a valuable asset for the CGIAR that can help achieve its mission.

Patenting does not mean going into systematic competition with the large private firms. On the contrary, the complementarities would be useful and in the common interest. A permanent interaction between these firms, the CGIAR, ARIs and strong NARS would therefore appear to be desirable.

The CGIAR will need a legal entity which could hold the patents of all the IARCs. This entity could be the central body proposed in Chapter 15. A central mechanism is also needed to allow the System as a whole to develop guidelines for partnerships in germplasm development with the private sector, ARIs, and NARS.

There is a high cost to obtaining and administering patents, and the IARCs will need to be able to quickly mobilize the required financing in a confidential manner. It is therefore essential that the CGIAR and the IARCs have enough financial resources at their disposal for this purpose.

5.5 An Integrated Gene Management Initiative

The greatest impact of IARCs so far has been in the area of crop breeding. This has been possible because of the wide range of germplasm assembled by the Centers and the wide range of locations for varietal testing. This strength must be preserved. The more than 600,000 *ex situ* collections of plant genetic resources maintained by Centers is not only the largest such collection of PGR in the world, it is also the most value-added collection in terms of information of applied value (such as genes for resistance to biotic and abiotic stresses). The benefits for global food security from this priceless international heritage can be further enhanced by an integrated gene management initiative. This CGIAR initiative should be based on the principles and provisions of the CBD regarding conservation, sustainable use, and the equitable sharing of benefits.

In terms of conservation, the initiative should cover *ex situ* preservation, *in situ* on-farm conservation of agrobiodiversity, and development and dissemination of guidelines for the sustainable management of *in situ* conservation sites (such as off-farm sites). A Corpus Fund should be established that would help insulate the conservation of the CGIAR germplasm collection from overall funding uncertainties. This fund will be important for preserving genetic resources for current and future use.

The initiative should help enlarge the composition of the food basket by including "minor" and little-used crops of value in traditional food systems which are important for household nutrition security. The list of crops prepared by FAO and IPGRI could be examined for this purpose. Enlarging the food basket can not only help improve the stability of food availability but also contribute to overcoming micronutrient deficiencies. In this connection, it would be appropriate to redesignate "coarse" cereals as "nutritious" cereals.

CGIAR Centers can serve as genetic enhancement centers that help distribute novel genetic combinations relevant to environmental sustainability for use by NARS in the breeding of location-specific varieties. They can assist NARS in molecular marker-based breeding, including the use of QTLs. The CGIAR can launch a global genomics cooperative to bring the benefits of molecular genetics and bioinformatics to the breeding efforts of developing-country NARS.

To increase the chances of sustainable use, the initiative can establish a policy framework for biosafety and gene deployment that will help avoid the risks associated with the release of transgenic organisms and work with the CBD Secretariat in the development of an agreed international biosafety protocol.

To move toward the equitable sharing of benefits, the initiative should strengthen steps to prevent misappropriation of CGIAR material held in trust under agreement with FAO for commercial profit and monopolistic use. It should also work with FAO in finalizing the revised International Undertaking on Genetic Resources and getting it included in the CBD, as well as promoting, in conjunction with the Commission on Genetic Resources for Food and Agriculture, a multilateral system of exchange of genetic resources in crops of importance to food and nutrition security. CGIAR can help NARS, upon request, with information relevant to the equitable sharing of benefits with the conservers of genetic resources, while promoting the integration of principles of equity and ethics in the use of genetic resources and information at the international level.

5.6 The Need for a Larger, System-wide Effort

Some aspects of research on the application of molecular techniques to produce novel genetic combinations are becoming increasingly controversial in the public mind. A case in point is the ongoing debate on the ethics of GMOs relating to the control of plant gene expression that can cause abortion of embryos in F1 hybrid seeds. Genomics and molecular breeding offer unusual opportunities for promoting environmentally sustainable advances in crop and farm animal productivity. On the other hand, it is clear that such unlimited scientific power must be used with care and must be based on a code of ethics if it is to result in lasting benefit to society.

A central coordinating and servicing unit could provide all the participants in the international agricultural research community (IARCs, NARS, ARIs, and private-sector R&D institutions) with advice on:

- intellectual property rights and patenting,
- biosafety,
- bioethics,
- biosurveillance,
- a System-wide format for material and knowledge-transfer agreements (which also exist now on the basis of the advice given by GRPC),
- *Sui generis* systems of plant variety protection, and
- a System-wide information network (which already exists in the form of SINGER operated by IPGRI).

This System-wide unit could be located at IPGRI, since this will facilitate close coordination with FAO.

The CGIAR will have to strengthen its capacity to provide analysis and advice in legal and strategic areas with respect to IPR. The System entity in charge of this function should:

- be well informed concerning the scientific, economic, and legal implications of current developments in the IPR field;
- have a good relationship with all the stakeholders, in particular NARS;
- be able to give valuable professional advice; and
- provide strategic advice to assist the CGIAR in dealing with new ethical issues, such as those arising from recently introduced genetic mechanisms.

Center-level biosafety, bioethics, and biosurveillance committees need to be set up. These exist now, but their duties and composition should be reviewed and streamlined within an overall CGIAR policy. In addition, these committees should have access to effective information and communication and education systems, which will help to allay public fears relating to recombinant DNA research.

A mechanism for public information and transparency in research objectives and approaches is also needed. The value of information empowerment of the public in matters relating to GMOs is evident in the results of the referendum carried out in Switzerland on 5 June 1998, in which all the Cantons and more than 66 percent of the voters approved continued research and testing in the area of recombinant DNA technology because of the efforts of researchers to convey credible information to the public. The proposed coordinating center should continuously provide unbiased information on ongoing research and its potential benefits and risks. There should be transparency in relation to research on GMOs.

A statement issued by the Royal Society of London in September 1998 entitled "Genetically Modified Plants for Food Use" stresses that "the use of GMOs has the potential to offer real benefits in agricultural practice, food quality, nutrition and health." At the same time, it points out, "all parties must appreciate the public's legitimate concerns; consumer confidence, based on an appreciation of the scientific evidence and the regulatory checks and balances, is central to whether GMOs will contribute to feeding the world's rapidly expanding population." CGIAR thus needs an effective public information system to promote clear understanding of the goals of the integrated gene management program.

We believe that the organizational structure suggested here can help harness the tools of modern biotechnology for improving crop and farm animal productivity without associated ecological or social harm. The details of such a global partnership could be worked out at the proposed International Genome Conference, to be convened by CGIAR jointly with other partners. At this conference, a Voluntary Code of Conduct can be developed to guide relationships among the partners. Such a code would supplement the regulatory measures that may be imposed by national governments from time to time.

5.7 Shifting System Resources to Address New Priorities

This report suggests a number of major new efforts be undertaken by the CGIAR, including the Integrated Gene Management Initiative. What programs might be reduced in order to free up the resources needed for these and other new priorities? It is our impression that the overall resources devoted to conventional plant breeding efforts could be reduced, and that this could be done without loss of productivity. Thus, for example, modern marker-assisted breeding greatly reduces the cycle times for the production of new varieties, as well as the amount of field testing required after crosses. Moreover, a vigorous effort to forge new collaborations with ARIs should reduce the number of personnel needed for these efforts at the IARCs. And the present duplication of breeding efforts for the same crops at different IARCs needs to be carefully examined.

For all these reasons, we suggest that CIMMYT serve as the convening Center for a System-wide review of all plant breeding activities, and that this effort—guided by a review team of outside experts—be focused on increasing the efficiency with which plant breeding is carried out by the System as a whole. This review should also ensure that modern marker-assisted methods of breeding and the appropriate bioengineering techniques are effectively incorporated throughout the CGIAR.

RECOMMENDATION 4

The Panel recommends an integrated gene management approach based on:

- **patenting processes and new varieties, and entrusting their use under free licensing;**
- **a legal entity which could hold CGIAR patents;**
- **the conservation of agrobiodiversity and its sustainable and equitable use;**
- **research on genomics and molecular breeding for the purpose of supporting NARS to enhance the productivity of major farming systems in an ecologically, economically, and socially sustainable manner;**
- **strict adherence to the equity and biosafety provisions of the Convention on Biological Diversity and national government regulations;**

- a central coordinating and servicing unit for advising both IARCs and appropriate NARS;
- a widened food security basket through inclusion of minor and underused millets, grain legumes, tubers, and other crops;
- the use of molecular and Mendelian methods of breeding in an integrated manner;
- an effective public information and communication system and total transparency and accountability in relation to work in the field of biotechnology; and
- a System-wide review of plant breeding efforts, with the aim of freeing up resources for new priorities while accelerating the introduction of modern marker-assisted breeding and bioengineering technologies.

CHAPTER 6. INTEGRATED NATURAL RESOURCE MANAGEMENT

Emerging natural resource management methods illustrate the paradigm shift that is occurring in agricultural sciences: from classical agronomy to ecological sciences, from analytical research to systems dynamics, from top-down to participatory approaches, and from factor-oriented management to integrated natural resource management.

New agricultural techniques will have to be rigorously assessed before being introduced in order to avoid potential negative impacts on ecosystems. Technical changes, as well as social, economic, and institutional changes, will have to be seen as modifications of the whole system in which they are included, not simply as independent introductions. Innovations in production systems will thus have to be considered as sets of changes related to strategies addressing the entire System. Integrated approaches to the study of system change will be needed. Agro-ecological systems management will therefore become a major research area. Ecosystems management in a wide sense—cropping systems, livestock systems, fisheries, forestry, agro-forestry, and the interaction with the surrounding ecosystems—is based largely on NRM and policy management. The purpose of these management approaches is to guarantee ecological and economic viability and sustainability, as well as the social acceptability of technical, economic, and institutional changes.

It is well known that the yields obtained by farmers with long-established varieties or landraces are often far below their potential for reasons related to NRM—that is, NRM problems are at present causing enormous yield losses. If the CGIAR pulled out of NRM research, it could be left in the position of providing steadily improved varieties that farmers were quite unable to use effectively for NRM reasons.

Natural resources are abundant. Most are renewable, although some are not. Each can be considered separately in order to understand their flows and cycles, such as nutrient cycles, organic matter cycles, and water cycles. But all resources form a system that must be analyzed in order to characterize its replenishment capacity and further develop solutions to maintain it and make it more productive through appropriate management. Research programs have been organized through the years to progressively integrate management practices around extended pieces of ecosystems: integrated pest management; integrated soil, water, and nutrient management; integrated crop management; and integrated resource management. Advances in methodologies for ecological analysis and in modeling allow progressively more comprehensive approaches.

Nevertheless there are still many difficulties in representing ecosystems, particularly over-exploited and cultivated ones. First, ecosystems are scale-embedded and are spatially organized at different levels through the plot, the farm, the local landscape unit, the catchment unit, and then the economic and social unit—extending to continental and global levels—all of which are interconnected. Second, there are also different temporal scales and cycles, for example those related to climate, economic cycles, or household time-life cycles. Third, many actors are

involved in the evolution of an ecosystem, such as agricultural producers, cattle breeders, fishers, people dependent on forest resources, village institutions, local governments, traders, enterprises, banks, public services, and so on. Often no institutions exist to facilitate coordinated and integrated management. In the rural areas of developing countries, where poverty is extensive, ecological crises result from the exploitation of natural resources in a manner that far exceeds their carrying and replenishment capacities.

Thus it is necessary to define methods that will make it possible in the future for all players in a local area to commit to a durable agricultural and rural development system—that is, to ensure the viability of ecosystems, farmed or not, and the societies that use them. To define an NRM approach in agriculture research using the best new scientific tools and methods to be used by NARS is an important objective that can be realized through eco-regional site-specific case studies. From such projects, many general lessons can be learned.

Why does the CGIAR need NRM research? Any organization dealing with land use, agriculture, and forestry must protect the basic resources of those systems, including soil, water, rivers, and forests. NRM research is an essential component of the integrated agronomy that advances the agriculture of an area. Without it, the potential of improved germplasm cannot be obtained. NRM research is also essential so that new methods and new germplasm do not produce results that damage the immediate productive resources or the wider environment.

At present, only 26 percent of the CGIAR Centers' expenditures on soil and water research go to off-site effects. For most of the large commodity Centers, the figure is 10–15 percent. If the major objective of NRM work is productivity enhancement, such a distribution can be understood, but the increasing importance of off-site effects must not be underestimated.

The CGIAR has not moved assertively enough to address international environment/natural resource issues. It could and should move proactively to occupy the “high ground” of global, problem-solving environmental science. It has to attract environmental organizations to its meetings, invite environmental scientists to its committees, and place environmental concerns on its agenda. The comparative advantage of the CGIAR for natural resource and environmental research lies in world-level analysis. CIFOR, for example, derives considerable comparative advantage from its ability to build links between the scientific communities in the three tropical regions.

6.1 Needed Research Approaches

The basic challenge facing the CGIAR is to extend Green Revolution-type productivity increases through the rainfed areas of the tropics. This calls for much more careful NRM work than before, so that drought resistance and suitable growth duration in the plant is matched with maximum soil water storage in the field. Most of the so-called marginal lands are marginal or fragile because of NRM problems caused by the climate and soil composition, so that their unimproved economic output will naturally be low and irregular.

In practice, the main types of NRM issues relevant to the CGIAR would be as follows, bearing in mind that all of these can occur in many different variants, and that the reversibility of the processes varies considerably.

- Soil physical degradation
- Soil chemical degradation

- Soil biological degradation
- Water quality degradation
- Forest degradation
- Loss of biodiversity
- Coastal zone degradation

6.2 Linking Local to Global Management of Environmental Problems

Global change resulting from human-induced climate change, regional climate change, desertification, water scarcity, and reduction of the diversity of species are all matters affecting ecosystems from the local to the global level. For the future, research at the different levels will need to become more integrated, and the CGIAR Centers have a strategic advantage in this. The CGIAR has a unique capacity to combine the expertise of its specialists to improve understanding of the dynamics at all scales of land use change.

This is particularly true in the area of forestry and agro-forestry research. Forests play an important role in maintaining biodiversity in *in situ* conditions, in improving water availability, and in moderating local climates and mitigating the impact of global change by carbon sequestration. Reduction of forest areas and particularly devastation by fires can reduce biodiversity, increase desertification in the long run, reduce water availability, and increase the greenhouse effect. Forests also play an important role in food security—some 500 million people, most of whom are very poor, depend wood and non-wood forest products for their livelihoods. An important challenge for the future is to define land use planning methods acceptable to local populations that can help to increase production while maintaining the favorable ecological role of forests. This includes agro-forestry production, establishment of protected areas, and sustainable management of forest areas. Scientific land use planning is an essential prerequisite for sustained advances in crop production.

An integrated NRM approach will involve three basic steps. The first is to identify the extent of the resource degradation and rural poverty problems to be addressed, place these problems in their relevant spatial and temporal scales and identify their driving forces, and then predict their future trends and patterns. Farmers and other local stakeholders need to be involved from the beginning of the process. The research questions to be answered by biophysical and social scientists working cooperatively are:

- What is the overall importance of the problem we are trying to address relative to other problems within our domain of expertise, mandate, or comparative advantage?
- Where does the problem occur, what is its relative magnitude, and if and where is it likely to become a problem over the planning horizon considered?
- What are the foreseeable options, strategies, or solutions available from CGIAR Centers and partners?
- What would be the expected relative efficiencies and net benefits (including potential “spin-offs”) should various options/strategies be implemented at specific places and at specific points in time?

Addressing these questions should lead to the identification of priority research themes (including priorities for policy research), priority geographical areas for the work, and priority target groups of stakeholders for the interventions.

The second step is to undertake research activities to enhance the food production services of existing land use systems in a sustainable manner. The questions to be addressed include, Which crop/tree species, which animal or fish species, which techniques should be the focus of the work, and why? How should the work be spatially organized through the farm, landscape, and region to assure the continuous improvement of the externalities generated by these systems? What are the prerequisites for successful adoption? This leads to the identification of a range of resource management options that should increase food production and farmers' incomes.

Those activities require interdisciplinary work, including policy specialists. There should be a strong focus on capturing indigenous knowledge concerning resource use, as well as on marketing issues related to new products.

The third step is to do on-farm research to assess the trade-offs among the options arrived at thus far. This leads to the identification of projects to be handled by various partners and Centers. Here an active interaction is needed with stakeholders of the region so that the priorities of the CGIAR are compatible and supplementary to those of the national programs and research agendas of NARS.

Clearly, the implementation of the NRM approach necessitates the establishment of partnerships with concerned stakeholders—including policy-makers at different level, from the village to the international sphere—as well as new collaborative modes among the CGIAR Centers, NGOs, NARS, and ARIs. The emphasis is no longer on large-scale adoption of a single solution, such as an improved crop variety, by one category of stakeholders (farmers), but on ensuring that a given problem that occurs in a variety of environments is solved in a sustainable manner through the adoption of ranges of options by farmers, regional bodies (including NGOs), and policy-makers at the national and international levels.

It is critical that a proper match be achieved between the precise needs of a NARS and the programs of IARCs. This will call for the joint preparation of an agricultural research strategy for each country by the respective NARS and a consortium of IARCs. Highest priority should go to the training of scientists and to the promotion of farming methods based on natural resource conservation. The CGIAR System must aim to do a much better job of developing bottom-up, demand-driven projects in which the main potential users of new knowledge have real ownership.

6.3 Current CGIAR Efforts on NRM

The CGIAR has many advantages. It is at the cutting edge of the production of new plant varieties, which is a critical part of the complex of factors that can drive forward agricultural productivity. It has an unrivaled string of research sites around the developing world. It has generally close and good relations with NARS, without which NRM improvements are unlikely to be developed and will almost certainly remain unused. CGIAR has the advantage of being international, thus bypassing some of the political problems that may beset work in developing countries, especially where NRM problems cross frontiers. The CGIAR both needs to and is well-placed to do NRM research.

Most Centers have now been established in one or more regions for a number of years, and should have built up a strong collective knowledge of their mandate territory. Each Center will need to define the sequence in which it applies its resources to different NRM problems, depending upon TAC's defined priorities and its judgment on the likelihood of success in each

case. Given true partnerships with the NARS, an eagerness to draw in partners, well-supervised on-farm work with farmers, and careful attention to the policy environment, this type of NRM work is extremely useful. We believe that it would best satisfy the motivations behind the eco-regional approach adopted by the System.

Centers will, of course, specialize in appropriate aspects of NRM. (See Table 1 for an overview.) Thus CIMMYT focuses largely on residue management and conservation tillage subjects, IRRI has a special focus on the treatment and behavior of flooded soil, ICRAF deals with the competition of mixed tree-crop species through the distribution of resources between them, ICRISAT and ICARDA are strongly involved in soil-plant-water relations in drought conditions, and CIAT and IITA have more general roles. This concentration of effort is entirely proper in terms of the Centers' mandates, but it is not certain that it produces a logical CGIAR cover of the NRM subject area in total. A more extensive analysis of work on the soil and water topics is given in TAC's 1997 Priorities and Strategies for Soil and Water Aspects of Natural Resources Management in the CGIAR. Several of the Centers are using GIS methodologies to develop scientific land use plans.

Table 1: NRM Focus of Various IARCs

Topic	Center
Soil	CIAT ICRISAT IFPRI IITA
Water	ICLARM ICRISAT IFPRI IIMI IRRI
Integrated NRM	CIAT ICARDA ICRAF ICRISAT IITA
Biodiversity	
<i>In situ</i> conservation	CIFOR ICRAF
<i>Ex situ</i> preservation	CIMMYT ICARDA ICRISAT IRRI
<i>In situ</i> on-farm conservation	CIAT CIP ICARDA IITA IPGRI WARDA

IIMI has now changed its scope to cover all forms of water use rather than just irrigation water. IIMI's work carried out in collaboration with NARS has shown that the scope for improving irrigation water use efficiency is large. For example, IIMI's analysis has shown that about half of the increase in demand for water by 2025 can be met by increasing the effectiveness of irrigation. In fact, excessive water application is leading to problems of water logging and salinization in many irrigation projects. Water is likely to become the most limiting factor in agriculture in several parts of the world. Consequently, there are several global initiatives to deal with issues in the areas of water conservation and sustainable and equitable use, such as the Global Water Partnership and the World Water Council. UNESCO and the Government of Spain plan to establish an International Center for Cooperation in Water Management at Valencia, designed to assist in a proactive resolution of emerging water conflicts. IIMI will have to work with such centers, so that water-related issues are dealt with in an integrated manner at the international level.

The various challenges to sustainable management of natural resources for agricultural development are largely eco-regional in nature and require eco-regional solutions. The CGIAR has placed emphasis on the eco-regional approach, although this is not yet well defined. In some ways it appears that the original spirit of the eco-regional approach—to create a force to address specific critical problems in specific areas—has been diluted.

Much of the lack of progress in implementing the eco-regional approach can be attributed to the reorganization required within Centers to develop a new paradigm for research and to form the wider partnerships required for these global imperatives, the lack of appropriate governance mechanisms, mechanisms based on participatory decision-making across large numbers of national agricultural research institutes (NARIs), and a proliferation of research sites.

Active interaction is needed with regional stakeholders so that CGIAR priorities are compatible with and supplementary to NARS' programs and research agendas. Eco-regional research requires increased collaboration with NARS and ARIs, and a stronger emphasis on incorporating indigenous and farmer knowledge and innovation systems. The CGIAR needs an effective management model for eco-regional research.

6.4 Formation of a Network

Conservation of natural resources is essentially a national task. IARCs can assist in scientific soil health and water management through a few well-designed eco-regional research and demonstration projects. A series of such pioneer projects could be linked in the form of an International Network for Integrated Natural Resource Management, promoting the conservation and enhancement of the ecological foundations of sustainable agriculture. Enhancement of crop productivity without damage to the ecological foundations is the pathway to an evergreen revolution. This will include emphasis on precision farming methods and environmentally benign technologies such as efficient water use, integrated pest management, and integrated nutrient supply systems. Precision farming helps reduce costs and enhance net income. At the same time, it helps avoid environmental damage.

The proposed network will be a learning experience both for scientists and for farmers. It will have to be organized in a participatory research mode. Systems of measuring the impact of new technologies on environmental capital stocks will have to be developed. The science of ecological economics is still in its infancy. IFPRI, in association with other advanced research

institutes working in this area, will have to develop reliable indicators and monitoring tools for measuring sustainability. To create awareness of the need to maximize resource use efficiency, IARCs should develop ecological methods of expressing productivity—for example, yield per cubic meter of water and kilogram of nutrients rather than merely yield per hectare of area.

There are vast opportunities for integrating the principles of ecological economics with field-level agronomic methodology. This is an area where the international network can lead the way. An international network of the kind proposed will require the support of a coordinating center. Because of its active involvement in the sustainable management of natural resources over many years, CIAT could be considered for this role.

There is also need for the sustainable management of marine resources. Countries with large exclusive economic zones will have to develop monitoring tools for ensuring the sustainable use of living aquatic resources. ICLARM could take the lead in the development and dissemination of tools and indicators for measuring the long-term impact of current methods for exploitation of ocean resources.

RECOMMENDATION 5

The Panel recommends that the CGIAR enhance its research methodology by adopting an integrated natural resource management approach. Further, the organization of an International Network for Integrated Natural Resource Management will link productivity research with the environmentally sound management of natural resources. The network should be based on, among other things:

- Centers that are retooled with sciences needed to manage the viability and sustainability of ecosystems;
- a definition of the corresponding methods at different spatial scales, particularly at local levels;
- adoption of precision farming techniques in relation to tillage, irrigation, nutrient supply and pest and post-harvest management;
- development of indicators for measuring sustainability;
- development of sustainable systems of management for aquatic resources;
- joint preparation of national agricultural research strategies by respective NARS and a consortium of IARCs; and
- development of more bottom-up, demand-driven projects.

CHAPTER 7. A GLOBAL KNOWLEDGE SYSTEM FOR FOOD SECURITY

The revolutionary new communication possibilities created by electronic networks not only have a tremendous potential to create a more synergistic CGIAR System, they also make it possible to spread knowledge much more effectively to all who need it. The past few years have seen a dramatic rise in the connectivity of the Internet around the globe, and new communication possibilities are emerging from the private sector, based on large satellite networks, that should soon make low-cost, rapid Internet access possible anywhere at any time.

Researchers in industrialized nations are already making heavy use of this new communication tool to speed the pace of scientific research. Moreover, there is a major thrust to make access to the world's store of knowledge through the World Wide Web a public good. Many governments and NGOs are making their data, books, and reports freely accessible to everyone on the Web. The CGIAR has an important role to play here, since a special effort will be needed to allow the global agricultural system to exploit the vast potential of the Internet for increasing food security and reducing poverty. We believe that the CGIAR System, working with FAO and the World Bank, NARS, ARIs, and NGOs, should take a leadership role in the development of an effective Global Knowledge System for Food Security for the benefit of NARS, NGOs, the private sector and other organizations working to end hunger and deprivation, and the media.

We suggest that ISNAR and IFPRI be considered as the convening Center for the Global Knowledge System, since the primary mandate of ISNAR is to build the capacity of NARS and since IFPRI already has programs relevant to this topic. Different CGIAR Centers could take the primary responsibility for different knowledge areas, while the FAO and many other organizations outside of the CGIAR System would make critical contributions to this effort in their primary areas of expertise.

7.1 Providing Scientific and Technical Databases Free to the Developing World

The developing world has traditionally had very poor access to the world's store of scientific knowledge. Scientific libraries are very expensive to establish and maintain, and the great distances and poor transportation systems in much of the developing world have made access to them problematic. The communications revolution has the potential to eliminate this lack of access. Nearly all scientific journals are now published in an electronic form. Some scientific organizations have already begun creating special access to the electronic versions of their journals for the developing world. An organized effort to spread this practice is quite likely to be successful, since there is a negligible cost involved in providing free password access to developing-country scientists. This will make the world's scientific and technical literature available immediately everywhere, as soon as it is published.

The next problem that developing-country scientists will face is finding the information they need in the voluminous published literature. Industrial countries, either through their governments or through private organizations, have generated a set of highly effective databases containing the world's literature that are searchable by electronic means, with directly accessible abstracts.

Traditionally, the cost of such searches has made them too expensive for much of the developing world. In 1997, however, the U.S. National Library of Medicine began to provide their indexing of the complete biomedical literature for free on the World Wide Web. Efforts are now under way to provide the same type of free electronic access to indexes of the world's agricultural and environmental literature.

The combination of electronic journals readily available on the Web with the free availability of electronic search capabilities in this medium should allow any developing-world scientist connected to the Internet to gain access to the world's store of scientific knowledge nearly instantaneously. This will create a quantum leap in the accessibility of scientific and technical knowledge throughout the world.

7.2 Special Web Sites Focused on Communicating with the Developing World

Developing-country scientists are likely to need much more than complete access to original scientific and technical literature to be truly effective in bringing knowledge to bear on important problems in their regions. They will also need special summaries of the most relevant knowledge in areas such as soil conservation, fertilizer use, water systems, plant breeding, livestock production, farming systems, agricultural technologies, pest management, GIS data, and so on. And scientists and extension workers who work directly with farmers will need simpler types of documents that they can distribute directly to people without higher education. Many useful documents of both kinds already exist, having been produced by various national research and extension institutions, CGIAR Centers, agricultural universities, and NGOs. But these documents are currently not available to the vast majority of their potential users.

The world agricultural system now has a great opportunity to make the best of these documents available in many languages, along with developing new documents. The availability of hypertext links that can instantaneously connect different Web sites allows the many relevant organizations around the world to contribute to a common central site—without losing either the control of their textual material or the credit that they deserve for producing it.

Perhaps the most important difference between the Internet and its predecessor technologies used for mass communication is its inherent ability to facilitate two-way communications. As a communication tool, it is enormously more suitable for the CGIAR mission than is the one-way communication of information possible through television or radio. Partnerships are central to nearly all CGIAR activities, and through the Internet, developing-country NARS can become an integral part of a global information exchange network. As a result, people in developing nations will be able to participate much more actively in global activities, and they should no longer feel isolated.

Through this two-way network, the Internet can also be used to organize and spread indigenous knowledge. The innovative talents and experience of farmers are extremely important resources for research on food security objectives—offering locally bred varieties, germplasm evaluation and characterization, *in situ* conservation, and skills in managing complex food production systems. But indigenous knowledge is eroding rapidly with the loss of many native languages. Researchers are often unfamiliar with community innovation and knowledge because of mutual apprehension and distrust, which stems from a serious lack of communication. Yet we know that indigenous knowledge combined with new and classical scientific knowledge is the best way to find appropriate solutions to local problems.

7.3 A Geographic Index of Projects That Addresses the Lack of Coordination in Agricultural Research and Development

The entire world system of agricultural research and development is badly in need of more coordination. Without it, a great many opportunities are being missed to spread knowledge of best practices throughout the developing world. If there were more cooperation and synergism in the system, each of the many different, independent, and often competing efforts to decrease rural poverty through improved agricultural practices would be more effective. Our visit to CGIAR Centers took us to parts of the developing world where many different multilateral, bilateral, NGO, and national efforts were being made to increase sustainable agricultural productivity. Everywhere we went, we found a surprising lack of knowledge and information exchange among these efforts. Not only were many opportunities for cooperative activities being missed, but the staff in national systems were often being pulled in contradictory directions by the different international projects they were asked to support.

Before any two organizations can think about cooperating, they need to know what each of them is doing in a particular nation or local region, and to be provided with an easy way to communicate between the relevant individuals. In principle, the World Wide Web is ideally suited for creating this special type of communication system. It is critical that the relevance, credibility, and timeliness of information be paramount, however, since these aspects would facilitate effective and efficient cooperation and coordination.

RECOMMENDATION 6

The Panel recommends that, the CGIAR, in partnership with FAO, the World Bank, NARS, ARIs, and NGOs, the CGIAR develop an effective Global Knowledge System for Food Security. This would be a central element in the CGIAR's future capacity building efforts. ISNAR and IFPRI should be considered as the convening Center for this initiative. This initiative should:

- benefit NARS, NGOs, civil society organizations, and the media;
- pay attention not only to frontier science and technology but also to traditional wisdom;
- be built on a decentralized management scheme for its various components;
- make international research databases available as free goods to developing nations;
- produce Web sites of special relevance to the developing world through a highly skilled central screening and coordinating unit;
- promote the organization, spread, and understanding of traditional knowledge systems;
- facilitate direct contact via e-mail between developing-country scientists and individual experts throughout the world, beginning with the organizing of young professionals and IARC alumni; and
- promote cooperative activities through a geographically indexed Web database containing projects of all organizations performing agricultural research and development in each region.
- take account of existing relevant databases

CHAPTER 8. POLICY RESEARCH

Since the onset of organized agricultural research systems, agricultural scientists have produced many innovations that have been spread by extension services. In numerous cases adoption of these innovations was difficult, either because the techniques proposed were not sufficiently well adapted to local conditions, or because they presented economic risks, contradicted local culture, or were constrained by inadequate accompanying economic policies.

Agricultural extension becomes effective only when the conditions needed to apply the knowledge being disseminated are also available, including not only inputs such as water, seed, and fertilizer, but also the availability of markets that reward increased productivity. When innovations lead to radical changes in methods of cultivation and livestock/fishery breeding, market forces in subsistence economies often do not provide sufficient incentive for change. Stronger accompanying policies are needed. However, this requirement is frequently not met, due to lack of know-how, political will, or good governance and management, or simply because of the complexity of the issues. Thus policy is a research area that is taking on critical importance—one that will increasingly evolve under the influence of changes in management sciences.

It is useful to distinguish several types of policy research: agricultural economic policy, environmental policy, food and nutrition policy, trade policy, social policy, science and technology policy as it applies to research, and good governance and management.

The development of agricultural economic policies is in various stages of evolution in developing countries. The obligation to apply policies for structural adjustment and economic liberalization has significantly affected general policy options. Agricultural production is generally expected to benefit from such reforms. But in reality the agricultural sector is so complex and often entirely driven by the market economy that macroeconomic policies rarely achieve the expected influence on producers' choices. Moreover, under liberalized conditions, governments have fewer policy instruments at their disposal to induce change. Markets play a much more significant role, but in many cases they are not well developed, particularly rural financial markets that greatly influence agricultural and rural growth and development. Furthermore, the expansion of democracy and the empowerment of civil society is bringing about new forms of debate and negotiation involving many economic and social stakeholders. In order to play their new role, governments will require new tools to help them in policy-making:

- new policy analysis tools allowing a better description of all categories of producers, consumers, and enterprises, as well as price information for most important goods and macroeconomic implications;
- new, more detailed sectoral models connected with general equilibrium models are needed in order to simulate the effects of macroeconomic decisions on the agricultural and food sectors, particularly for the poor;

- tools that facilitate the development of a more equitable market economy: commodity sub-sector analysis, analysis of market institutions, market information systems, and tools for enabling negotiation among economic partners to reduce risk and uncertainty, increase productivity, improve quality, and define common export strategies; and
- tools that facilitate negotiation between producers' organizations, other stakeholders, and the State in making public choices for agriculture.

Environmental policy is another important area for policy research for the CGIAR. The IARCs should certainly enhance their research capacities so that they can better link the environmental and economic aspects of policy; but what they may be best able to do, following their natural resource management orientation, is to focus on public policies at local levels, where most of the decisions regarding sustainable exploitation of land, water, and other natural resources in agriculture are made.

The public decisions that create environmental linkages to agriculture, livestock, fisheries, and forestry on a local scale are often numerous—for example, with respect to transportation infrastructure, land use planning, and technical choices for public irrigation schemes. In order to be efficient, these local public choices need to maximize social well-being and social revenues; in order to be socially acceptable and capable of mobilizing the needed capacities, they need to be debated in a democratic framework. Local-level democracy and efficient public choices are thus inextricably linked. The social sciences have much to contribute with respect to the methodologies used to generate a local consensus that provides the appropriate advice for local decision-making.

It is also on the local scale that natural resources such as irrigation water, groundwater, forests, grazing areas, wildlife, and so on are most often managed. These resources are, in most cases, common property resources that have often been used unsustainably. Uncontrolled access commonly results in overexploitation and conflict. The twenty-first century will likely be marked by numerous conflicts over access to and management of resources—especially water. Here again, the social sciences and conflict resolution research will have a key role to play. In the ultimate analysis, public understanding and cooperation are vital for ensuring that the population does not exceed the supporting capacity of ecosystems. Regulation is important, but education and the social mobilization needed for local decision-making are equally central to success. Therefore, research must invest more in understanding local-level institutions and in improving methods for institutional reform, institution building, and conflict resolution.

Science and research management policy is vital for the success of a research system. The CGIAR has created a special institute (ISNAR) for servicing the NARS in this domain. Modern management techniques have been defined and proposed to NARS (such as programming, evaluation, monitoring). Much more can be done, since developing countries need to come up with their own rationale and policies for research priorities setting, so as to become more focused and better able to guide the resources provided by various donors. Use of the techniques developed in this area ultimately depends, of course, on an appropriate priority being assigned to research in the developing nation itself.

CHAPTER 8. POLICY RESEARCH

Since the onset of organized agricultural research systems, agricultural scientists have produced many innovations that have been spread by extension services. In numerous cases adoption of these innovations was difficult, either because the techniques proposed were not sufficiently well adapted to local conditions, or because they presented economic risks, contradicted local culture, or were constrained by inadequate accompanying economic policies.

Agricultural extension becomes effective only when the conditions needed to apply the knowledge being disseminated are also available, including not only inputs such as water, seed, and fertilizer, but also the availability of markets that reward increased productivity. When innovations lead to radical changes in methods of cultivation and livestock/fishery breeding, market forces in subsistence economies often do not provide sufficient incentive for change. Stronger accompanying policies are needed. However, this requirement is frequently not met, due to lack of know-how, political will, or good governance and management, or simply because of the complexity of the issues. Thus policy is a research area that is taking on critical importance—one that will increasingly evolve under the influence of changes in management sciences.

It is useful to distinguish several types of policy research: agricultural economic policy, environmental policy, food and nutrition policy, trade policy, social policy, science and technology policy as it applies to research, and good governance and management.

The development of agricultural economic policies is in various stages of evolution in developing countries. The obligation to apply policies for structural adjustment and economic liberalization has significantly affected general policy options. Agricultural production is generally expected to benefit from such reforms. But in reality the agricultural sector is so complex and often entirely driven by the market economy that macroeconomic policies rarely achieve the expected influence on producers' choices. Moreover, under liberalized conditions, governments have fewer policy instruments at their disposal to induce change. Markets play a much more significant role, but in many cases they are not well developed, particularly rural financial markets that greatly influence agricultural and rural growth and development. Furthermore, the expansion of democracy and the empowerment of civil society is bringing about new forms of debate and negotiation involving many economic and social stakeholders. In order to play their new role, governments will require new tools to help them in policy-making:

- new policy analysis tools allowing a better description of all categories of producers, consumers, and enterprises, as well as price information for most important goods and macroeconomic implications;
- new, more detailed sectoral models connected with general equilibrium models are needed in order to simulate the effects of macroeconomic decisions on the agricultural and food sectors, particularly for the poor;

RECOMMENDATION 7

The Panel recommends that:

- **greater emphasis be placed on social and management sciences in order to address issues of local policy-making, conflict resolution related to natural resource management, participatory research approaches, and research policy;**
- **policy analysis research be strengthened;**
- **policy formulation and analysis be carried out with selected developing countries;**
- **the CGIAR organize System-wide Dialogues for Policymakers at regular intervals;**
- **in collaboration with other appropriate IARCs, NARS, and relevant bilateral and multilateral development institutions, IFPRI launch a special program to strengthen the capacity for collaborative policy research and formulation in countries where inadequate public policy support is the major cause of a wide gap between potential and actual yields in farmers' fields; and**
- **capacity building in policy research cover economic policy-making and environmental and science and technology research policies.**

Lastly, research must define new relationships with producers, as they are the real clients of the CGIAR and IARCs. For a long time agricultural scientists have been working primarily in research stations, following their own visions of producers' needs. This process has been reversed with Farming Systems Research, as producers' organizations have begun to play a more important role in setting the research agenda. But for the future, further steps are necessary. Producer knowledge and experience must be considered as a primary input for problem-solving research. New methods for targeting research activities and making farmer participation more effective must be developed.

CGIAR's work since 1972 has shown that agricultural progress takes place only if mutually reinforcing packages of technology, services, and public policies are introduced. Agricultural progress is retarded if a region has inadequate public policies in the areas of poverty alleviation, household food security, nutrition, land reform, natural resource conservation and sustainable use, rural infrastructure development, or pricing. The absence of producer-oriented marketing opportunities also greatly hinders progress. Contrary to what has been traditionally assumed, an efficient market is not an unregulated market. On the contrary, it is a market that operates according to rules that will guarantee its efficiency and reduce its negative external effects. In particular, new agricultural policies are needed in most African nations, in order to create the local market incentives that will stimulate farmers to grow more food. Additionally, food security and nutrition policies also must be in place. Outside expertise, based on studies of what has worked elsewhere in the world, is of course important in the development of such national policies. However, it is critical to recognize that any policy developed by outside experts and then offered to a nation, no matter how wise, is much less likely to be adopted than are policies developed in collaboration with national policy-makers.

We therefore recommend that IFPRI, in collaboration with ISNAR and other appropriate IARCs as well as NARS, launch a special program to strengthen the capacity for policy research and formulation in countries where inadequate public policy support is the major cause of a wide gap between potential and actual yields in farmers' fields. Capacity building in policy research should cover not only economic policy-making but also environmental and science and technology research policies. Wherever possible, the capacity building should occur as part of a collaborative process in which CGIAR personnel work closely with the appropriate in-country personnel.

The CGIAR should also organize System-wide Dialogues for Policy Makers at regular intervals. One aim of these Dialogues would be to assess the real needs of those in developing countries by bringing them face-to-face to those most intimately involved in their national policy making—whether from universities, government, NGOs, or the private sector. The other major aim would be to build both personal and intellectual links between all those in the CGIAR who have complementary skills with similar goals.

The IARCs themselves have derived immense benefit from such cooperation. Multilocation trials have helped to obtain speedy and reliable data on genotype-environment interactions. IARC-NARS cooperative research has also been essential for understanding the constraints responsible for the gap between potential and actual yields in farmers' fields, as well as the relevance of new germplasm and other technologies—including their social, ecological, and economic impacts.

Thus capacity strengthening is and has been a major focus of the CGIAR, though budgetary allocations to these activities have declined somewhat in recent years. As some NARS have gained strength and as financial resources have tightened, there has been a general push within the System to move capacity strengthening activities "upstream." For example, the 1996 TAC panel on Priorities and Strategies for Policy, Management, and Institution Strengthening concluded that resources should be shifted from services to research on institutional development related to agricultural research in developing countries.

Given this trend, what role, if any, should the CGIAR play in training and capacity building in the coming years? Is there still a need for training? Is the CGIAR still providing a public good that is not available elsewhere? TAC has concluded that "there is a need to strengthen NARS capabilities in policy and natural resources management research, both in terms of trained scientists and institutional capacities. However, given the current support available from other sources for NARS, TAC considered that the CGIAR should continue to assist NARS principally through collaborative research, providing access to its products and research management support."

While some services may well be available through non-CGIAR sources, many NARS, including NGOs, nevertheless continue to place a high priority on receiving them from CGIAR Centers. ISNAR is responding to this dilemma in part by moving generally toward the research end, but providing services through consultants on a cost-recovery basis. And some CGIAR Centers are moving from training activities per se to "training of trainers."

The Panel agrees with the goal of working toward the strengthening of national-level organizations that can in turn provide training and other services to NARS. However, insofar as this goal has not yet been achieved, the CGIAR and its Centers should ensure that training services are available for the NARS that require them. Weak NARS cannot be allowed to fall further behind, especially as the research community moves ahead with new sciences and technologies. Further, Centers should provide training in strategic research (for example, biotechnology) to any already stronger NARS through meaningful collaborative research partnerships. The CGIAR Centers also have an important role to play in providing training in the areas of bioethics and biosafety, a service not yet being provided elsewhere.

Also in an effort to both encourage NARS' capacity and to streamline Centers' portfolios, many Centers have been urged by recent External Program and Management Reviews (EPMRs) to devolve various activities to NARS partners. While turning over appropriate research activities to capable NARS should be part of the CGIAR's strategy to build national-level capacity, many Centers note that NARS are often not ready or able to take on these activities. A deeper and perhaps more realistic understanding of NARS' capabilities is therefore in order.

Not only must the CGIAR support capacity strengthening in terms of technical skills, but NARS must develop into functioning national agricultural research systems that are more inclusive.

CHAPTER 9. STRENGTHENING NARS: CAPACITY BUILDING

Building capable and effective national agricultural research systems is an undertaking that extends far beyond the CGIAR. Governments of developing countries must place a high priority on supporting and fortifying their NARS as part of their overall development strategies. Further, a few NARS are now undertaking high-quality strategic research in addition to solid adaptive research. The CGIAR should work in partnership with these NARS to support relatively weaker systems. And it should actively encourage the internationalization of strong NARS and the development of South/South research cooperation. It must also encourage developing-country governments to place higher priority on providing financial and institutional support to their NARS.

9.1 A Continuing Emphasis on Proven Capacity Building Programs

The ability of agricultural research to address poverty and food security is dependent on the effective functioning of all actors in the research and development continuum. The weakness of many NARS in adapting CGIAR Centers' research outputs to the national level has long been cited as a primary constraint on CGIAR's impact. As the System adopts an explicit dual focus on productivity and natural resource management, the increased complexity of research questions places even greater demands on NARS partners.

To date, one of the successes of the CGIAR has been the fostering of an effective partnership with national agricultural research systems, which are broadly defined as the universities, local research NGOs, relevant private-sector research organizations, and governmental agricultural research institutions in a nation. The IARCs have contributed in several ways to strengthening NARS. Some of the efforts that have been most successful are:

- training individuals at the post-doctoral and graduate levels and through short-term non-degree programs;
- supply of germplasm and research material;
- dissemination of information and literature;
- organization of cooperative networks;
- organization of workshops, symposia, and seminars;
- linking NARS with advanced research institutions in industrialized countries; and
- fostering cooperation between NARS of different nations through workshops and site visits.

Other areas where different IARCs have helped NARS are in institution building and development of experiment stations. IRRI, for example, has helped China, Vietnam, Cambodia, Egypt, Madagascar, Thailand, Bangladesh, Indonesia, and the Philippines to develop their own rice research institutes. This type of work is of course critical for sustainable national agricultural development over the long term.

9.3 Production of Web-based Education and Training

In industrialized nations, it is widely recognized that lifelong learning has become essential in a world driven by new science and technologies, with frequent retraining being needed for many professions. Fortunately, we now have a new tool that makes this type of education much more readily possible. The World Wide Web is being used as a direct teaching tool that allows virtual classrooms of interacting students and faculty to be created through "asynchronous learning networks." Studies that have compared the performance of students in the same course taught either in person or on-line have demonstrated that highly interactive distance learning through the Web can produce students who do just as well as those taking a course on a university campus.

Because the Web allows a course taught at one site to be taken by students anywhere in the world, it increases enormously the ability to build scientific and technical capacity in developing nations. A large range of different education and training opportunities can be offered on-line, so that an individual will be able to obtain exactly the education and training he or she needs, rather than being confined to the particular courses offered at the local university.

The Panel believes that the CGIAR System should view itself as having special responsibility for promoting access to appropriate education and training opportunities on the Web. The System could start by evaluating the distance learning courses being developed by universities throughout the world, specifically searching for those that are particularly appropriate for the CGIAR mission in developing nations. By simply cataloging and advertising the availability of these courses, and perhaps subsidizing tuition where appropriate, the CGIAR System could play an important role in worldwide capacity building in agriculture. However, the CGIAR System should also develop its own courses in those cases where no one else is providing the appropriate Web-based training.

The CGIAR System could also consider acting as an accrediting organization that makes available a variety of different types of graduate degrees and training certificates—based on specific criteria that the System sets for course quality and student performance. By offering its own degrees, the CGIAR System could set a meaningful international "gold standard" for student accomplishment, which might help developing countries identify the most-qualified people for research and extension positions in their own NARS.

RECOMMENDATION 8

The Panel recommends that:

- the CGIAR continue to emphasize the capacity building efforts that have been successful in the past;
- the CGIAR strengthen partnerships with bilateral and multilateral development agencies providing technical assistance and support in capacity building
- there be an increased emphasis on broadening the range of capacity-building efforts that the CGIAR considers essential for its work, particularly policy-making capacity in NARS;
- new emphasis be placed on establishing national-, regional-, and sub-regional-level consultative processes for research and development;
- the CGIAR play a leading role in organizing, and if necessary producing, a large menu of Web-based, highly interactive distance education and training courses;

Organizations and institutions beyond the NARIs must be meaningfully included in the systems, and fields beyond agriculture, such as natural resource management, must be incorporated. This broader definition of what constitutes a NARS becomes even more important as we deal with issues such as natural resource management, biodiversity, gender, knowledge-intensive management, policy, equity, poverty reduction, and food security, in which the social science inputs required are considerable.

Accomplishing this will require the System to involve individuals and organizations of a wide range of different types within each nation. In particular, we recommend that a new emphasis be placed on fostering national- and regional-level consultative processes for agricultural research and development. In developing a national strategy, coordination should be maintained with the bilateral and multilateral agencies operating in that country, as well as with appropriate ARIs and agricultural universities.

In this respect, the Panel agrees with the 1996 TAC panel on Priorities and Strategies for Policy, Management, and Institution Strengthening in recognizing the importance of expanding capacity strengthening activities to cover organizations operating in the private non-profit, university, and profit sectors, and fostering inter-Center collaboration in capacity strengthening to increase impact beyond the mandate areas of individual Centers.

Further, the Panel believes that true collaborative research partnerships between CGIAR and NARS scientists are an important form of NARS capacity strengthening.

9.2 New Capacity Building Efforts That Need More Emphasis

For small countries or countries having common problems, or when countries want to share activities, regional research organizations have been created. The international research community and international donors are often interested in supporting these regional organizations because they can make the limited scientific resources available to each nation more effective; in addition, they are expected to be more stable than many small national public research institutions. In addition to strengthening NARS, IARCs in the future should focus on strengthening these regional research organizations, both through individual capacity building and through policy work focused on helping them become more effective in their roles. This includes helping regional organizations establish independent and objective review processes, similar to those that are routinely used to monitor and improve the various components of the CGIAR.

In general, the CGIAR must become more adept at generating bottom-up, demand-driven projects, in which the main potential users of new knowledge (regional research organizations, farmer groups, NARS, and so on) have been engaged fully in planning phases, making it clear they have some ownership in the outcome. This will not only go a long way toward building the type of partnerships that are needed for the dissemination of effective technologies, it will also ensure that the upstream efforts of CGIAR scientists are focused on the development of germplasm, natural resource management systems, and so on that best meet the actual needs of the poor. This will require both a special outreach effort on the part of the IARCs and the development of more effective science-based strategic planning capacities on the part of NARS and regional research organizations. The development of such a capacity, where it is lacking, should become a major new focus for training by the CGIAR System.

CHAPTER 10. ERADICATION OF POVERTY, WITH A SPECIAL FOCUS ON WOMEN

The evolving concept of food security stresses a human-centered approach to agricultural research, education, and development that alone can help lead to a world free of hunger and deprivation. Today, economic access to food has assumed the greatest urgency, since food is available in the market, except under conditions of conflicts and mini-wars, for those who possess the necessary purchasing power. Poverty elimination is thus a must for ensuring economic access to food.

CGIAR's work on environmentally sustainable productivity improvement is particularly important for farm families operating small holdings. Stability of prices induced by adequate production also helps consumers belonging to the economically under-privileged sections of the society. Thus CGIAR's research agenda leads to a beneficial downstream impact on poverty.

CGIAR's mission calls for the mobilization of science and technology to alleviate poverty. Poverty alleviation is an important goal of all national governments and international and bilateral donors. Both the World Bank and the U.N. Development Programme have poverty reduction as their major mission. The White Paper on Poverty issued by the U.K. Government in 1997 outlines a strategy for concerted action to remove poverty and deprivation. In spite of all these efforts, poverty and economic and gender inequity are increasing in the world. The World Bank has calculated that more than 1 billion people have a per capita income of US\$1 or less per day. Another 2 billion live on earnings of US\$2 or less per day. What contribution can CGIAR make to minimize and ultimately eliminate poverty?

Available data show that in most developing countries, rural poverty is more acute than urban poverty. In addition, degradation of environmental assets, including common property resources, leads to the unplanned migration of the rural poor to towns and cities, leading to the proliferation of urban slums. The poor are poor mainly because they have no assets—no land or livestock or fish ponds or forest trees or technical skills. Their major assets are time and labor. Poverty alleviation will be possible only if it is based on an asset-building foundation. An immediate impact can be made through information empowerment and through imparting new skills. An integrated approach to on-farm and off-farm employment needs to be promoted, using the opportunities afforded by new environmentally sound technologies for initiating decentralized production enterprises.

It has become increasingly clear that among the poor, women farmers and farm laborers need particular attention. Indeed, the World Conference on Women held in Beijing in 1993 called for urgent action to halt the growing feminization of poverty, and drew attention to the increasing feminization of agriculture.

Women in the field of agriculture are often engaged in operations that involve much drudgery and physical work for low wages. CGIAR's role in poverty alleviation, apart from the

- **Centers pursue meaningful collaborative partnerships with strong NARS in areas of strategic research;**
- **the CGIAR encourage the internationalization of certain strong NARS, thereby facilitating more South/South research collaboration; and**
- **a stepped-up CGIAR public awareness program is needed to promote awareness of CGIAR/NARS collaboration and the importance of research to developing-country governments.**

CHAPTER 11. A PRIORITY FOR SUB-SAHARAN AFRICA

Although South Asia constitutes the major "hot spot" region from the point of view of the number of people going to bed hungry, inadequate progress in improving food production in several parts of Africa—in spite of the availability of extensive research know-how and national, bilateral, and international efforts—is a matter for serious concern. Population growth in many African countries currently exceeds 3 percent per annum. Desertification is extensive, particularly in the Sahelian region. The CGIAR has been spending 40 percent of its resources in Africa. Nevertheless, success has been limited, except in instances like the biological control of cassava mealy bug and the spread of improved varieties of maize, wheat, barley, cassava, and a few other crops. According to current estimates, fully one third of the population in sub-Saharan Africa will be food-insecure in 2010. This, taken with the high percentage of Africans living below the poverty line, indicates the magnitude of the problem.

The challenge for the agricultural research community is to adapt itself in order to play a strategic role in agricultural development that not only increases food availability but also income for rural farmers and firms, and at the same time maintains the integrity of the natural resource base.

Sub-Saharan Africa has been the focus of attention by the development community because of recurrent famines, droughts, and environmental degradation. In the past, it was possible to explain deterioration of the food situation in Africa by a lack of political will and by social strife and ethnic conflicts. These cannot be the sole reasons now. Some African countries have put in place sound policy priorities for agricultural development. Agricultural prices favoring producers have substantially contributed to growth and poverty alleviation. Numerous local initiatives made possible by the new liberalization and democratic processes are likely to result in meaningful improvement of rural livelihoods.

In the Sahelian areas, attempts to introduce a Green Revolution of the Asian model based on high-yielding varieties grown with irrigation water and adequate supply of nutrients have not yielded the expected results on a national scale. In rainfed agriculture, intensification of peanut-cereal-livestock systems was too risky under conditions of soil degradation and irregular climatic conditions. Populations have been forced to migrate due to crop failures. In irrigation-based farming, preference was given to large irrigation schemes that were difficult to manage, leading to high production costs. For livestock, production has not been greatly improved mainly because of inappropriate property rights for grazing areas and rangeland (*de facto* open access, and conflicts in common property rights). The Sahelian "transition forest" suffers from the same failure in property rights, leading to a rapid degradation in areas where fuelwood exploitation is not controlled. Adaptation to drought, smallholder irrigation schemes and techniques, and new property rights and natural resource management schemes for livestock and forestry are still critical research topics.

In the savannas, cotton- and maize-based cropping systems have been a success, but fertility of the land is difficult to maintain, weeds are poorly controlled, and erosion is increasing. Yet

downstream beneficial impact of increased agricultural production on both resource-poor farmers and consumers, can be in the field of skill and information empowerment of women in agriculture, both owners of land and wage labor. The aim should be to reduce drudgery, decrease the number of hours of work, and increase the value of each hour women work. The opportunities opened up by modern information technology, including distance education methods, can do a great deal to accelerate the pace of asset building for resource-poor women.

Once the approach to the alleviation of poverty is directed toward asset building and social development, each IARC will be able to develop a program, including a network, for the technological empowerment of women farmers and farm women. This is particularly important in Africa, where the cultivation of food crops falls largely to women.

We propose that an International Network for the Technological Empowerment of Women in Agriculture be organized as CGIAR's contribution to halting the feminization of rural poverty and enhancing the role of women in agricultural progress. This Network will be designed to strengthen all the ongoing work in relation to women in agriculture and bring about symbiotic linkages with the programs of multilateral, bilateral, national, and non-governmental agencies. The network we envision would derive from a series of mini-networks operated by different IARCs, on the model of IRRI's Women in Rice Farming Network in Asia. Within CGIAR, IRRI has the longest experience in running a research network for women in rice farming systems and hence might provide the coordinating and servicing unit for the proposed international network.

RECOMMENDATION 9

The Panel recommends that CGIAR organize an International Network for the Technological Empowerment of Women in Agriculture. The network should promote a common platform for action at the country level by national, bilateral, international, non-governmental, private-sector, and women's organizations. IRRI could serve as the coordinating Center for the Network, based on its experience with the Women in Rice Farming Network in Asia.

stimulate accelerated agricultural progress. The most urgent need is for a concerted effort to strengthen the policy framework for sustainable food security in Africa. The absence of a conducive institutional environment at the national level, including performance-based systems, is also a serious constraint. While referring to Africa as a continent, we are deeply conscious of the enormous diversity prevailing in the continent in agro-ecological, socio-economic, ethnic, cultural, and political factors. Hence, a country- and eco-region-driven strategy rather than a continental approach will be appropriate when converting our suggestions into precise action plans.

FAO has initiated a Special Program for Food Security in many African countries, as well as other low-income, food-deficit countries elsewhere. It includes steps such as water harvesting and management, crop intensification and diversification, small animal production (particularly poultry farming), and human resource development. There is general agreement that macro-economic policies and investment in rural infrastructure, particularly in the field of post-harvest technology, need urgent attention. Even where production advances have been accomplished, there is a striking mismatch between production and post-harvest technologies, thereby denying both producers and consumers the benefits of enhanced production. CGIAR can provide the technical backstopping necessary for the success of the FAO initiative.

The CGIAR research agenda for Africa must be based on bottom-up, participatory research focusing on farmers' needs. It should be built on continuity and clear objectives in which research endeavors are not overloaded. On-farm research and local public awareness campaigns are important. The challenge of dealing with drought also must be kept in mind.

The CGIAR can appropriately dedicate its efforts in Africa to several research activities, among them:

- better coordination and focus of Centers' research in the context of African food security;
- strengthening of African research capabilities in on-farm research and farming systems research;
- improving the capacity and productivity of the NARS by improving collaboration with all national and international partners;
- strengthening regional research collaboration;
- development and adaptation of appropriate traditional crops; and
- collaborative research on food and agricultural policies.

It will be important for the CGIAR to become part of the policy dialogue if agriculture is to receive higher priority in Africa. The System might also be influential in raising the credibility of researchers with their governments and in spreading the message to both African governments and the international community that sound investment now in agricultural research for Africa could forestall immense expenditures in disaster relief. Increasing political will to improve the agricultural situation in part depends on demonstrated short-term results of research investment.

The specific steps to create a strategy for African agriculture include taking an active part in assisting every African country or a group of neighboring countries belonging to a specific eco-region to organize national/regional consultative processes for agricultural research and development. Such consultative groups should include all bilateral and multilateral donors and appropriate IARCs, national governmental and non-governmental organizations, and the local private sector. They should be complementary to and build upon the efforts of sub-regional organizations such as CORAF, SADCC, ASARECA, SACCAR, and the World Bank's SPAAR.

producers know that productivity and quality improvement are possible and are organizing themselves to compete in international markets. The ability of this region to regain and maintain agricultural growth will depend on such factors as satisfactory prices and reduced transport and transaction costs, which are particularly high; use of non-erosive fertility- and water-maintaining techniques (such as cover crops and other mulch techniques); and integration of livestock into agriculture in order to, among other things, meet growing urban demand for meat.

In humid tropical Africa, deforestation is intensifying due to pressure from a rapidly increasing population and may well contribute to regional micro-climatic changes. Moreover, global climate circulation models indicate that the West Africa region may suffer significantly from an increasingly dry climate. In this ecological region, weeds are difficult to control. Some of the problems needing research attention are the possibility of a yield breakthrough in rice-growing locations and in new "bas-fonds" agriculture; new agro-forestry models, including perennial export crops; research on roots, tubers, and plantains; and inland fisheries, as fish are one of the most important sources of protein for the population.

In high plains and mountain areas, mainly in East Africa, the population density is generally high. Despite high levels of productivity with indigenous cropping systems, these zones remain ecologically, economically, and socially vulnerable. Civil wars lead to migrations and new population settlements. It is often difficult to improve indigenous cropping systems, as they are highly complex, diverse, and risk-prone. Nevertheless, new cover crops and mulch techniques, agro-forestry, and more intensive livestock production techniques could create additional income-earning opportunities. Cropping system research and natural resources management research will play a relevant and critical role.

Urbanization in Africa is growing rapidly, and cities receive more and more food from surrounding areas. This agriculture is highly input- and labor-intensive. It uses modern varieties, chemical fertilization, and pest management techniques. These areas provide opportunities for rapid technical changes and progress. There are also important risks in pollution and food safety. Urban agriculture has a greater urgency in Africa than elsewhere in part because there is not enough non-agricultural activity to absorb migration to cities. Peri-urban agriculture has great potential and could represent a major agricultural belt. Specific research is needed for peri-urban and urban agriculture.

Demonstrations in farmers' fields with improved varieties and agronomic practices have clearly shown that the gap between potential and actual yields even with currently available technologies is high. Analyses of farm-level constraints have indicated that such a yield gap is largely due to the absence of public policies that can ensure stable and remunerative marketing opportunities to farmers—and partly also due to inadequate efforts to reach women farmers, the principal food growers in many African countries. While increasing yield is important, it is not sufficient; it must be coupled with environmental stability. Further, attention must be paid to increasing income among the poor as well. And producers' organizations and the private sector cannot be ignored. Unless mutually reinforcing packages of technologies, services, and public policies are introduced, the yield gap will persist. A systems approach needs to be fostered in agricultural planning and project implementation in many countries in Africa.

In our view, a "more of the same" approach will not make much difference to the present situation, even if large new resources are deployed. The production constraints are often known and so are the remedies. What is lacking is a concerted drive to eliminate the constraints and

it will be important to harness the tools of modern information technology for reaching the unreached. This program should be designed jointly by all stakeholders—farm families, scientists, development workers, input supply agencies, and marketing organizations. It should be structured on an end-to-end approach, beginning with the sowing of the seed and extending up to the consumer. The Lab to Land Program obviously has to be a two-way process, with scientists learning from farmers and farmers learning from scientists. This will help convert ongoing research into a demand-driven process, and it will help identify more precisely the components of the policy package needed to bridge the gap between potential and actual yields.

RECOMMENDATION 10

The Panel recommends a special collaborative focus on Africa that incorporates the following elements to create an effective strategy for African agriculture and that complements the efforts of other organizations, including sub-regional associations:

- **Promote national/regional consultative processes for agricultural research and development in order to facilitate the integration and increase the efficiency of the efforts of all actors.**
- **Set up an African Capacity Building Initiative for Sustainable Food Security as a major inter-Center initiative. It should help train a cadre of African leaders who can assist the political leadership in their countries to remove policy constraints and develop a well-conceived strategy for sustainable food security.**
- **Under the leadership of the director of the proposed African Capacity Building Initiative, set up a task force with the Centers, TAC, the CGIAR Secretariat, FAO, the World Bank, UNDP, the U.N. Environment Programme (UNEP), and other relevant organizations, including sub-regional associations, to develop a special focused program for African food security.**
- **Launch a well-planned Lab to Land Program to take the benefits of the best available technologies to farmers and to promote on-farm participatory testing, breeding, and research.**
- **Develop research programs in urban and peri-urban agriculture in cooperation with relevant organizations, including AVRDC.**
- **Emphasize modern ecological farming methods, taking into account the poor infrastructure and low use of external inputs.**
- **Set priorities on staple or relevant food crops, such as cassava, yams, cowpeas, plantain, and other “indigenous” African food crops.**
- **Promote partnerships between strong NARS from various parts of the world and strategic African NARS.**

Such consultative processes should help to define and complement an agreed strategic framework for the CGIAR and should complement other African initiatives and organizations, such as SPAAR and sub-regional associations. A special emphasis should be placed on supporting each African nation in improving its policy environment, so that poor farmers have both the resources and economic incentive to produce sustainable increases in outputs.

The CGIAR should launch a new initiative for training a corps of African scientists who can assist the political leaders in their respective countries in formulating and introducing appropriate public policies and strategies for achieving accelerated agricultural progress. Such an African Leadership Development Program in Agriculture can make a substantial contribution to filling the prevailing gaps in public policy. African scientists rather than experts from outside should be the principal technical advisors to their governments. Africa needs a cadre of agricultural scientists well versed in both agricultural science and technology and public policy who can guide the continent's agricultural destiny. The training and development of such a cadre will have lasting benefits. While designing the program for training mid-career professionals to become leaders for an African agricultural renaissance, the experience gained under the Rockefeller Foundation-supported LEAD program may be useful. This initiative should complement other existing efforts in this area, such as the African Virtual University, which was established in 1995. Africa's agricultural problems can be solved only by African leaders, and hence the training of African leaders for positions of leadership deserves high priority. The "best and brightest" African scientific and leadership talents must be encouraged to remain in Africa.

Nearly all IARCs have activities in African countries. In addition, there are four major IARCs headquartered there—IITA, WARDA, ICRAF, and ILRI. To provide an integrated focus to CGIAR's activities in Africa, we recommend the development of an African Capacity Building Initiative for Sustainable Food Security. This initiative does not necessarily require the establishment of a new physical location. The Panel sees this as a major inter-Center activity that may be useful in generating the needed coordination and synergy among the numerous vertically structured programs of IARCs, bilateral and multilateral donors, commercial companies, and NGOs currently active in different African countries. With its many field offices in sub-Saharan Africa, ICRISAT may be well-positioned to play a convening role.

We believe that the CGIAR should increase its total efforts in sub-Saharan Africa. Since a great deal of what is needed in Africa involves building capacity in both science and policy, the hoped-for large impact on farmers' fields is likely to be seen only in 10 years at best. In fact the recent increased emphasis in the CGIAR System on impact assessment has tended to move work out of Africa, even for the Centers located there. The System will need to counteract this process through more appropriate assessment practices.

Recent successes in some countries, such as Ethiopia, in bringing about a rapid improvement in food production provide room for optimism about Africa's agricultural future. The new Capacity Building Initiative should help draw appropriate lessons from successes and facilitate their widespread replication. It should be headed by someone at the level of Director General. The initiative can serve as the African hub of the proposed Global Knowledge System for Food Security as well as of the African Leadership Development Program.

The initiative should consider developing an extensive and well designed Lab to Land Program aimed at the knowledge and skill empowerment of both male and female farmers. Since ecologically sound farm practices will be intensive in knowledge rather than capital or chemicals,

salaries. To compensate for insufficient public means, local NGOs and producers' organizations are carrying out field research that is directly useful to producers. The two constituencies—research and public education on the one hand; producers' organizations and NGOs on the other hand—are establishing ever closer ties. This should result in the evolution of effective NARS that will facilitate synergy among the various components. Indeed, these NARS are already and will become more and more open and will need greater access to new knowledge and international support. This is already the case for most African countries. For them, the CGIAR Centers must help build capacities; connect researchers, university professors and students, public services, producers' organizations, and NGOs to the Internet and to global agricultural information and other networks; and undertake collaborative research and training programs.

In intermediate-sized countries with average incomes, governments have often made great efforts to develop research and agricultural training. The opportunities to export agricultural raw materials (coffee, cocoa, palm oil, cotton, and so on) have often provided the stimulus for public and private (food industries, producers' organizations) research. Structural adjustment policies have sometimes led governments to reduce public research and to privatize certain of the activities involved. This has been witnessed particularly in Latin America. Wherever the linkages between the public and private sectors have been strong, progress has been rapid. These NARS, therefore, have real potential for progress, but these countries cannot always support capacity development in every area. Research, which is often specialized in a few major products, may waver between a strategy of specialization and one of diversification. These countries have real possibilities if there is political will to support national researchers. The CGIAR Centers could undertake collaborative research and training and, in specific cases, foster "South-South-CGIAR" common activities.

A few large countries, including Brazil, China, and India, have high-quality public research bodies and universities. These NARS, in particular public research institutes, achieve a high level of scientific performance and would like a relationship with the IARCs based on collaboration on specific objectives. Such NARS should work alongside CGIAR Centers in building capacity in countries having less developed research systems. Strong NARS should be encouraged to share their scientific staff and facilities.

12.2 Advanced Research Institutions

Advanced research institutions located in industrialized as well as developing countries play a leading role in the creation of new knowledge and material. Some of them have a long tradition of research cooperation with developing countries, such as the organizations that form part of the ECART Consortium. Others are universities or reference research centers whose activities interest both the IARCs and the NARS. And a handful are specialized international research centers, some of which are associated with the CGIAR. From the viewpoint of internationalization of agricultural research, their participation in collaborative research activities will increase, in particular in the fields of genetics, agronomy, information sciences and techniques, modeling, management sciences, and new approaches to sustainable agricultural and rural development.

Both the CGIAR Centers and NARS could work closely and develop stronger relationships with advanced institutions and universities that have good graduate research programs and train large numbers of developing-country students. IARCs have been working with ICIPE located in

CHAPTER 12. PARTNERSHIPS AND NETWORKING

The first IARCs and the CGIAR were created at a time when the world map of public and private agricultural research was very different. Since then, several NARS have gained considerable scientific capacity and experience. And there has been fast growth of private-sector initiatives in the area of agricultural research.

The CGIAR, like every complex multi-institutional organism, struggles for balance between the need to create coherence and community within its own framework and the need to relate to the widest possible range of creative partners sharing its goals. This is a particularly challenging task for a global scientific body dedicated both to cutting-edge science and to poverty alleviation. Because the CGIAR System begins with 16 Centers, four multilateral sponsoring agencies, more than 50 member institutions, a number of permanent and task-driven Committees, and the world's farming communities all as real or potential partners, there is a natural tendency for the System to look inward and avoid wider relationships. It is a tribute to the CGIAR, therefore, that it has struggled against this tendency and has continued to reach out to new constituencies and alliances.

Partnering with other institutions often involves high transaction costs. Partnerships should therefore be well focused and demand- and project-driven. The Panel acknowledges that the System has not always been successful in its efforts to reach out and find the best expertise for each project, and that some new initiatives could be considered. A review of the System's collaborative partnerships must begin with three realities:

- Although it is in many respects pivotal, the CGIAR contributes only 2-4 percent of the global resources available for international agricultural research, and therefore depends heavily on others—including the private sector and, especially, NARS—for both scientific advances and the application of research products.
- The CGIAR's commitment to poverty alleviation and sustainable agricultural development requires a very broad partnership context that cannot be met by the scientific community alone.
- The CGIAR's mandate to work in conjunction with the indigenous knowledge of farming communities calls for innovative and flexible partnership arrangements.

A pro-partnership environment can be strengthened in several ways. The CGIAR already has taken several useful steps, but other initiatives should be considered. A brief description of the various kinds of partners relevant to the mandate of the CGIAR System is provided in this section.

12.1 National Agricultural Research Systems

Public agricultural research is experiencing widely contrasting development, depending on the country. Many public organizations and universities in low-income countries have had their budgets drastically reduced, with the result that a disproportionate part of the budget goes to staff

Perhaps one of the greatest barriers to a balanced and creative approach to CGIAR-industry cooperation is the lack of familiarity with their different activities and roles. By and large, agribusiness is unaware of the role that the System plays in international agricultural research and has little or no sense of the partnership potential. Likewise, many Center scientists have spent their careers in public sector and academic posts and have no real understanding of the scope or flexibility of the private sector.

The CGIAR's links and partnerships with the private sector must be strengthened in a number of fields. Significant issues must be resolved in order to achieve the optimum beneficial collaboration, including intellectual property rights and concerns, the necessity of confidentiality in some joint initiatives, and the vital importance of trust and transparency before the international agricultural community and the NARS.

The CGIAR should expand its relationships with the private sector in developing countries. Such partnerships could provide better markets in rural areas, create employment opportunities, ensure technology dissemination, give the CGIAR a good assessment of the demand for and adoption of its products, and provide an indication of the plant characteristics in demand by farmers. Rather than resorting to corporate farming, the private sector should promote contract farming with small-scale farmers in order to ensure guaranteed and remunerative marketing opportunities.

12.5 Producers' Organizations

Producers' organizations are emerging partners that could play a decisive role in technical progress. Wherever peasant farming acts to create organizations to defend its interests, this has a stimulating effect on agricultural research. Farmers' organizations participate in the planning of research by asking questions of the researchers. In addition, they finance research, create specific applied research organizations, and often organize farmers themselves to participate in experiments. National organizations already exist that carry a certain weight in many countries. Regional and international organizations could be formed that, little by little, wield more power and become partners listened to with respect and attention.

Natural resource management programs and eco-regional programs involving producers' organizations could help in establishing participatory networks. Connecting these organizations with future CGIAR knowledge systems will increase synergies in research and innovation activities.

12.6 Indigenous and Other Local Communities

Recalling the mandate so clearly enunciated in the Lucerne Declaration on the importance of indigenous knowledge, which together with "high science" is a pillar in the development of sustainable food security, the Panel agrees that this is an important issue needing further elaboration within the CGIAR. We also note that the knowledge of indigenous and other local communities was emphasized in Agenda 21 and is being actively pursued in both the Convention on Biological Diversity and the FAO Commission on Genetic Resources for Food and Agriculture.

Nairobi for many years. Collaboration with ICIPE needs to be strengthened. Among others relevant to the mandate of CGIAR, mention may be made of:

- International Center for Genetic Engineering and Biotechnology, Trieste (Italy) and New Delhi (India);
- Iwokrama International Center for Rain Forest Conservation and Development, Georgetown, Guyana;
- International Network for Bamboo and Rattan (INBAR), established in 1997 in China; and
- International Board for Soil Research and Management (IBSRAM), Bangkok.

Bringing such international centers into appropriate CGIAR networks will be mutually beneficial.

One of the biggest problems facing the CGIAR is how to attract and hold the best scientific staff. The Centers also need to explore integral partnerships with ARIs and larger public institutions that would be attractive to the very best scientists.

12.3 Science Academies

CGIAR has already established linkages with science academies in industrialized and developing countries, including the Third World Academy of Sciences. These academies serve as flagships of scientific excellence, creativity, integrity, and autonomy. They have recently organized themselves into a network known as the InterAcademy Panel (IAP), focused on sustainability issues, and they publish high-quality scientific journals. Several leading academies are active in promoting the public understanding of recent advances in science and technology. CGIAR's partnership networks should therefore include appropriate science academies from both industrialized and developing countries.

12.4 The Private Sector

International firms in the seed, chemical, and agri-business sectors are becoming key players in advancing the frontiers of both knowledge and production. Private-sector agricultural research in OECD countries is now well in excess of US\$7 billion and accounts for half the world's entire agricultural research investment. Perhaps three quarters or more of the cutting-edge investment in new agricultural biotechnologies lies within the private sector. These large firms, though few in number, are capable of financing teams that bring together the best researchers in the world and providing them with adequate budgets. Through patenting and investments in research, they could develop excessive control of new research material and information.

Clearly, a network such as the CGIAR, in order to provide the best science to developing countries, must be in a position to tap into the research and resources of this vital and growing sector. The CGIAR must be more exposed to this expertise and must also try to influence the major players at national and international levels. Important strategic alliances must be formed with private-sector partners. It would be in the mutual interest of IARCs and ARIs that they develop linkages, based on well-defined Memorandums of Understanding (MoUs), since often their strengths may be complementary.

In areas of research like genetic engineering, it is essential that a mutually agreed MoU is entered into. It should contain a Voluntary Code of Conduct in relation to the ethical and benefit sharing aspects of the cooperative research program. IARCs should not enter into partnerships that will lead to the monopolistic and exclusive use of research results.

RECOMMENDATION 11

The Panel recommends that:

- where appropriate, the range of the CGIAR's partnership be broadened to include other organizations with a shared commitment to its mission and goals;
- in relevant areas, the CGIAR enter into Memoranda of Understanding with partners that contain a Voluntary Code of Conduct;
- IARCs should not enter into partnerships that will lead to the monopolistic and exclusive use of the research results;
- the CGIAR establish a Media and Communications Unit; and
- the Chair convene a high-level meeting with CEOs of interested representative agribusiness to exchange views and consider opportunities for new partnership relationships, including with farmers' cooperatives and seed growers' associations.

Broadening and deepening partnerships and collaboration with other actors in the agricultural research–development continuum is of utmost importance for the future of the CGIAR. As a result, several additional specific recommendations on partnership can be found throughout this report.

12.7 NGOs

NGOs have been at the forefront of the public scene to protect the environment, defend public access to agricultural inputs and technologies, and promote a commitment to people-centered research. They play a stimulating and positive role, operationally as well as intellectually. More and more frequently, NGOs views are listened to, taken into account, and integrated into research strategies. Their participation in the international scientific community is essential, not only to stimulate debate, but also to overcome mutual lack of understanding and conflicts, and to find, point by point, solutions that satisfy all parties involved.

The Centers must have a strategy to involve development NGOs in research activities. This could include inviting them to carry out certain field-specific programs and participate in agenda setting for eco-regional research. NGOs' knowledge of rural realities and needs will be most useful to the Centers, particularly in the proposed Lab to Land Program in Africa.

12.8 Media

In recent decades, the media both printed and electronic, have played a key role in promoting democratic values, spreading scientific information, correcting wrong notions and unfounded fears, and preventing damage to the environment. The media serve as an early warning system with reference to the onset of famines and food shortages. It is important that the CGIAR develops structured linkages with the media, in order to spread public information on new scientific opportunities and promote public participation in increasing agricultural production. CGIAR should develop a Media and Communications Unit to provide media with useful material and information on a sustained basis. Its Board of Management should include representatives of IARCs, NARS, ARIs, and the printed and electronic media.

12.9 Conclusion

Although the individual strengths of NARS may vary, the collective strength of the global agricultural research system spearheaded by the CGIAR is considerable. It is only this collective strength that can help ensure sustainable food security and the elimination of poverty in the coming millennium. Hence, we urge IARCs to foster a culture of symbiotic partnerships committed to ending hunger and deprivation. Commodity-centered and farming-system-based networks may be organized for this purpose. The coordinating and servicing unit of the proposed Integrated Gene Management initiative could advise IARCs on methods of dealing with patents, plant variety protection acts, and other forms of intellectual property rights.

CGIAR's research agenda for the future needs to be more responsive to the needs of NARS and to be guided by considerations for harnessing and conserving biodiversity, embracing the changing interface between the public and private sectors, protecting intellectual property, the increased application of biotechnology and its accompanying biosafety concerns, and a need for greater stakeholder participation in the research process. Farmers and NARS must remain the cornerstone of all future research efforts of the CGIAR. The success of the future globalization must embrace participatory and inclusive approaches that are built from the bottom upwards.

CHAPTER 14. GOVERNANCE: OVERALL ASSESSMENT

14.1 Introduction and Purpose

Since the CGIAR was established in 1971, its governance has been based on the following underlying operating principles:

- a vision that investments in scientific research generate improved agricultural technologies and practices and yield high returns in terms of food security and poverty alleviation;
- donor sovereignty, in which each donor determines its level and composition of contribution to the Centers;
- Center autonomy, in which each Center is a separate legal entity with an independent governing board and independently formulated goals and strategies;
- independent scientific advice;
- a non-political (non-partisan, non-ideological) nature;
- consensus decision-making among Members of the CGIAR, facilitated by the Chair; and
- an informal organization of stakeholders, without legal status or explicit bylaws.

The basic structure of the CGIAR includes:

- the Consultative Group (the Chair, co-sponsors, Members, fixed-term representatives, and the Finance and Oversight Committees);
- the Centers;
- partners and clients; and
- central advisory and administrative units, including the Technical Advisory Committee, the TAC Secretariat, the Impact Assessment and Evaluation Group (IAEG) and its Secretariat, and the CGIAR Secretariat.

A more detailed description of the current system of governance is provided in Annex I, and a summary assessment of its key components can be found in Annex II.

Although the underlying principles and structure of the CGIAR have largely remained unchanged, the System has become increasingly complex in recent years as it has attempted to address several issues, including the need for greater inclusiveness of developing countries and other stakeholders; rapid advances in science; a growing awareness of the interrelationship between natural resources, sustainability, and food security; and changing patterns in official development assistance. We have reviewed the current governance and finance mechanisms and processes of the CGIAR, along with its structure, in order to sharpen the focus of an already quite effective system of research for development. This improved focus can be achieved by protecting the good and valuable features of the CGIAR, and by updating or eliminating any characteristics and processes that are no longer relevant.

In this chapter, the Review Panel recommends that the CGIAR System strengthen its governance and finance by improving its capacity for strategic policy-making and oversight. We seek to

CHAPTER 13. CONSOLIDATION OF CENTERS AND CENTER ACTIVITIES

Since the CGIAR is a small though distinctive and highly strategic actor in global agricultural research, it must be well focused. The new CGIAR should avoid duplication of efforts and unnecessary competition among Centers. Such a focused effort requires interaction among Centers through, among other things, joint project planning when required, and through System-wide programs. The potential comparative advantage of the System is its expertise in many different but related fields pertaining to food security. The CGIAR Centers will also be much more involved in collaborative research activities with a number of other relevant partners. Such developments should follow more easily once there is a well-designed CGIAR strategy. Additionally, global mandates of Centers allow for some duplication of efforts, and specific demands by donors add to this.

The Panel entered into this System Review with the conviction that some consolidations are necessary. However, it has not been feasible to make specific recommendations in a manner that would be fair to the Centers. Nevertheless, our deliberations in this area have reinforced our initial impressions.

Various scenarios can be imagined. For example, in each of the geographical regions where the CGIAR operates, one Center may be identified as a main Center with primary responsibility for regional activities and institution strengthening. Some Center amalgamations may be advantageous to achieve greater effectiveness by reducing overlaps in mandates, create economies of scale and reduce overheads. In addition, voluntary strategic alliances between Centers may, over time, be formalized. The new System-wide review workshops proposed by this Panel will be useful in informing this process.

Specific recommendations will require a more in-depth management study and analysis of current strengths and weaknesses of individual Centers and their possible future mandates in relation to a coherent CGIAR strategy. The Panel suggests the following criteria for a subsequent process of consolidation of Centers and activities:

- mandates of individual Centers in relation to the CGIAR strategy;
- strategic advantage (this may include future scientific focus and sufficient "critical mass" in a longer-term perspective, the requirements of specialized skills, and strategic location within the System);
- past performance; and
- cost-effectiveness, in comparison to other research organizations.

Centers that perform important functions but are unable over the long term to secure funds to perform such functions effectively should be considered for consolidation or phasing out.

RECOMMENDATION 12

The Panel recommends that the CGIAR's governance continue to be based on the principles of member sovereignty, Center autonomy, and independent scientific advice. While we fully endorse the principle of member sovereignty, we stress the necessity for individual member governments to harmonize their own national policies and speak with one voice in all international fora and negotiations relevant to CGIAR business, particularly on genetic resources and intellectual property rights.

14.3.1 Consensus decision-making

One distinct feature of the CGIAR is its decision-making by consensus, whereby decisions by the Group are sensed and articulated by the Chair at the conclusion of CGIAR business meetings. Formal authority to make "decisions" at the System level rests exclusively with CGIAR Members. Between meetings, the Chair and the four co-sponsors serve as a focal point for "crisis management." Today, this is done with the Chairs of the Finance and Oversight Committees, or with the full Stakeholders Group, depending on the issues. Any formal decision to be taken between meetings on behalf of the Group requires consultation with all Members. But most discussions among stakeholders are informal, and this process of "off-the-record" consultations is vital for achieving the "consensus" that emerges from the formal biannual meetings of the CGIAR.

In the early years of the CGIAR, when the Consultative Group consisted largely of a small group of industrialized countries and a few foundations and multilateral organizations, this decision-making process was an effective way to reach agreement and set policy. More recently, however, as membership has grown considerably, consensus decision-making has limited the CGIAR's ability to make difficult decisions when called for, to manage conflict, and to adapt quickly to changing circumstances and opportunities. Adaptability is increasingly necessary in an organization such as this, given rapid changes in science. And as the System continues to broaden its inclusiveness and grow in membership, cost-effective and efficient decision-making are increasingly important. While consensus will remain the basis of decision-making within the CGIAR, a more executive process is necessary to better facilitate consensus among Members.

14.3.2 Non-political character

The CGIAR has always underlined its nature as a non-partisan, non-ideological, scientific organization, relying on advice from an independent Technical Advisory Committee. This has been considered a strength, with a dedication to produce relevant outputs in the form of international public goods. Over the last few years, however, the work of the CGIAR has been increasingly conditioned by a rapidly changing intellectual property rights environment, the ratification of the Convention on Biological Diversity, the issue of farmers' rights, and the growing importance of biotechnology and the private sector in agricultural research. All these developments have political implications for the CGIAR's ability to pursue its mission and goals, including free access to and exchange of genetic resources. Thus the non-partisan, non-ideological character—perhaps an asset in times past—has left the System vulnerable to international agreements and policies that could severely limit its effectiveness in addressing its mission.

protect, in particular, donor sovereignty and Center autonomy, which produce an essentially decentralized mode of operation. Our objective is to help the CGIAR exercise authority and influence more effectively and efficiently when managing the System's activities, and to adapt itself into a System that can continue to attract the very best scientists and managers with the necessary skill sets to address the complexities of the CGIAR and its mission.

14.2 Principles and Criteria of Governance

The Review Panel used several criteria for assessing the current system of governance, as well as for identifying suggested improvements (see Table 2).

Table 2: Key Criteria for Assessing CGIAR Governance

Criterion	Key Features
Impact	Achievement of goals and objectives
Efficiency	Cost effectiveness and value for money; low transaction costs
Transparency	Clarity in how decisions are made
Accountability	For financial, corporate, and input/output decisions
Participation	Access to and openness of activities and decision-making processes
Flexibility	Ease of adaptation of structure and activities, as needed

These criteria are consistent with—and flow from—the principles of governance endorsed by the CGIAR. Some additional principles and “central values” are also crucial for an entity such as the CGIAR System that produces research results of global relevance but with a primary focus on developing countries (see Table 3).

Table 3: Key Principles and Central Values Suitable for the CGIAR System

Principles and Values	Key Features
Principles	member sovereignty Center autonomy non-political character consensus decision-making independent scientific advice informality
Central Values	foster innovation and risk-taking manage and resolve conflict ensure a well-focused strategy and agenda be responsive and non-bureaucratic

14.3 Appropriateness of Current Key Principles

The Panel has carefully examined the continuing appropriateness of the current principles of governance. It is convinced that some of these will remain valuable in the coming years. Others will need to be adapted to better align the System's governance and finance with its vision,

mission, and strategy. The strategic implications of the twenty-first century context and the proposed CGIAR mission on System governance are outlined in Table 4.

Table 4: Future Context and Mission and its Strategic Implications for Governance

Features of Future Context and Mission	Strategic Implications for System Governance
The requirements of sustainable agricultural development are many and multi-faceted.	Maintain current focus on research, emphasizing the CGIAR's strategic niche in the global system
Food security, sustainable development, and poverty alleviation are the responsibility of many actors.	Further develop an open system based on collaboration and partnerships.
The external environment continues to evolve rapidly.	Improve adaptation and flexibility.
International agreements, conventions, and undertakings are becoming increasingly important.	Become a strong player in international fora, and take a stand on sensitive issues.
There is a multiplicity of stakeholder views within the CGIAR and among its external partners.	Strengthen capacity to develop and implement "CGIAR" policies.
Issues of globalization, privatization, and technological change are inherently multi-dimensional and complex.	Improve responsiveness, at both the System and Center levels, to technical, economic, and political considerations.
With continued System Renewal, the need for participation, transparency, and accountability will increase.	Adjust the system of governance, guiding principles, and mode of operation.
Increased partnerships bring with them the need to improve complementarities and reduce duplication.	Adjust the System's structure and decision-making processes; weigh and balance the benefits and costs of partnerships.
If development assistance declines further, the pressure to provide funds directly to NARS may intensify.	Obtain supplementary funds for the CGIAR from alternative sources.

In examining the CGIAR's performance against the criteria identified, the Panel believes that the System does not score very well. The pressures, opportunities, and future challenges confronting the CGIAR, as well as the adaptations required to address them, are outlined in Table 5.

At MTM95, the CGIAR endorsed the establishment of an independent Impact Assessment and Evaluation Group as a result of a proposal in the *Lucerne Declaration and Action Program* to "strengthen the assessment of performance and impact." The CGIAR System is also to be commended for grappling with the important but very difficult problem of attempting to assess impact. Many technologically advanced nations have been struggling with the same problem in order to monitor the use of public funds by research agencies. To our knowledge, no one has developed impact analyses for fundamental long-term research that are truly satisfactory.

Thus although it is relatively straightforward to assess whether the goals of an applied research program have been met (such as whether a specific type of germplasm has been produced, or a particular problem in soil management solved), the type of research needed for long-term advances is not expected to have field-level impacts over the short term. Any system that attempts to ensure that every project has a measurable impact in less than 10 years will stifle the type of creative, risk-taking research that has historically been so crucial for producing major breakthroughs.

Since it is quite true that "what gets measured in a high-stakes assessment is what gets done," the System must be careful not to develop a way to measure impacts that drives its Centers to focus exclusively on short-term applied research, or that creates a strong incentive to focus efforts exclusively on developing nations with strong national agricultural research systems, when even modest efforts by the CGIAR System can readily be amplified by extension services to produce a large impact.

14.5.2 Current weaknesses

One of the weaknesses of the present system of assessment has just been mentioned: the threat to the effectiveness of the overall program that stems from the difficulty of measuring impacts for important projects that are expected to yield major benefits only after a period of many years.

Further, since its inception, the Impact Assessment and Evaluation Group has been limited by insufficient funding and staffing and a lack of clearly defined objectives. On the whole, it seems the IAEG has had difficulty combining its own requirement for stringent academic work with the more pragmatic desires of Members for "quick and general figures on impact." Further, the linkages between the IAEG and Center activities on impact assessment have been weak. While most stakeholders feel there is a continuing need for a System-level impact assessment mechanism, there is widespread agreement that the IAEG has not been effective.

A second major weakness of the current mixture of evaluations and assessments is the tremendous amount of time it requires of the scientists and staff of the CGIAR Centers. Some of this time is obviously necessary, but we believe there are more efficient ways of carrying out the same function that would leave scientists with more time to do their important work.

We have commended the idea behind the independent five-year assessments of management and science at each Center, as presently carried out by EPMRs. But we believe that the present procedure is too expensive (more than US\$500,000 each, once Center staff time is included). In addition, each member of the review team is asked to commit three weeks or so to the site visits required, which prevents most full-time active scientists from participating. Because of the extremely rapid pace of change within science, the failure to involve more cutting-edge scientists

in these reviews is a serious liability. Some specific suggestions for changes that could address this important weakness are presented later.

Another weakness is that the current evaluation and assessment processes should be more focused on creating more System-wide synergism through networking: both Center to Center, and Center to outstanding individuals from relevant non-CGIAR organizations. Again, we have some specific suggestions to make.

Finally, and importantly, there is a need to close the gaps in the loops of the evaluation cycle so that the findings from monitoring, evaluation, and impact studies feed back into the processes for setting strategy, priorities, and budgets. Many successful modern organizations make concerted efforts to embed a continuous learning cycle in their activities. The CGIAR System, through the many changes introduced since its establishment, has shown itself capable of adapting to new situations and learning from its successes and failures. Evidence of this comes not only from the changes in CGIAR strategy and focus over the years, but also from the many studies that the System has commissioned to provide thoughtful analyses of goals and performance.

Nevertheless, CGIAR's continuous-learning cycle could be substantially improved by more closely tying its evaluations and assessments to its priority-setting, planning, and resource allocation processes. It is also important that these functions be designed so that they are explicitly seen as a positive component of the System—as a way of better informing each Center and its scientists about what the System and others have learned about best practices. The results of the evaluations and assessments could then not only improve the functioning of CGIAR programs and projects, but also spread useful ideas and procedures to others through the proposed Global Knowledge System for Food Security.

14.5.3 Conclusion

Any research organization that wants to remain dynamic and maintain high standards of social relevance and scientific excellence needs both continuous self-evaluation and a periodic external evaluation. The CGIAR has in place an effective system of self-evaluation, in which the primary responsibility is given to the Center staff and Center Boards. This should help identify and remove constraints and, where needed, introduce changes in research strategies, methods, and personnel.

In our view, too much time and energy at each Center is now being consumed by paperwork connected with evaluations and assessments. The ultimate success of IARCs has to be measured in terms of their contributions to improving farm productivity on an environmentally sustainable basis and to empowering impoverished rural women and men through the provision of knowledge and technology. These goals can be achieved only if CGIAR scientists combine professional excellence with a deep commitment to environmental protection and poverty reduction. But they need to work in an enabling environment where they can pay undivided attention to working toward the attainment of the goals of their Center, as well as those of the System as a whole.

It has not been feasible for the Panel to examine these processes in depth. Instead, the CGIAR should establish a special task force composed of selected Center Directors and Board Chairs, with the participation of the CGIAR and TAC Secretariats, and charge them with the responsibility of making specific recommendations for improving the efficiency of the

assessment. This work will need to be carried out in close consultation with TAC, as well as the major donors who sponsor projects and support the System.

We do, however, have a few suggestions on external evaluations, which presently consist of a series of expert reviews of particular programs (commissioned by the Centers) that are fed into an EPMR performed every five years.

First, the EPMR site visit should require no more than a week of each reviewers' time. This should enable a large new group of younger, active scientists to be recruited for review teams. To provide any remaining needed information, we suggest that the EPMR be supplemented with a new type of review mechanism that appears to have many advantages. The idea for this type of mechanism is taken from some of the reviews carried out for research programs in industrialized nations.

We propose that for each major type of activity in the CGIAR (plant breeding, soil conservation, farming system work, natural resource management, knowledge systems, and so on), the System organize a series of Review Workshops. Each of these would be a five-day workshop involving perhaps 100–150 CGIAR scientists, plus perhaps 10 outside experts who serve as the reviewers. During the five days, each laboratory unit in the CGIAR would make a presentation on its work. Prior to the workshop, the reviewers would receive a 5- to 10-page summary from each laboratory unit, plus its publications. This very brief written material, plus the talks and personal interactions between reviewers and CGIAR scientists, would be the basis for an evaluation of each unit during a subsequent two-day meeting of the reviewers. These evaluations would be provided to the Center Director and Board Chair responsible for the reviewed unit, as well as to TAC. The sum of all the evaluations for each Center would constitute an important part of the input to the EPMR review team when it meets.

The new type of review mechanism being suggested is designed to serve three purposes:

- providing an expert outside evaluation—We believe that many of the most outstanding active scientists in the world could be recruited as reviewers for these workshops, and that they would be willing to serve without any compensation aside from expenses.
- creating much more of a "System" from the set of 16 autonomous CGIAR Centers—Because the meetings would allow everyone doing similar work in the System to become personally acquainted, many new collaborations that could not have been predicted would certainly result. In addition, each Center would be stimulated to copy the best practices of other Centers.
- bringing the leading active scientists outside the System into direct contact with CGIAR scientists—Not only would CGIAR efforts in each type activity thereby be measured directly against the very best of the world's efforts, but many of the expert reviewers would be stimulated to harness the expertise and talent in their own institutions in support of the CGIAR and its mission.

Regarding our second suggestion for external evaluations, CCERs have been a positive development in the CGIAR's review processes, providing depth of evaluation in specific areas that an EPMR team would not be able to achieve. Although CCERs are not all intended to feed into EPMRs, relevant ones should be timed and organized so as to better meet the needs of and supplement EPMRs. In the future, CCERs may even evolve to meet the CGIAR's requirements for review in certain areas.

Third, as the Panel endorses the instituted review and evaluation process, Members should be encouraged to continue to accept these reviews in lieu of their own independent project reviews. When donors wish to conduct their own reviews of Center projects, Centers should be financially compensated by them for the extra work involved in preparing for and assisting visiting teams.

Fourth, as Center autonomy rests on the effective functioning and guidance of Center Boards, and as Boards become more proactive in setting research strategy, resource allocation, and review processes, EPMRs should give more attention to Board governance. This is particularly important with respect to the Board's role in priority setting, Board operations and practices, and Board performance. EPMRs should be explicit in providing more precise recommendations in this area.

Finally, we find the present system for undertaking impact analysis unsatisfactory. Ways must be found to provide these analyses more efficiently. They should also be directly linked to the System's strategic planning efforts carried out by TAC. For this reason, the present IAEG should be replaced with a more pragmatic assessment unit that is set up by the proposed central body (see Chapter 15) and TAC. An integrated evaluation and impact analysis system will be useful both for the CGIAR System as a whole and for individual IARCs. We urge TAC to devise objective systems of analyses that do not divert the time and energy of Center scientists into writing numerous reports. We suggest that these analyses make much better use of information obtained from the various organized groups that the CGIAR is attempting to serve. For example, confidential evaluations of the various CGIAR programs could be requested from individual NARS, along with specific information with regard to impacts.

The impacts of each CGIAR technology should be placed in the context of overall national socio-economic development and provide an objective evaluation of the success or failure of the various responsible sectors. In this way, the CGIAR will neither be blamed inappropriately when progress stagnates in a program, nor given undue credit. For example, when the rice production of a country has been increased, the success is likely to be due not only to the introduction of a new rice variety, but also to the irrigation systems made available by the water resource development agency of the government, an agricultural policy that helps farmers to produce, an enabling market generated by the private sector, and so on. In other words, the innovative knowledge generated by a CGIAR Center should be assessed in a wide national context.

RECOMMENDATION 14

The Panel recommends that:

- the CGIAR establish a special task force, including TAC and Center Directors, for improving the efficiency of the evaluation processes;
- the EPMR site visit be reduced in scale so as to require no more than one week of each reviewer's time;
- the CGIAR institute Review Workshops for each major type of CGIAR activity, both to improve the review process and to reduce the amount of time and effort required for EPMRs and CCERs;
- Centers be financially compensated by donors that wish to conduct their own reviews of Center projects;
- EPMRs give greater attention to Board governance; and
- the present IAEG be replaced with a more pragmatic unit, possibly within TAC.

CHAPTER 15. FUTURE GOVERNANCE

The current CGIAR governance model has served the System well. Its informal character and highly participatory nature have proved to be advantageous in maintaining the collegiality and consensus decision-making that have contributed so much to the adaptability and successful performance of the System since its inception.

As both the internal and external factors that bear on the CGIAR's effective functioning become more complex, however, the disadvantages of the current model will, the Panel believes, become an increasing constraint. These disadvantages include high transaction costs, lack of full transparency in decision-making, and lack of a clear system of accountability. At the same time, the Panel foresees a growing need to provide a more institutionalized capacity to secure and ensure proper stewardship of the intellectual property developed within the System, to secure funding from a broader variety of sources, and to take positions on behalf of the System—all of which could be more effectively carried out through a formally constituted central body. We further believe that the constitution of such a body would provide an appropriate occasion for rationalizing and simplifying the current governance structure, reducing the number of committees and providing that their mandates and accountability be clearly established within the constitutional framework of the central body. The views and specific recommendations of the Panel on this proposed new structure are set out in this section.

15.1 Proposed Formal Organization

When incorporating a formal legal body to replace the current informal governance structure, it is important that as many advantages of the informal system as possible are retained, particularly with respect to the CGIAR's representative and participatory character and the professional, non-bureaucratic nature of its deliberative and decision-making process. At the same time, the Panel considers it of utmost importance to ensure that in effecting this change there be no fundamental change in the relationship between the central body and the Centers, although the modalities of these relationships will necessarily need to be revisited to some extent.

An inter-governmental model would be neither necessary nor desirable in achieving these purposes, nor would it be appropriate, given the fact that the stakeholder constituency of the CGIAR includes both governmental and non-governmental actors. Accordingly, the Panel concludes that the central body should be incorporated as a non-profit service organization in an appropriate jurisdiction, and all further references to the "central body" in this report are based on this assumption.

15.2 Proposed Model of Governance

As noted earlier, we are convinced that the CGIAR needs more focused programs, a culture that fosters innovation and risk-taking, conflict resolution techniques, the ability to adapt to external change, and non-bureaucratic governance. Among the goals should be stability in attracting and keeping the best scientists, higher visibility with key audiences, publicity on international agricultural research, and re-allocation of resources from old to new priorities.

The Panel considered the pros and cons of various models of governance (see Box 1). Our assessment is that at the System level, the CGIAR best resembles the governance by community model. It seeks agreement among independent actors on the basis of common objectives, shared norms, long-standing traditions, and face-to-face relationships and reciprocity. At the Center level, there is an increasing influence of "free market" forces under pressure from donors, whereby, in funding the research agenda, the System respects member sovereignty and Center autonomy. Within the Centers (the only "legal" bodies of the CGIAR), there is "governance by hierarchy." Each Center's Board and management rely on explicit policies, defined responsibilities, and clear accountability. Thus, the overall CGIAR System is a hybrid of all three models of governance.

Box 1: Alternative "Models" of Governance

According to the dictionary, governance is "the act or process of governing; controlling or directing influence." A working definition within the CGIAR might be "the manner in which authority and influence are exercised in the management of business/affairs of the CGIAR System." In principle, there are three basic types of governance, differing from each other in terms of more than one variable. Actual models of governance involve variations of these types:

Governance by Community

Governance by community is based on coordination achieved by agreement. Such agreement and order is reached from independent actions of linked and interdependent actors. Thus, this form of governance may also be referred to as governance by network. Decisions are reinforced by common objectives, shared norms, traditions, many-sided and long-standing—often face-to-face—relationships, and reciprocity among the actors.

Governance by Free Market

This type of governance is characterized by a large number of buyers and sellers acting independently to transact business in a "marketplace." The rules are set by the market. Order is achieved as an outcome of independent actions of all the major actors. All of them are free to enter and exit the market at their discretion and whenever it is beneficial to them. This model is practiced by government and the private sector for the provision of services and commissioning of research.

Governance by Hierarchy

A third type of governance would be that of a formal organization. Governance by hierarchy is ruled in a top-down manner and characterized by explicit policies, rules, and regulations. These form the basis for achieving order and applying well-defined responsibilities, accountabilities, and norms for transacting business.

In general, the CGIAR has sought to be responsive to changes in its external environment and to its own Agenda for Renewal, and the system of governance continues to evolve as new needs are recognized. Nevertheless, the governance system is over-stretched, and is perceived to be top-heavy, process-oriented, and complex. It needs to be better aligned to the System's proposed mission and future strategy. This requires that the CGIAR move toward a more streamlined and formal organization that, at the highest level—a central body of the CGIAR, is capable of effectively undertaking policy and strategy formulation and oversight.

RECOMMENDATION 15

The Panel recommends that the informal structure of the central mechanisms of the existing CGIAR System be transferred to a new central body to be incorporated as a non-profit public service organization in an appropriate jurisdiction, to be established after consideration of legal and other factors relevant to its effective functioning. The body would have the following specific characteristics:

- It would consist of the CGIAR Chairperson, a central body and Executive Committee, and a chief executive officer. (A full-time CGIAR Chair could also serve as chief executive officer.)
- Membership of the central body would be drawn from the stakeholders of the CGIAR. Based on a principle of rotation, all Members would have the possibility of serving on the board. Regular meetings should be held once a year. In addition to the Chair, the board would contain representatives of or individuals from the following categories: Members from the South (up to 6 persons), the North (up to 6), the private sector (up to 3), the NGO community (up to 3), institutions and foundations (up to 3), and co-sponsors (4). The total would be up to 26 persons. The central body would be elected by its members, with the number of seats to be allocated to each stakeholder group being elected by the members of such group, so as to ensure balanced and representative character.
- Central body members would serve on staggered, three-year terms, and would be eligible for re-election for up to a period of six years. There would be no alternates. Each category would elect its members on the body, using the following criteria: funding exceeding US\$ 500,000 annually and during the full period of membership; "vision" and knowledge about global agricultural research; "vision" and knowledge about agricultural research in the South; and ability and willingness to consult with other relevant actors. The chairs of TAC, the Committee of Board Chairs (CBC), and the Center Directors Committee (CDC) would be ex-officio, non-voting members of the body.
- Acting on behalf of the central body, an Executive Committee would meet up to three times a year and be chaired by the CGIAR Chair. It would perform the current tasks of the Oversight Committee. The Executive Committee would exercise the powers of the central body when not in session, subject to the terms as agreed by the central body. The Executive Committee would be composed of three members each from the categories of the North and the South, and one member each from the private sector, NGOs, and institutions, plus the co-sponsors. In all, it would have 14 members (including the chairs of TAC, CBC, and CDC as non-voting, ex-officio members).
- The Finance Committee would become a committee of the central body.

- A portion of the agenda support funds would be at the disposal of the central body/Executive Committee in order to ensure stable and guaranteed support for Centers in such important areas as training, maintenance of gene banks, and indirect cost recovery.

15.3 Members of the CGIAR

For much of its past, the CGIAR was known as a "Club of Donors." In 1972, it had 16 donors. In 1992, six developing countries contributed financially to the System. As of MTM98, the South-North ratio of member countries is 20 to 21. This growth of Members from "the South" indicated that the need to have separate regional representatives is not as pressing as it was during the early years of the CGIAR. A possible expansion was predicted by the 1994 Study Panel on the CGIAR's Long-Term Governance and Financing Structure, which concluded that "future governance system should allow for much increased ownership of the system by developing countries." Although the current financial contributions from developing countries are relatively small compared with those of industrialized countries, this trend illustrates a real shift in the sense of "ownership of the CGIAR by the South," indicating a much increased political acceptance by developing countries.

Further expansion leads, however, to some fundamental questions. One relates to how much the CGIAR should further widen its base of membership and the overall, long-term direction in which the CGIAR should develop. A global system may ultimately imply that all nations may become a member. Further growth of membership implies that there might be a need for more sharply defined requirements for future membership beyond the current minimum annual financial contribution to the CGIAR (US\$500,000). One possible avenue may be to have three levels of minimum annual contribution based on the GNP of Members. Another issue relates to how new Members are invited. At present, new Members are approached by the CGIAR Chair and Executive Secretary.

RECOMMENDATION 16

The Panel recommends that the CGIAR broaden its membership by over time including more governments and other stakeholders to enable the CGIAR to become even more inclusive, as research becomes increasingly globalized and dependent on collaboration among a wider range of partners. Specifically:

- Membership in the CGIAR should be broadened to include the private sector and the NGO community, as both play increasingly important roles in the international research-development continuum. The basis of membership should be not only financial, but a shared commitment to the mission and goals of the CGIAR and a representative character of the parties concerned.
- The minimum, annual contribution should be US\$1 million for all Members. However, for Members from the South with a per capita GNP of less than US\$750, the current annual minimum contribution should remain unchanged for the next 5–7 years.
- In-kind contributions should be officially recognized by the CGIAR.
- As the membership base broadens to include new sectors, ethical ground-rules for collaboration with new partners will need to be developed.
- Regional representatives should be eliminated.

15.4 CGIAR Chair

The CGIAR Chair has always been a Vice President of the World Bank. In the past, the Chair's major tasks were to conduct the business meetings and encourage new Members to join the CGIAR. That role, however, changed in times of financial crisis. In the early 1990s, the Chair took considerable initiative and was instrumental in resolving some financial problems by instituting a renewal of the CGIAR. Partly as a result of the renewal process, the Chair's role has somewhat expanded to include serving as "ambassador" of the CGIAR and speaking on behalf of the System at international meetings. In general, activities of the recent past show a large role for the CGIAR Chair, who has acted with both ingenuity and effectiveness and has improved the overall morale of the System. The current Chair has been exceptionally effective and decisive in providing leadership in and managing the process of renewal of the CGIAR and giving new direction and impetus to the System. The chairmanship is becoming a highly demanding position. In view of these increasing demands, it may be desirable in the future for the chairmanship to become full-time.

Although some stakeholders believe that the Chair's position as a Vice President of the World Bank causes the CGIAR's policies to be "Washington-oriented" and World Bank-dominated, the Panel believes the World Bank's leadership role and financial support to the CGIAR is indispensable. Another advantage is the visibility that a senior World Bank official brings to the CGIAR. There is a large potential scope for positive action available for a committed and charismatic leader. At the same time, the effectiveness of the Chair is highly dependent on the individual serving in the position, and the CGIAR has little voice in the selection process for its Chair.

RECOMMENDATION 17

The Panel recommends that while the World Bank's primary leadership role and financial support to the CGIAR continue, a vice president of the World Bank (or a person of equivalent or higher stature within the World Bank) should continue to serve as Chair of the CGIAR. The Chair will be appointed by the central body in consultation with the World Bank. The position of CGIAR Chair may require a full-time effort in the future. In this case, the Chair could also serve as chief executive officer.

15.5 Committees

Originally, the Technical Advisory Committee was the only advisory body. There were two Center Committees: the Committee of Board Chairs and the Center Directors Committee. Since the early 1990s, however, several new Committees have been established (Annex I provides a brief summary of their terms of reference and composition). The Panel has attempted to review the overall work of the CGIAR Committees. In addition, part of the questionnaire to stakeholders focused on whether the past work of Committees was effective.

TAC should be re-organized into a small core group supplemented by sub-panels on major research issues to facilitate its future role of formulating strategic positions on future science for the CGIAR in addition to its current extensive and useful work on priority setting. In addition, TAC could mount short-term, ad hoc scientific Panels, composed of five to eight specialists in areas for specific study and of future relevance to the CGIAR. Members of TAC will be

appointed by the central body. TAC, along with the CGIAR Secretariat, would continue to advise on future strategies and priorities and, with the Secretariat, to monitor centers through reviews (the EPMRs) and scientific scrutiny of Centers' budgets.

The rapid establishment of several Committees has various causes and took place primarily during the period of financial crisis in the early and mid-1990s. This contributed to more active participation by Members than in the past. In fact, such participation has been encouraged as illustrated by the Standing Committees. However, the proliferation of Committees also carries significant inefficiencies and transaction costs. The ad hoc manner in which the Committee structure evolved resulted in a serious lack of clarity and efficiency. In response to the Panel's Survey of Stakeholder Views on the CGIAR, there was widespread agreement among all stakeholders that simplification, clearer definition, and enhanced coordination of Committees are necessary. Further, in spite of the large set of interdependent Committees, the CGIAR lacks a body responsible for the System's long-term strategy.

The Panel concludes that the CGIAR's Committee structure needs to be streamlined and reoriented in order to serve the System and its stakeholders more effectively.

Some highlights of the work of the Committees are given in Annex II, together with a summary of major findings from the responses to the Survey of Stakeholder Views of the CGIAR. Some concluding remarks from the survey are provided in Box 2.

Box 2: Stakeholder Views on CGIAR Committees

The OC seems to serve the CGIAR Members well; the major concern is that it has not been effective in taking necessary measures and actions in response to serious situations.

The FC is considered to be an effective committee that serves the System well; the only concern is that it has not been able to identify and recommend options for mobilizing new sources of funding.

The role of TAC is very important, though the Committee has given too much attention to budgetary matters rather than strategic issues, natural resource management, proprietary science, and intellectual property rights. TAC has not been sufficiently effective in monitoring changes in the global research context and incorporating views of actors outside the CGIAR itself. Membership should be based more on expertise in a rapidly changing scientific environment than on geographic concerns.

The IAEG has had difficulties in both funding and staffing. Its work has not met the expectations of most survey respondents. There is a need to delineate clear responsibilities between impact assessments by Centers and those at the System level.

The Genetic Resources Policy Committee (GRPC) seems to have been effective, though CGIAR Members were disappointed in its monitoring of implementation of the CGIAR agreement with FAO.

The Private Sector Committee (PSC) has brought some of its perspectives to the CGIAR but it has kept too low a profile and refrained from making formal recommendations.

Box 2, continued

The NGO Committee's (NGOC) effectiveness has been limited, especially with regard to furthering collaboration between NGOs and Centers.

The Public Awareness and Resource Mobilization Committee (PARC) has a crucial task but its effectiveness is judged to be marginal so far. It is obvious that the CGIAR needs an aggressive public awareness strategy, focusing on high-level decision-makers.

Time and funding constraints limit the CBC's potential, and it has limited input to the System. The CBC's work is viewed to be effective, though the Board Chairs themselves do not think so regarding their task in encouraging and developing leadership by Center Boards.

The CDC represents a significant source of scientific and practical expertise that is not always used effectively. The CDC is not effective in implementing activities of collective interest to the System.

In general, the CGIAR and TAC Secretariats seem to be effective in performing their major tasks. Nonetheless, Center Directors are not satisfied with the support given to Centers by the CGIAR Secretariat.

RECOMMENDATION 18

The Panel recommends that the current Committee structure be streamlined to improve effectiveness and efficiency, and to ensure compatibility with other proposed changes in System-level governance. Specifically:

- The functions of the Oversight Committee should be assumed by the Executive Committee of the proposed central body.
- The Finance Committee should become a committee of the *proposed central body*.
- The scientific capacity of TAC needs to be strengthened and its independent scientific advice maintained. TAC should be reorganized to include the TAC Chair and two or three strategic thinkers or "visionaries," who together would constitute the TAC nucleus. They would assist the proposed chief executive officer in formulation of a CGIAR Strategy, and would serve renewable three-year terms. The TAC Secretariat should remain at the FAO in Rome.
- The IAEG should cease to exist in its current form. The central body should establish an impact unit in cooperation with TAC. This unit may be incorporated within TAC.
- The important tasks of public awareness and public relations, including PARC and the "Future Harvests" campaign, should be taken over by a new Media and Communications unit that is closely linked with the proposed central body and chief executive officer. It should be supplemented with a media consultation each year at ICW.
- An independent committee similar to GRPC remains necessary. Such a Policy Committee should be attached to the proposed CGIAR central body. Alternatively, it may be attached to TAC as a permanent sub-panel.

- **The NGO Committee and the Private Sector Committee should be replaced with wider consultative processes with representatives of each sector during each ICW. These representatives would be invited to participate in relation to relevance of the issues being considered. The two committees should continue to exist in the interim until such consultative processes are implemented.**
- **The input of the CDC and CBC should be sought and valued.**

15.6 Co-sponsors

The World Bank, FAO, and UNDP have been co-sponsors of the CGIAR since its inception. In 1994, UNEP was invited to assume co-sponsor status, reflecting the CGIAR's increasing commitment to sustainability and natural resource management. The co-sponsors roles have included, among other things, backstopping important aspects of the CGIAR and bringing a developing-country, multilateral perspective to the Consultative Group. The World Bank financially supports the CGIAR Secretariat, while the co-sponsors collectively support TAC, the TAC Secretariat, and the IAEG. The four agencies appoint members of TAC and the IAEG. The World Bank also has provided substantial financial support to the CGIAR's programs, combined with overall leadership through the provision of the System's Chair and the chair of the Finance Committee.

The World Bank contribution of some \$600 million over the period 1971–1997 has been critical in mobilizing other CGIAR contributions from Members totaling over \$4 billion. In contrast with the special role of the World Bank, the financial contributions to the System of the other agencies have become marginal in recent years. UNDP, previously a large financial supporter to the CGIAR, mainly with unrestricted funding, has significantly decreased its contributions. FAO, like UNEP, makes no financial contributions to the research programs.

The co-sponsors have played a critical and commendable role in the CGIAR System and this needs to continue. At the same time, the Panel believes that the "co-sponsor" status, as it was originally conceived, is no longer relevant, as the System has expanded to include a wide range of stakeholders and Members. Hence, the roles of these four multilateral organizations should be based on much stronger programmatic linkages and joint programs with the CGIAR.

Financial support and the support provided in the form of the CGIAR and TAC Secretariats also continues to be indispensable. However, the Panel believes that the relationship between the CGIAR and these organizations needs to be updated to reflect changing circumstances and recommended changes in governance of the System. Specifically, the status of "co-sponsor" would no longer be a separate category, and the co-sponsor role would be recognized through permanent seats on the proposed CGIAR central body and its Executive Committee. A World Bank representative would continue to chair the Finance Committee.

Strengthening the programmatic links between the work of the CGIAR Centers and that of the on-going programs of the four agencies, particularly the FAO and the World Bank, must be accorded high priority, given the interdependence of the organizations' missions. For example, there could be a closer collaboration between FAO and the CGIAR Centers through FAO's Special Program on Food Security; and the Bank's rural development portfolio, especially its agricultural research projects, could be more closely connected to the work of the CGIAR. This would result in a better mix of research and development work at the field level, with a focus on

poverty alleviation. However, such collective efforts raise questions on the role of co-sponsors in relation to the Boards of Trustees of individual Centers or in particular countries where there are joint activities with CGIAR Centers.

RECOMMENDATION 19

The Panel recommends that:

- “co-sponsor” status be replaced with permanent seats on the central body and its Executive Committee;
- a World Bank representative continue to chair the Finance Committee, as long as the World Bank’s leadership and financial support continues;
- joint programmatic efforts between the CGIAR and these four agencies receive high priority, particularly in the area of strengthening NARS;
- collaborative efforts between the FAO’s Special Programme for Food Security and the CGIAR should be further explored to facilitate more intensive collaboration at the national level; and
- these agencies should play a more consistent role in strategic issues through coherent efforts during major meetings related to the mission and work of the CGIAR.

15.7 Global Forum on Agricultural Research

Based on a recommendation by the Study Panel on the CGIAR’s Long-Term Governance and Financing Structure, a Global Forum for Agricultural Research (GFAR) was established in 1996 to serve as a meeting ground for all actors involved in agricultural research for development. Convening once every two years, GFAR is intended to identify problems, describe progress, and establish needs for global agricultural research; assess and clarify global priorities; suggest roles for various actors; and explore ways to strengthen alliances and partnerships.

A draft Programme of Work (1998–2000) of the Global Forum was presented at ICW 97. The GFAR Secretariat, located in the Environmentally and Socially Sustainable Development–Agricultural Research and Extension Group (ESDAR) of the World Bank, is to deal with global aspects, organize meetings of the Global Forum every three years, develop an electronic global information system, and carry out specific studies on generic issues of global interest. Funding is assumed to come from a special Donor Support Group. Coordination and close interaction is planned with the NARS-Steering Committee secretariat, located at FAO in Rome. Its main purpose is to facilitate the strengthening of NARS, the participation of NARS in regional/sub-regional fora, and the establishment of research partnerships with several other partners, such as IARCs, advanced research institutes, the private sector, and NGOs.

The establishment of the global and regional fora is in line with increased “ownership of the CGIAR” by developing countries, the outcome of a participatory process, and the result of a genuine desire to improve the involvement of the NARS in the decision-making process of the CGIAR.

RECOMMENDATION 20

The Panel recommends that the CGIAR support the convening of a Global Forum every three years, confined to a general meeting on future global agricultural research issues and involving all major stakeholders. Further, the CGIAR should monitor GFAR's development and viability, as well as the implications of GFAR with respect to the work of CGIAR Centers, particularly ISNAR.

15.8 CGIAR Meetings

The Panel examined various aspects of CGIAR meetings, including their frequency, timing, format, agenda, participation, outcomes, and follow-up. At present, the agenda is set by the CGIAR Chair after consultation with many stakeholders, and is usually quite substantive. The agenda is generally adopted without major amendments. Due to the increasing number of activities, the agenda is now quite crowded. With a lack of time for deliberations, there is usually time for only one intervention per member, and intensive discussion or exchange of views is practically impossible. In general, interventions are of a reactive nature to proposals presented, mostly in well-prepared background documentation by TAC, the CGIAR Secretariat, or a Committee or Panel. The meetings are conducted very efficiently, and the consensus view ("decision") is summarized by the Chair at the end of the meeting.

After the renewal of the CGIAR, the role of the MTM became more critical in planning the research agenda. Based on Center proposals for the next year and TAC recommendations, the CGIAR endorses an indicative planning figure recommended by the Finance Committee at the MTM. The final budget decision is then taken at ICW.

Meetings are organized by the CGIAR Secretariat and, in the case of MTM, in conjunction with a host country. While the cost to the Secretariat of these meetings is not great in absolute terms, when Centers' and Members' time and travel and the expense to the MTM host country are taken into account relative to the overall budget of the CGIAR, the business meetings quickly become more costly. Although business meetings are an important part of the consultative process underlying the CGIAR, they should be streamlined to promote efficiency in conducting the System's business.

RECOMMENDATION 21

The Panel recommends that there be one annual business meeting at ICW. MTM should be held every third year, with possible elimination over the longer term. Additional ad hoc meetings could be held around the Executive Committee meetings as necessary. A triennial MTM would be complementary to TAC's three-year planning cycle; the recommendations of the Finance Committee currently given at MTM would be circulated in writing. Further, the size of all kinds of delegations to CGIAR business meetings should be restricted.

15.9 Secretariat

The Secretariat is to be headed by the chief executive officer of the new central body. Suitable arrangements will need to be made with the World Bank to ensure continuity of Secretariat services, either through secondment or contract.

The Panel concludes that the CGIAR Secretariat is very effective in providing support to the CGIAR Chairman, but currently gives less attention to services needed by the Centers. We are convinced that in the future the CGIAR needs new types of secretariat services in a range of System-wide activities. This will require expertise in and responsibilities for providing services in public relations, legal services on intellectual property rights, information technology support, identification of new sources of funding, human resources policy, and so on.

Human resource development is especially crucial to the CGIAR. The System and the IARCs are only as good as the staff they recruit. The high quality and dedication of Center Directors is an important strength of the CGIAR, and they need more support from the Secretariat. In the future, the complexity of the CGIAR's mission will require changes in the skill sets of Center scientific and management staff. The Centers would be able to select from a wider pool of qualified candidates if there were an effective mechanism in the Secretariat for widely advertising the CGIAR mission in conjunction with soliciting applications for various types of positions relevant to the System's work.

RECOMMENDATION 22

The CGIAR Secretariat should expand and strengthen its human resources services to ensure that the Centers are able to identify and attract the very best scientists and managers, including young professionals.

15.10 Conclusions

The Panel is convinced that the proposed changes in System governance—establishing a central body, setting the CGIAR up as a more formal organization, and streamlining the Committee structure—would have many significant benefits to the System as a whole (see Box 3). Essentially, CGIAR Members would be able to focus more on strategic policy and oversight, and accountability for decisions (and ultimately the impact of the System) would be enhanced while maintaining member sovereignty and Center autonomy. Difficult and sensitive issues will be dealt with more effectively, there will be greater transparency, and transaction costs will be reduced.

Box 3: Key Benefits of the Panel's Recommendations on Governance

- Greater coherence of the System, especially in policy and strategy formation and oversight.
- A "legal" status for the CGIAR.
- A more proactive role for, and closer collaboration with, all co-sponsors (not only the World Bank).
- Closer collaboration with other partners (ARIs, associate centers, global/regional fora of NARS, and so on).
- Improved effectiveness of Committees, and enhanced quality of discussions at CGIAR meetings.
- More transparency and efficiency in decision-making at all levels.
- Closer linkage between governance at the System and Center levels.

RECOMMENDATION 23

The Panel recommends that a special task force of key CGIAR stakeholders, with supporting staff, be established to develop a planned process of implementation of the governance changes recommended in this report.

CHAPTER 16. CENTER-LEVEL GOVERNANCE

In the Panel's view, other complementary changes are needed in certain aspects of governance at the Center level. Among other issues, there is a need to ensure greater accountability of Centers' Boards for System-related issues, to strengthen the decentralized management of independent Centers operating within the CGIAR System, and to ensure closer collaboration among the Centers, particularly for inter-Center activities and System-wide programs.

16.1 Linking CGIAR and Center Governance

Under the CGIAR principle of *Center autonomy*, Centers are governed and guided by independent Boards of Trustees. Centers are independent legal entities that maintain individual missions and goals under the umbrella of the CGIAR. Center autonomy has contributed to flexibility within the large and complex CGIAR structure. In addition, it contributes to maintaining the scientific excellence and relevance of the Centers.

In principle, Center Boards require succinct decisions by the CGIAR, a minimum of transaction costs, and predictability and stability in funding. The independent Boards of Trustees continue to be responsible for all Center activities, but they increasingly take into account CGIAR System-level decisions.

Members of the group may not always fully share their opinions publicly at the CGIAR meetings; they may not agree fully with the consensus decisions and—referring to member sovereignty—they can act otherwise since there is no formal, binding decision.

Centers must be well informed also about priorities of each financial contributor since funding of the Centers is primarily bilateral. Thus the recently introduced agreed research agenda of the CGIAR is an improvement in fostering a collective action and guidance in governing both individual Boards and CGIAR Members.

The CGIAR has become more financially centralized after the renewal process. Boards are quite constrained both financially and regarding oversight. The large number of Committees limits the flexibility and strategic work of individual Boards. And CGIAR Members have recently decided to favor restricted funding of Centers, giving Boards even less freedom to maneuver. With some exceptions, Board Chairs and Center Directors usually contribute their views collectively at CGIAR meetings.

Two of the Panel's principal recommendations for System-level governance in particular—increased formality of the CGIAR and increased centralization of System governance—are likely to affect Center governance. Increased centralization of System-level governance, with its concomitant strengthening of executive authority, may also affect the nature or extent of Center Board authority.

Within a more formalized entity, Center Boards of Trustees should become more proactive in developing long-term scientific and financial strategies based on an explicit, overall CGIAR strategy developed by the proposed central body.

RECOMMENDATION 24

The Panel recommends that Boards of Trustees of individual Centers maintain much closer relationships between themselves and the central body. We recommend establishment of a special task force to develop a strategy to delineate the nature and modalities of the relationship between Center Boards of Trustees and the proposed central body. This task force should consist of a small number of Center Directors, Board Chairs, and CGIAR Members.

16.2 Role and Performance of Center Boards

Everyone who responded to the Review Panel's questionnaire noted that Boards of Trustees have established appropriate mechanisms for strategic guidance and financial management of a Center and keen understanding of its mission. However, respondents suggested that Boards do not "fully understand overall CGIAR strategies and priorities" and do not "make effective decisions." Even more important, they do not find Board decisions to agree with consensus decisions by the CGIAR.

Board operations have been of concern for quite some time to the major donors, illustrated by the work of the Oversight Committee since its establishment. This resulted in the development of collective reference guides for all Centers in 1997. They cover aspects such as the role, responsibilities, and accountability of Boards; the role of a Board Chair; creating a well-balanced Board; building effective Board Committees; choosing a Director General; evaluating a Director General; and Board self-assessment. The Panel finds these guides a useful contribution by the OC, elaborated in close consultation with the Committee of Board Chairs and formally endorsed by the CGIAR. The Panel assumes that these guidelines are now being implemented by all Boards.

Board governance relates to effective direction and oversight of individual Centers, including the appointment of Director Generals with the right qualifications. The latter point is of special relevance, since Boards must make a strategic choice about whether to appoint a research manager or a top scientist as the leader of the Center. According to some EPMRs, the Boards are becoming more pro-active in research strategy, resource allocation, and review processes. Still, they could sometimes be even more active and professional in their duties of governance.

The EPMRs for 1992–1998 also mention that Boards generally lacked appropriate regional, gender, research management, and/or financial expertise to carry out their responsibilities. All respondents to the questionnaire found that the membership of Boards has sufficient representation with regard to the South and scientific expertise. The contrary views applied to financial and management expertise, although Board Chairs expressed their satisfaction on that point.

The Panel believes that:

- Boards of Trustees should become pro-active in developing a long-term scientific and financial strategy at the Center level based on an explicit, overall CGIAR Strategy.
- All Boards of Trustees should have appropriate mechanisms in operation for regular and effective assessments of Director Generals and their own operations.
- All members of Boards of Trustees should be given regular, comprehensive, up-to-date briefings at annual Board meetings on the strategy, priorities, and funding concerns of the CGIAR. This should include information about ongoing international negotiations of relevance to CGIAR. A short report should be prepared by the CGIAR Secretariat after the Annual CGIAR Meeting.
- As general guidelines, Boards of Trustees should have 10–13 members, and a well-functioning and effective Board must have not only relevant expertise but also adequate representation of different stakeholders and regions of the world. All Boards should seek to include members from the private sector and the NGO community. All Centers should establish “Board profiles,” indicating the best balance of Board membership, considering all relevant parameters.
- Representatives of “donors” with responsibility of directing any funds to a Center should not serve as a Board member as a matter of principle, and the current system of CGIAR nominees should be improved through regular nominations from both the North and the South.
- Boards of Trustees should seek to achieve geographic and gender balance, without compromising the effectiveness of the Boards. A retiring member from one Board should only be eligible for a new Board after two years.
- Centers need modern personnel policies, management systems, financial policies and performance appraisal systems, all with Board approval.

16.3 Governance of Eco-regional and Inter-Center Initiatives

During the renewal phase, CGIAR Members underlined that more attention should be given to new forms of collaborative research in which several Centers work with NARS, NGOs, and other actors. Various collaborative research initiatives have since arisen, such as eco-regional and other System-wide programs. On their own initiative, Centers also engage in collaborative research with one another in areas of common interest. Once established, however, such collaborative activities have found it hard to attract the required additional financial resources.

Governance of such inter-Center and System-wide initiatives has been problematic, as there are no clear governance and management mechanisms set forth. So far, there are few experiences with management of such complex activities as just described. In 1994, the Study Panel on the CGIAR’s Long-Term Governance and Financing Structure stressed that no single management formula will apply to all cases and underlined that “such programmes will require ingenious approaches to avoid inefficiency and high costs.” Models of management will include a lead or convening Center with explicit division of labor between the partners and collective management through a Committee or management by a single Center or a new entity established principally

for this particular purpose, with other participants in subordinate roles, or through modified networks. Such undertakings will require not only financial support from other participating partners, but also collective support and understanding of the more complex governance process. According to the Survey of Stakeholder Views on the CGIAR, there is widespread agreement within the System that implementation of System-wide and inter-Center research programs needs to be improved.

The eco-regional approach, a significant component of System-wide programs, was initiated by TAC based on the idea that relevant partners join forces in trying to resolve major research problems in an agro-ecological region rather than a more conventional commodity (or single Center) approach. Ideally, this would require that a NARS be in command of invitations to relevant partners, the budget, and management of the activities. Too often, however, such activities are controlled by the donor or group of donors that have decided to work collectively with a particular NARS or regional or sub-regional organization. This is an area of difficulty to Boards in reconciling a long-term research strategy with changing donor attitudes and financial influences. Their problem is accentuated by the fact that donors may not accept the basic principle of governance by NARS, nor may they give this responsibility to a single Board, preferring instead to exercise full control of "their" operations. These complications may lead to unnecessary confusion and difficulties in Board and Center management.

Current systems of governance do not promote effectiveness in eco-regional activities. The first step seems to be for donors to decide whether they can delegate more responsibility to the NARS and regional and sub-regional organizations. Since this is primarily development work, adaptive research, and a component of the strengthening of NARS, the Panel believes all these aspects must be considered in an integrated manner. At this stage, we are not convinced that Centers would be the best convenors of eco-regional research activities on behalf of the donors. Initially, clear lines of responsibilities must be agreed upon.

Despite challenges in governing and funding inter-Center and System-wide programs and other collaborative undertakings, such activities will be increasingly important as the CGIAR's mission broadens, as research questions are increasingly complex, and as the nature of funding changes. Synergies among Centers and between Centers and their partners must be exploited. Further, many of the Panel's recommendations on issues of science and strategy also call for intensified collaboration. In achieving this, effective mechanisms for governing, financing, and managing must be developed.

RECOMMENDATION 25

The Panel recommends that:

- Relevant System-wide programs be provided sufficient funding on a long-term basis (at least five years), as they can be a useful complement to the CGIAR through improved coordination;
- since eco-regional activities are part the strengthening of NARS, a workshop examines and assesses past practical experiences, issues, and potentials involving all relevant actors in a region, with a proposal for further actions to be discussed by the CGIAR in 1999, at the latest;

- **Members and Centers place high priority on ensuring funding of collaborative research activities, including ecoregional and other System-wide programs as well as other inter-Center initiatives that are important to the CGIAR mission;**
- **eco-regional activities be managed by the NARS and regional and sub-regional organizations, with the political and financial support of both the NARS and any bilateral donors; and**
- **a special task force composed of key stakeholders be established to formulate specific plans and modalities to improve the governance and financing of System-wide programs.**

CHAPTER 17. FINANCING THE SYSTEM

In this chapter the Panel considers various issues related to the CGIAR System's financing, financial planning, and resource allocation. These include such aspects as leveraging the CGIAR's important though small contribution to global research efforts, ensuring increased ODA for the CGIAR, and ensuring a suitable North/South balance in funding of and influence on the research agenda. We also discuss aspects related to predictability and stability of funding for the CGIAR-supported Centers, rational resource allocation for CGIAR-supported research, and a suitable approach for funding research (restricted versus unrestricted funds). In addition, we focus on steps needed for adequate protection of the CGIAR research agenda (and related issues of the disbursement practices of CGIAR Members) and financial planning and resource allocation at the CGIAR level (including roles of the World Bank and the Finance Committee).

17.1 Financial Outlook

The outlook for 1998 continues to be stable according to the report by the Finance Committee at MTM98; the funding forecast by Centers for 1998 totals US\$335–340 million, which is about 2 percent below the financing plan of US\$345 million. If the declining trend of ODA continues in the next 10-year period, this will require stronger political actions by the CGIAR than those that led to the Lucerne Ministerial Meeting in 1995.

Most modern societies consider research vital to national development. The Panel wishes to underline that government allocations to research normally range between 2 and 3 percent of gross domestic product. If this figure is applied to CGIAR's future long-term research of global relevance, current levels of ODA allocated to the CGIAR (0.7 percent in 1996) are unacceptably low.

Over the years, the composition of CGIAR funding by its Members has been quite stable. The OECD/DAC countries provide some two thirds of total funding, institutions about one quarter, and the remainder is split between developing countries and foundations. In spite of increased numbers of developing-country Members, this group's share of the total budget has not changed significantly (Annex III, table 1). In 1997, exactly 50 Members contributed to the CGIAR research agenda. The 10 major contributors provided three quarters of the funding. Five years ago, some 76 percent of the core program grants came from 9 Members, whereas 18 Members provided 96 percent of the total grants.

In 1994, the report of the Study Panel on the CGIAR's Long-Term Governance and Financing Structure Future stated that "the CGIAR will continue to rely primarily on public funds. In order to remain competitive, the CGIAR will need to articulate its relevance and priorities clearly and demonstrate its efficiency and impact." The same view was recently expressed by the FC, adding that the dominance of ODA sources is consistent with "the international public good character of the CGIAR." In general, the Panel concurs with these assessments. Nonetheless, we wish to emphasize that this may imply that the CGIAR budget will remain stable or even decline over the

next decade. Adding to the uncertainty are the outcomes of ongoing international negotiations with reference to the Convention on Biological Diversity regarding a global system for genetic resources. These negotiations chiefly involve Ministries of Natural Resources and/or Agriculture, in contrast to discussions at CGIAR, where funds come from aid ministries.

New sources of funding have been discussed now and then within the CGIAR. Today, most industrialized countries are Members of the Group and few additional ones are possible sources. On the other hand, a number of industrialized countries contribute to the CGIAR below their potential compared with others. Also, member (donor) countries may use not only their multilateral branches of the Ministry of Foreign Affairs but also sectoral, bilateral desks, not the least for collaborative activities between Centers and other partners. Recently, several new developing-country Members have joined the Group, which the Panel finds encouraging. A quite realistic target for the CGIAR System may be a doubling of the number of Members from the South in 5–10 years. This would not only add income, it would give a strong political signal. It must, however, be supplemented by strong representation to industrialized countries that they need to strengthen the CGIAR.

An important category of new sources of funding relates to the World Bank and its lending program for agriculture. In addition, a special unit within the World Bank—ESDAR—was established a few years ago. One assumption was that these efforts would complement each other in trying to include components of agricultural research in agricultural loans to governments of the South. This would offer opportunities for the CGIAR Centers to be actively involved in national activities, either directly or through collaborative arrangements. But being long term in nature, agricultural research is not given adequate priority. Since the new unit was created only recently, it is unclear how well this approach has been working and no specific data are currently available. In short, it seems that this policy has not been instrumental to the CGIAR thus far. In addition, it appears that ESDAR activities may not be permanent.

The Panel believes that:

- First, as the CGIAR will continue to rely primarily on ODA funding over the long term, multilateral and bilateral funds should supplement each other within the CGIAR agreed research agenda.
- Second, Members of the North should agree on a target of having their annual funding of the agreed research agenda reach 1.4 percent of their respective development assistance budget, a doubling of the current situation.
- Third, CGIAR member governments should take active part in ongoing international negotiations on a possible global system on genetic resources to ensure secure funding of a future CGIAR. This will require strong and coherent action through harmonization of their own overall policies.

RECOMMENDATION 26

The Panel recommends that the international development community reverse the decline in ODA for agriculture and agricultural research, tap other non-ODA public sector resources, and commit all parties (all governments, international organizations, national research organizations, NGOs, and the private sector) to coordinate their resources and efforts to combat the risk and threat of pervasive poverty, food insecurity, and environmental degradation in developing countries. Given the challenges ahead, this is a time for greater financial commitment to the CGIAR.

17.2 Potential for Private-Sector Finance

In the past, individual Centers have received funds from private sources. Seed companies have long had access to plant genetic resources on the basis of the universal policy on free access and exchange of genetic resources. The ratification of the CBD and an increasing role of the private sector in agricultural research has led some observers to believe that the private sector may make financial contributions to the CGIAR to gain access to genetic resources. Others, in the NGO community and the South, believe such a move for cooperation could cause political concerns.

The Panel is aware that the objective of the establishment of the Private Sector Committee was not to engage the private sector as a future financial contributor to the CGIAR. On the other hand, the private sector is strong in biotechnology, interested in access to genetic resources, and deals with seed production. All these aspects are of major relevance for the CGIAR to have greater impact from its collaborative research at the national level. Even if the private sector initially may not wish to give general grants to the CGIAR as a whole, the Panel concludes it would not be unrealistic to assume some financial support. This may include, for instance, collaborative research of mutual interest and well-focused training/education programs such as post-doctorate scholarships at Centers, seminars, and so on. All these activities would most likely have a focus on biotechnology. Based on EPMRs, the Panels notes that few Centers have developed a model for private-sector partnership or demonstrated replicable, fruitful interactions with the private sector.

At the Lucerne Ministerial Meeting, Members of the CGIAR stressed that there is now better recognition that publicly and privately funded agricultural research will be complementary. The CGIAR was asked to explore the possibility of setting up a foundation as a mechanism to channel ad hoc or non-traditional financial contributions in supporting the CGIAR. The basic idea was that funds attracted by a foundation should support the agreed research agenda, serving the CGIAR overall or on regional commodity or thematic lines. If a CGIAR-linked foundation is to have its own Board of Governors, this raises certain basic questions regarding governance of the CGIAR in light of an independent Board of Trustees of a CGIAR Foundation. Other concerns include the addition of a new partner—one with an intrinsic danger of distancing itself over time from the CGIAR and developing a life of its own. A foundation might also be active in public relation matters and could hold intellectual property rights on behalf of the CGIAR, which at the moment only the Centers have a legal standing to do. It is not impossible that—in the long term—the CGIAR (or a foundation) could handle incomes generated from intellectual property rights.

The Panel believes that an active, professionally run foundation should be established to mobilize funding in support of CGIAR activities. The recent reactivation of the International Fund for Agricultural Research (IFAR) in Washington D.C. by the CGIAR Secretariat is a positive development. Originally it was established as a mechanism to solicit support for international agricultural research and create public awareness about it. This foundation could become the locus of a major fund-raising strategy for the CGIAR.

The findings of the current study by the CGIAR Secretariat should be given further examination based on the understanding that such a foundation and its operations should be well integrated into the proposed governance structure.

As the CGIAR's financial needs grow, it would be unrealistic to expect that this increase will be met entirely by traditional sources of financial support. It would be equally unrealistic to believe that these increased needs will be met by new sources unless the CGIAR receives the strong and continued support of its traditional donors, particularly the World Bank.

RECOMMENDATION 27

The Panel recommends that an overall policy for CGIAR collaboration with the for-profit sector be developed at the System level under conditions that contribute to and do not compromise the basic public interests and objectives of the CGIAR. Financial contributions from the for-profit sector should be accepted for research activities of mutual interest, in line with the CGIAR mission statement, and directed toward the agreed research agenda. Further, a foundation should be the locus of a major fund-raising strategy to mobilize funding from the private sector.

17.3 Financing Issues

In an Issues Paper prepared for the CGIAR System Review, the FC concluded that "the changes in financial procedures introduced as part of the renewal program have strengthened the financial structure of the CGIAR." Nonetheless, it identified several issues that it considers critical over the next few years that the Review Panel should examine. Funding is one of these issues, and it has several aspects: predictability, modality, stability, and disbursement practices.

17.3.1 Predictability of funding

Since 1971, the CGIAR has been exceptional in attracting funding for long-term research—based on one-year commitments by CGIAR Members to an expanding budget. However, there have been times when funding deficits have had serious negative consequences for Centers. This has led to efforts to make funding more predictable. In 1981, the Report of the 2nd Review Committee recommended a rolling five-year plan as remedial action. This was tried but did not work, partly because Members—being governments—normally have a one-year budget themselves.

The 1995 Ministerial Meeting in Lucerne encouraged Members to provide multi-year commitments. The Panel notes with satisfaction that some governments have recently taken steps to make commitments on a multi-year basis. But this may not lead to a final solution. It might even result in reduced levels of contributions to the CGIAR in the current environment of declining ODA resources. Alternatively, Members wishing to offer multi-year finances may be forced to place more restrictions on use of their resources. Some governments will have constraints due to legislative reasons. In theory, an Endowment Fund would serve the CGIAR well, though such a fund will not be attractive to most member governments.

As funds are unlikely to increase over the years to come, a major effort should be made to use available resources more efficiently. This includes:

- reducing the costs of Centers through joint services,
- critically analyzing which research activities currently carried out by the Centers can be undertaken by the NARS in specific regions,
- eliminating duplication between Centers, and
- reducing costs and increasing efficiency of operating the CGIAR System.

The CGIAR must reach out to three important constituencies: the private sector, the rapidly growing philanthropic sector, and development agencies. Where development agencies are concerned, Centers should look to executing research components of large development projects of bilateral and regional agencies. Each Center may also have to invest considerable resources in fund raising.

17.3.2 Modality of funding

Restricted/Unrestricted Funding

In the past, CGIAR funding was made available with few restrictions. In addition, the reporting requirements were limited to those of the CGIAR as a whole (mainly Annual Reports of Centers and the CGIAR Financial Report). The outputs and impact of the Centers were to be noted by the Members and funders mainly in the field or through highlights of impact in annual reports. This was to ensure accountability. All funds for "core contributions" were at the full disposal of the Board. In addition, some Members financed "non-core" or "special projects." These were not examined by TAC and their results were reported separately and directly to the donor. These kinds of activities have been categorized in a number of ways, such as "essential" versus "desirable," "unrestricted" versus "restricted," and the current classification of "agreed research agenda" versus "non-agenda."

In 1997, more than 60 percent of the total budget was provided as unrestricted funds. The change has been dramatic during this decade, for in 1992 unrestricted grants represented 82 percent of the total CGIAR core program funding. Compared with CGIAR's first 10 years, the situation is almost completely reversed; "special projects" accounted for some 11–14 percent of the total budget. More scrutiny of public spending is one reason for this change. Another may be lack of confidence in Boards and Center management. Today, most contributors require attribution of their funding. This provides less flexibility to Center management, requires more administration, and is less preferred by the Centers. The renewal process underlined a need for general commitment of Members to give financial support with minimal restrictions. This requires good standard reporting by CGIAR.

The Panel concludes that there is a stated, general commitment of Members to provide grants with minimum restrictions. We wish to emphasize that CGIAR standard reporting seems to be quite sufficient. In spite of this, we believe the current trend toward more restrictions will accelerate. The dilemma of restricted grants will most likely remain. The Panel concludes the situation may change if and when the CGIAR System can better prove its accountability by showing specific impact of its research that is acceptable to Members. This is an area of equal importance to both the North and the South in securing sustainable funding.

The renewal process introduced two procedural changes in financial arrangements—the research agenda matrix and a project-based approach to Center planning. The projects are the basic Center unit of activity, with objectives, outcomes, and milestones. The distribution of financial resources is presented as the CGIAR research agenda matrix, with Centers forming the rows and CGIAR activities the columns. Nineteen activities are aggregated into five groups, representing the five major undertakings of the CGIAR. The matrix is constructed by fully allocating costs of Center projects to CGIAR activities. The CGIAR project portfolio contains some 300 projects, with common definitions and concepts used by all Centers. CGIAR Members can make their

contributions to these projects. In addition, there are some thematic areas, exemplified by the System-wide programs.

According to the FC, these procedural changes offer “excellent mechanisms to meet the attribution and accountability required by the aid bureaucracy.” Issues in the future will, however, continue to include high opportunity costs of targeted funding, reduced management flexibility, and reporting burdens on the Centers. The Panel is not convinced that the introduced changes are effective in providing necessary accountability. We suggest that the issues identified should be given an analytical examination, perhaps by the FC, to illustrate the actual costs to both Centers and CGIAR Members.

Indirect cost recovery

One important aspect of the shift to the agenda matrix and project-based funding is the commitment of Members to fund the indirect costs of doing research. Nevertheless, year after year, these costs are not being adequately funded. The Panel reiterates the Chairman’s call at MTM98 for Members to redouble their commitment to this indispensable aspect of Center operations.

Germplasm collections

As with indirect costs, Centers have expressed difficulty in securing adequate funding for maintenance and operation of their germplasm collections. While these collections represent one of the single biggest assets of the CGIAR, it is increasingly difficult to ensure their appropriate maintenance, evaluation, characterization, and use. Where the CGIAR has an international responsibility, as is the case with its germplasm collections, sufficient funding should be provided to enable the Centers to meet their international obligations.

Training

When budgets are tight, training is another area in which funding is not always assured. The Panel has expressed its belief that training remains an important area of work for the Centers, and financing must be forthcoming.

17.3.3 Stability of funding

Since most contributions to the CGIAR are made on an annual basis—mainly from multilateral budgets—they are prone to reductions when aid budgets are contracted and governments are forced to maintain internationally negotiated commitments. In some cases, this has led to reductions for the CGIAR; in others, the lack of formally pledged figures has provided flexibility through support from more than one budget line or increased contributions in an opportunistic manner. An introduction of procedures of formal pledging may require formal voting. Multi-year commitments contribute to stability. Also, the FC has set up a small reserve to partially buffer unplanned financial shortfalls. Above all, the FC makes use of the World Bank allocations, since they provide some flexibility in giving stability in funding to those Centers facing financial shortfalls. These measures seem to have been helpful—at the moment and on an annual basis.

The Panel notes funding at the CGIAR System level is stable. However, there are still funding

problems at some individual Centers. This is so in spite of the existence of various financial mechanisms and an active, constructive, efficient FC. Certain Centers seem to be permanently under-funded (Annex III, tables 2 and 3). We find this alarming and assume the FC will investigate this issue more even though it is only indirectly a System-wide issue (as indicated later).

17.3.4 Disbursement practices

Cash flows are important to Centers. Disbursement of funds must therefore be timely. This has been a problem for many years and is of added importance when funds are scarce. During 1988–1992, about one third of the funding was available to Centers by midyear, some 60 percent after nine months, and 92–93 percent had been disbursed at year end. After the renewal process, CGIAR Members provided funding to Centers in multiple financing modalities. In 1996, some 13 percent of committed funds to the CGIAR were still in the treasuries of Members at the end of that year and only available in early 1997. Receipts of funds for 1997 amounted to 89 percent. The FC has repeatedly expressed serious concern and urged Members to improve their disbursement practices. The Panel found this situation unacceptable.

RECOMMENDATION 28

The Panel recommends that:

- **three-year financial commitments to the agreed research agenda be encouraged;**
- **as a general rule, no individual center should have less than 70 percent “unrestricted” funding of its annual budget;**
- **the project based approach to center planning should remain and, together with the CGIAR Financial Report, should provide Members with excellent financial information and accountability;**
- **the use of the agenda matrix is most likely the best approach for the present CGIAR Governance model, although caution should be taken to avoid a complete dependence resource allocation by the free market in the longer run;**
- **donors improve their current disbursement practices so that Centers receive all funds at the beginning of the fiscal year; and**
- **Members ensure funding for indirect costs and areas in which the CGIAR has a global responsibility, such as germplasm collections and training, with funds at the discretion of the proposed central body possibly used to ensure sufficient support for these budget items.**

17.4 Financial Planning and Management at the System and Center Levels

Member autonomy offers Members choices in funding—both individual projects and Centers. This market approach may weaken the System as a whole. To avoid this, the current financial system incorporates a validation step, the purpose of which is to protect the CGIAR agenda as a whole, “the heartland”. A key role is played by TAC’s review of Center activities as embodied in their plans. TAC has to assess that the activities are well defined, relevant, and of the highest priority. The recent exercise of priorities and strategies, new Center medium-term plans, and the research agenda for 1998–2000 can be considered well documented. This means that current research by the CGIAR is the “heartland.” Whether current financing procedures will allow for

some flexibility and changes toward future priorities at a higher level of priority is not quite clear to us.

The FC has taken certain steps to ensure needed protection of the agreed research agenda. These include the improvement of the information flow to indicate which parts of the agenda are not adequately funded. The financial situation of Centers is closely monitored by the FC at each of its meetings. A portion of the World Bank allocations is set aside in the beginning of the planning period to be allocated in cases of unexpected financial shortfalls—after careful review of the specific circumstances.

The options and considerations taken into account by the Review Panel include having the World Bank, as one member of the CGIAR, exert its power in its allocation of funds to Centers of its own choice, and having an overall research strategy to show “the heartland,” since the current set of individual MTPs of Centers may not provide such a consistent approach.

The Panel concludes that although the Finance Committee has been quite successful in managing the finances at the level of the CGIAR System, some individual Centers are still facing financial problems.

This assessment and evaluation should be undertaken by the Finance and Oversight Committees or by the proposed central body, and the existing mechanisms for “protecting the heartland” may be sufficient for the short-term perspective. We reiterate our words of caution that the current financial system—in spite of the role played by the World Bank—may be too heavily driven by funding opportunities and may ultimately develop into CGIAR governance by free market.

17.5 Role of the World Bank

For many years, the World Bank has served as the indispensable “donor of last resort.” Through this passive process, the Bank mechanically filled gaps of funding for Centers not attracting funds from other Members of the Group. The maximum Bank contribution to an individual Center was not to exceed 25 percent of its core program budget. Since the mechanism would disburse more funds if funding gaps were larger, it became advantageous to Centers to demonstrate large gaps in funding. For some Members, their views on relative priorities among Centers were not expressed. In reality, this meant that an “unpopular Center,” according to the majority of donors, might not have been forced to change, since stopgap funding was forthcoming from the Bank. Also, this process did not allow the World Bank to have its own priorities in funding individual Centers. This problem came to a head in 1993/94 when the funding gaps exceeded the total World Bank contribution to the CGIAR (15 percent of the total core program budget).

In 1992, all Centers needed World Bank support. Seven Centers received less than 10 percent of their core program support, six Centers between 10 and 20 percent, and five Centers more than 20 percent—with two Centers at the 25–26 percent level. This trend had been growing since 1988. Some Centers permanently received high contributions from the Bank (Annex III, table 3).

Today, some of the World Bank funds are allocated on a matching basis—that is, proportionate to contributions by other Members. The 1998 contribution was split into US\$33 million matching funding in relation to US\$300 million in non-Bank financing. The matching World Bank ratio is 11 percent (although the ratio will return to 10 percent for 1999). A basic

underlying principle is also that Center financing plans are considered to be fully funded according to estimates by the Centers. The Bank's contribution of 11 percent is definite and based on the assumption that other Members will provide their shares. At MTM 98, nine Centers were below their funding targets (only two below 5 percent), five Centers expected to exceed it somewhat, and two Centers estimated 20 percent increases of their budgets.

Whenever financial problems have arisen after the renewal procedure, collective actions by several Members have been taken, mainly as a result of the work of the Finance Committee. These have strengthened the ownership by renewing the membership commitment to the CGIAR as a whole. The new approach and better discipline may also lead to incentives for Centers. It gives more clarity and, most likely, better understanding of the financial situation to all Members. The Panel concludes that the new approach by the World Bank in financing the research agenda is very efficient at the System level. We are much less convinced that this approach reveals all the reasons why individual Centers are not able to attract sufficient financing of their proposed budget plans. Moreover, there may be scientific reasons for this situation, which are dealt with elsewhere in this report.

Continued financial support and intellectual leadership from the World Bank will be as crucial to the CGIAR in the future as they have been in the past and are in the present. In fact, given the revolutions in the biological and information sciences, some expansion of World Bank support may be warranted.

The World Bank's contribution of \$600 million over the period 1972–1997 mobilized more than \$4 billion from like-minded institutions, national and international. This support, combined with overall leadership, adds up to an impressive record of effective intervention by the Bank on behalf of the poor and disadvantaged. Their liberation from hunger and poverty lies at the heart of the World Bank's mission.

Today, the international community needs the CGIAR more than ever before. Despite the great advances that have been made, food security for all remains elusive. The yield gap and the food gap in many parts of the world both have to be closed. Agriculture has to be ecologically and socially sustainable. Natural resources management requires urgent efforts. Thus, the global food security situation will be even more challenging in the new millennium than it was in the 1970s. And the rapid commercialization of science ensures that any diminution in the production of public goods in the broad area of agricultural research and development will hit the poor and hungry hardest.

The role played by the CGIAR cannot be fulfilled without sustainable support. The World Bank's continued involvement to the fullest extent is critical because it is the world's preeminent catalyst and financier of social change.

RECOMMENDATION 29

The Panel recommends that the World Bank continue to provide the financial and policy support and intellectual leadership which is indispensable to the future of the CGIAR as envisaged by this Review.

ANNEX I. OVERVIEW OF CGIAR COMMITTEES

Standing Committees

The Oversight Committee (OC) was established at MTM 93. It shall ensure that due care and diligence are exercised in the operations of the CGIAR and centers, that the System has a set of policies and instruments. It shall advise the Group on particular, strategic issues and maintain a "watching brief" of the Centers. The OC is not an Executive Committee but its Chairperson reports to the CGIAR. It consists of six members, serving in their personal capacity for a single term of three years. These members are nominated by the CGIAR Chair following consultation with CGIAR members. The OC members elect their own Chair, who serves on a one-year term, on a renewable basis.

The Finance Committee (FC) was also established at MTM 93. It provides overall leadership for the efficient management of CGIAR finances. This includes recommendations on allocations of funding and an annual financing plan for the CGIAR, the development of criteria for the allocation of the World Bank's contribution to the CGIAR, and recommendations on financial policies and procedures. The FC has 10 Member representatives, including the World Bank, which is a permanent member and serves as the Chair. FC members are selected through decentralized decision-making by the Group on the basis of nominations from caucuses of delegations. Two members are selected by and from among developing-country Members; six members are selected by and from industrialized-country Members that in the previous year had contributed the equivalent of US\$ 1.0 million or more to support Center activities that are part of the CGIAR agreed research agenda; and one member is selected by and from the non-national group of institutional Members (foundations and international and regional organizations). FC membership is rotated among members from each of the categories mentioned above, except for the World Bank. Members serve for renewable two-year terms. To ensure fuller participation by the membership of the CGIAR, membership of the FC is determined following appointments to the OC.

Advisory Committees

The Technical Advisory Committee plays a central role in the work of CGIAR, providing independent advice and judgments on strategic issues and on the quality of the scientific programs financed by the CGIAR. It recommends research priorities and strategies and ensures that research activities are relevant to CGIAR goals and objectives. TAC also recommends the allocation of resources among Centers in the context of CGIAR-approved priorities and strategies. This means that TAC monitors changes in the global context with implications for the CGIAR and addresses issues that cut across Centers and the System, such as commodity/activity balance, regional distribution and inter-Center conflicts; it also monitors the System's evolution. For these activities, TAC commissions task forces, study/review panels and working groups as needed and - based on their reports - makes recommendations to the CGIAR.

TAC is composed of up to 14 scientists and experts, usually half from developed and half from developing countries. Members are appointed by the co-sponsors after wide consultation. They serve in their personal capacities for terms of two years or less, renewable up to six years. The TAC Secretariat at FAO provides technical and administrative support to TAC. The Executive Secretary is appointed by FAO. He reports to the Director General as an employee of FAO. On

program matters he reports to the TAC Chair. The TAC secretariat has nine staff members, all employees of FAO. The budget of the TAC Secretariat is administered by FAO, but the costs of TAC's operations, including the costs of the TAC Secretariat and the emoluments of TAC members and other expenses are financed by the four co-sponsors.

The Genetic Resources Policy Committee was established at ICW 94. Its tasks are to advise the CGIAR on policy matters regarding genetic resources issues and to assist the Chairman of the CGIAR in his leadership role in this area. This means keeping abreast of the mechanisms established by the CBD, the FAO Commission on Genetic Resources for Food and Agriculture, UPOV, and other international groups as they relate to CGIAR; examining policy, legal and ethical issues on genetic resources; and monitoring the implementation of the CGIAR agreement with FAO regarding *ex situ* collections of the Centers.

The Committee is appointed by the CGIAR Chairman, following consultations with the CGIAR constituency. It has nine members, serving in their personal capacity. The initial term was two years (but has been extended for two more years). IPGRI provides secretariat services and staff support on technical matters.

The establishment of the Impact Assessment and Evaluation Group is a result of a proposal in the Lucerne Declaration and Action Program to "strengthen the assessment of [the CGIAR] performance and impact by establishing an independent evaluation function reporting to the CGIAR as a whole". At MTM 95 the CGIAR endorsed the establishment of IAEG. Its preliminary tasks are to facilitate the strengthening of CGIAR's *ex post* impact assessment capabilities, provide guidance and oversight to impact assessment activities and ensure that the design and conduct of evaluations document the impact of the CGIAR as a System. Originally, the IAEG consisted of a Chair and three members appointed for renewable two-year terms. They are to serve in their personal capacities. The co-sponsors serve as a search-and-selection committee and propose the appointment of the Chair and members on a no-objection basis. It reports at CGIAR meetings and its first annual report came at ICW 97. A secretariat established by the UNDP, and an Executive Secretary has been recruited.

Partnership Committees

At MTM 95, CGIAR decided to establish a NGO Committee to enrich the CGIAR dialogue with the NGO community, strengthen the voice of NGOs in CGIAR decision-making, and enable the CGIAR to build an enduring and effective relationship with the NGO community. The NGO Committee is seen as a complement to existing efforts of CGIAR Centers to maintain and strengthen working relations with NGOs. Specific objectives include: seeking to strengthen a people-centered approach to sustainable agriculture and its implementation and contributing to a mutual understanding between NGOs, the CGIAR, farmers' organizations and fisheries and forestry producer organizations.

The NGO Committee has up to 12 members, serving in their personal capacities. They have been appointed by the CGIAR Chair after wide consultation with the NGO community. They serve for initial renewable two-year terms. Periodic rotation of committee members ensures a balance between members from the South and North and provides opportunities for a variety of perspectives to be considered by the Committee. It has two Co-Chairs -- one from the North, another from the South -- supported by a small independent secretariat. The Committee meets at least once a year and reports to the CGIAR at ICW.

The Private Sector Committee was also established at MTM 95. A broad mandate of this Committee is to provide a private sector perspective on the current status of global agricultural research and future needs. Its aim is to foster and develop new programmatic partnerships that exploit fully the respective strengths, network of relationships, and comparative advantages of the CGIAR and the private sector. The purpose is not investigating engaging the private sector as a future financial contributor to the Group.

The Committee is co-chaired by one representative of the North and another from the South. The Committee has six members each from the North and the South, serving in their personal capacities. They represent principal sub-sectors of interest to the CGIAR and cover different geographical regions and large and small companies. Members are appointed by the CGIAR Chair in consultation with the co-sponsors for initial renewable two-year terms. The Committee meets at least once a year and reports to the CGIAR at ICW.

Center Committees

The Committee of the Board Chairs (CBC) serves as a bridge between components of the CGIAR System. Its main functions are to encourage and develop effective leadership by Center Boards, facilitate increased coordination between Centers and contribute to the development of CGIAR policy. All Board Chairs are members of the Committee, with the Chair being elected by its members, usually for one year. Meetings are normally held in conjunction with meetings of the CGIAR, during which the Committee makes a report. A staff member of the CGIAR Secretariat usually serves as Secretary to the Committee.

The main functions of the Center Directors Committee (CDC) are to discuss issues of common interest, ensure linkages with TAC and other components with the System, including the Committee of Board Chairs, implement activities of collective interest, inform members of important developments affecting the System and especially the Centers, and undertake certain public awareness activities for the System. The Director General of each Center is a member of the Committee. The Chair is offered to a Director General according to his/her seniority as a Center Director, and provided he/she has not served as Chair before. The Chair is assisted by an Executive Committee, composed of the immediate past, present and incoming Chairs. A sub-committee is the Center Deputy Directors Committee, which reports to the CDC. Other sub-committees include those on priorities and strategies, sustainability and environment, public awareness and resources, intellectual property rights and plant genetic resources, and Sub-Saharan Africa.

The Public Awareness and Resource Mobilization Committee is a strategic planning group whose purpose is to help increase member confidence in the CGIAR and its Centers and their work and to expand the financial resource base for CGIAR-supported Centers. It is composed of four Center Directors (one of whom is the Chair), the Chair of the Finance Committee, the Chair of the Public Awareness Association (PAA), and two external experts on public awareness and/or resource mobilization from outside the CGIAR. Center Directors are elected annually by the CDC, following an initial two-year term, and the outside experts are elected annually by PARC. The Committee meets at least twice annually. Execution of activities resulting from PARC's work are undertaken by the PAA, various CGIAR Committees and others.

The CGIAR Secretariat

The CGIAR Secretariat serves as the staff arm of the Group and is the principal service unit of the CGIAR. It functions directly under the CGIAR Chairman. The Secretariat carries out three broad functions: policy and analytical support to the CGIAR, its Chairman, committees and other actors in the System; building partnerships and managing relations both within and outside the CGIAR System in support of the efforts of the CGIAR Chairman, and administrative services to the CGIAR, its meetings and committees and to the broader System.

Administratively, the Secretariat is a department of the World Bank, which appoints the staff and pays all costs of its operations. The Secretariat staff work in three teams -- one each for finance, information and management. It has a science advisor supporting its work, in consultation with TAC. The CGIAR Executive Secretary is selected through a search process initiated by the CGIAR Chair, appointing a Search Committee with representatives of all stakeholders. The final selection is done by the CGIAR Chair. The Secretariat has some twenty staff members.

ANNEX II. BRIEF ANALYSIS OF THE EFFECTIVENESS OF CGIAR COMMITTEES AND SOME ASPECTS OF GOVERNANCE

Committees

The Technical Advisory Committee (TAC)

In principle, the TAC should focus on long-term strategic, scientific issues. However, it has - during years of financial constraints - been asked to do a lot of budgetary reviews of center budgets. Furthermore, the rapid growth of science may have made the current composition of TAC somewhat rigid and less flexible as an innovator in emerging areas such as biotechnology, information technology, new scenarios through the Convention on Biological Diversity, intellectual property rights, etc. and the implications for changes of the CGIAR scientific direction.

TAC played the major role in formulating CGIAR future research priorities and strategies in a large undertaking in the mid 1990s. Compared to the past, there was a major change since TAC also examined CGIAR's research in light of what other actors do in global agricultural research. TAC's scientific advice on future research was generally approved by the CGIAR members of the CGIAR. TAC had less influence on the formulation of a new vision and CGIAR mission statement.

TAC's work on priorities and strategy is an ongoing activity and so is the organization of the External Program and Management Reviews (EPMRs). They focus on four dimensions of center performance: research results, quality and relevance of science, vision and strategic direction and management efficiency. As of today, the EPMRs rely on the CCERs for details on components of Center activities.

Respondents to the questionnaire by the Review considered TAC to be effective in recommending medium and long-term priorities of the System and the research agenda matrix. Also, it is effective in recommending annual System-wide resource allocations to CGIAR activities, annual reviews of Center programs and budgets, and MTPs and EPMRs of Centers. Center Directors and CGIAR members did not, however, find TAC effective in monitoring changes in the global research context and identifying gaps in publicly-funded research of relevance to the CGIAR.

The Genetic Resources Policy Committee (GRPC)

The GRPC attempts to provide policy overview at the international level and has regularly given recommendations to the CGIAR. It has held seven meetings. The GRPC recognized at MTM 97 that there will be an ongoing need for policy advice on genetic resources within the CGIAR and recommended that "this be addressed in the context of the CGIAR Review".

Respondents to the questionnaire by the Review considered the GRPC to be effective in examining policy, legal and ethical issues regarding genetic resources and recommending CGIAR actions, and in keeping abreast of the mechanisms established by the United Nations and other international organizations of relevance to the CGIAR and recommending actions by CGIAR. CGIAR members considered GRPC to not be effective in monitoring the implementation of the CGIAR agreement with FAO. Respondents expressed uncertainty as to

whether IPGRI should ensure that the CGIAR System and its Centers fulfill their responsibilities under international treaties.

The Impact Assessment and Evaluation Group (IAEG)

It should be noted that IAEG has had insufficient funding and staffing. Also, its objectives have not been clearly defined. On the whole, it seems as IAEG has had difficulties in trying to combine its own requirement of stringent academic work with more pragmatic desires from members for "quick and general figures on impact". Furthermore, the linkages between IAEG and Center activities on impact assessment have been too weak.

All respondents to the questionnaire by the Review considered that IAEG was not effective in providing guidance and oversight, ensuring the design and conduct of evaluation and avoiding duplication of work. Except for Center Directors, respondents agree that there is need for a System-wide review mechanism, such as IAEG.

The Finance Committee (FC)

At MTM 98, the Finance Committee delivered its thirteenth report. In general, these reports are characterized by clarity and provides up-to-date information about CGIAR finances. Sections usually include estimates of financial outcomes, funding requirements for the coming year, review of Center financing plans and World Bank financing. Its work is professional and executed with effectiveness, providing precise recommendations.

Respondents to the questionnaire by the Review found the FC effective in providing advice and recommendations for the management of the Group's finances, changes in CGIAR financial policies and procedures, funding allocations, development of criteria for allocating the World Bank's contribution to the CGIAR, and an annual financing plan for the CGIAR. There was general agreement that the FC is not effective, however, in identifying, reviewing and recommending options for mobilizing new sources of funding for the Centers.

The Oversight Committee (OC)

The OC held its fifteenth meeting at MTM 98. Initially, the OC was very active in the renewal process and the development of a revised CGIAR mission statement in addition to its overall role of "watching brief" on System and Center governance. It has played quite a useful role in examining the role and effectiveness of Center Boards. However, it was not until its twelfth report that the OC introduced sections entitled "Actions suggested", summarizing its recommendations on each item. The OC has also given a lot of attention to the role of the IAEG and its initial work. At ICW 97, the OC noted the key role of the cosponsors, urging them "to utilize their good offices in maintaining momentum and taking this important work forward". Also, it wished the System Review to "offer advice on how impact measurement systems might be strengthened and improved in the CGIAR", underlining that this is an area where the OC will focus in its due diligence role.

With the exception of Board Chairs, respondents to the questionnaire by the Review found the OC effective in analyzing whether the System policies, instruments and processes are conducive to efficient operation, implementation, providing checks and balances and carrying out *ad hoc* assignments at the request of the CGIAR or its Chair. The OC is found effective in maintaining "watching briefs" - a view not shared by the Board Chairs. Only CGIAR members - but not the Centers - find the OC effective in taking necessary measures and actions in response to serious situations. All respondents find the OC effective in communicating its views to the CGIAR.

The Private Sector Committee (PSC)

The PSC has conducted seven meetings. It has developed a special paper on CGIAR-private sector partnerships, where biotechnology is seen as a cornerstone - on which the PSC would have liked more feedback from the CGIAR. But the PSC also wishes to address models of partnerships. Though the PSC does not offer recommendations, it has discussed the rationale for a high-level conference to serve the purpose of educating private sector leaders about the CGIAR. Individual centers already have some contacts with private companies. In the future there will be closer collaboration between the private sector and the CGIAR and its Centers, as well as NARS. This implies policy issues on ethical ground-rules for collaboration, its importance to governance at the CGIAR level, and the need for jointly agreed views on intellectual property rights.

Respondents to the questionnaire by the Review find the PSC is not effective in linking the CGIAR with the private organizations in both "the North" and "the South". The same assessment is valid for bringing to the CGIAR its perspectives regarding current and future needs and priorities for agricultural research in developing countries and on current and future strategies of the private sector in "the South". The PSC is considered effective, however, in bringing its perspectives on CGIAR policies and strategies, although this view is not shared by the Board Chairs. The latter also find the PSC to be less effective in increasing the awareness and understanding of the CGIAR by private industry. While CGIAR members and Center Directors find the PSC effective in both identifying new promising areas for collaboration and cutting-edge technologies to share with the CGIAR, the Center Boards are in complete disagreement with this view.

The NGO Committee (NGOC)

The NGOC held its sixth meeting at MTM 98. It has been engaged in several activities including Center visits, national and regional consultations, a thematic workshop on soil fertility replenishment in Africa, perspectives on biotechnology, interactions with TAC, and views on the forthcoming System Review. With regard to the latter, the NGOC has questioned whether poor farmers would benefit from CGIAR technology. The NGOC does not offer recommendations.

Respondents to the questionnaire by the Review considered that the NGOC had not been effective in helping the CGIAR to take into account the NGO experience and perspectives, a point made by both Board Chairs and Center Directors. However, CGIAR Members found it to be effective, which was the case also in advising the CGIAR on how to engage in a broad based world-wide consultation process with interested NGOs. All respondents also found the NGOC to not be effective in recommending ways of ensuring greater engagement by Centers and NARS, in improving farmer-to-scientist collaboration, and on strengthening consideration of gender at CGIAR. Except for Board Chairs, respondents found the NGOC effective in broadening the list of candidates for Center Boards.

The Committee of Board Chairs (CBC)

Time and funding constraints limits the CBC's potential. Turnover among CBC members is also too great. The CBC has limited input to the System in current operations. All respondents to the questionnaire by the Review find the CBC effective. The only exception is that Board Chairs do not find the CBC effective in encouraging and developing leadership by Center Boards.

The Center Directors Committee (CDC)

The CDC represents a significant source of scientific and practical expertise within the CGIAR, although it is not always made effective use of. Respondents to the questionnaire by the Review find the CDC effective in creating links with TAC and other components of the System. On the latter point, the Board Chairs disagree. All respondents find that the CDC is not effective in implementing activities of collective interest to the System (System-wide Programs, Ecoregional Research, etc.)

The Public Awareness and Resource Mobilization Committee (PARC)

PARC has given quite a lot of attention to public awareness and resource mobilization. Almost all respondents to the questionnaire by the Review find that PARC is not effective in designing, reviewing and up-dating periodically a resource mobilization strategy, setting priorities for this and monitoring its impact. Center Directors are slightly more positive and Center Boards are more critical. All respondents find that PARC is not effective in increasing public awareness, identifying new audiences and funding sources, though CGIAR members tend to be slightly more positive.

Secretariats

The TAC secretariat

Respondents to the questionnaire by the Review considered the TAC Secretariat to be effective, but made no specific comments.

The CGIAR Secretariat

All respondents to the questionnaire by the Review find the CGIAR Secretariat effective in providing policy and analytic support to the Chairman, Committees and Co-sponsors, but not to the Centers. Most respondents agree that the Secretariat is effective in building partnerships and managing relations within the CGIAR System, supporting Center activities in these areas and providing administrative services to the CGIAR. CGIAR members and Center Directors do not find the Secretariat effective in building partnerships and managing relations outside of the CGIAR System. As to future tasks, all respondents wish the Secretariat to assume expertise in and responsibilities for providing System-wide services. However, most respondents think that the Secretariat should not do so in publications policy, though Board Chairs and CGIAR members find this acceptable.

ANNEX III. SOME STATISTICAL NOTES ON CGIAR MEETINGS

The CGIAR meets regularly for one mid-term meeting (MTM) in May and the annual meeting (ICW) in October. The ICW meeting in Washington D.C. lasts for one week. In 1979, the first MTM meeting was held at the World Bank office in Paris. It lasted two days. The first CGIAR meeting in a developing country took place in Manila in 1980, including a visit to IRRI.

During the last decade, time requirements for CGIAR businesses have increased significantly, in particular for the MTM meeting, which usually takes place in a member country willing to host the Group. In 1987, the MTM had some 155 participants, as compared to about 240 in 1997. The corresponding figures for the ICW are some 230 participants in 1987, compared with more than 480 persons in 1997. It is doubtful if this growth is cost-effective. In contrast, 58 persons attended the first meeting of the CGIAR in 1971, all of whom were financial donors from the North, the average delegation composed of 2.1 persons.

In 1997, there were 54 member delegations attending the ICW, with the average delegation being 2.6 persons. The average number of staff of the CGIAR Centers numbered 7.6 persons compared to 4.9 of an average non-CGIAR center. Corresponding figures for ICW 87 were 2.2 for member delegations, 5.8 for CGIAR Centers and 2.2 for non-CGIAR centers.

The number of ancillary meetings during ICW - for various sub-groups - also has increased significantly. In 1997, the total number of meetings was 44, out of which 22 took place the week prior to ICW. About half of the latter meetings were on CGIAR activities. During the ICW, there were eight meetings on non-CGIAR affairs, the annual business meeting of the CGIAR, 12 CGIAR-related meetings, and a meeting of the CGIAR System Review Panel. As a result, the time required to attend meetings has expanded from one week to about 10 days for most participants at ICW. Furthermore, member delegations must be larger in order to cover most activities.

ANNEX IV. SOME FEATURES OF RECENT FUNDING OF THE CGIAR

Table 1. Funding by donor group in 1988-1991 and 1996-1997 with an estimate for 1998

	1988-91	1996	1997	1998
	<u>Core program</u>	<u>Agreed research agenda</u>		
		(rounded figures)		
		<u>Actual</u>	<u>Actual</u>	<u>Estimate</u>
North America	25 %	15 %	16 %	15%
Europe	32 %	44 %	44 %	44%
Pacific Rim	11 %	14 %	12 %	11%
LDC	1 %	3 %	3 %	4%
Foundations	1 %	2 %	2 %	2%
International and regional organizations	29 %	21 %	19 %	21%
Non-member contributions	?	2 %	3 %	3%

Source: CGIAR Secretariat (1993 and 1998) and 12th Report of the Finance Committee

Table 2. Funding gaps at CGIAR Centers during 1996 - 1998

<u>Year</u>	<u>Center</u>	<u>Estimated shortfall</u> US \$ in millions	<u>Identified reasons</u>
ICW 96			
	CIAT	4.6	Gaps due to the "re-classification" issue
	ICRISAT	6	
	IRRI	6	
	CIMMYT	2.6	
ICW 97			
	ICRISAT	5	Expecting a shortfall of 5 million in 1998, why 1997 budget was reduced by 5 million
	ILRI	2	Potential shortfall of 5 million in 1998
	ICARDA	3	Deficit in 1997; similar outcome expected in 1998
	IIMI	1	Program underfunded by 10%
	IITA	3	Seeking extra funds due to decline in unrestricted budget
	WARDA	1.6	Extra funds for physical facilities
MTM 98			
	IIMI		Problems remaining from ICW 97
	ICARDA		- " -
	IITA		7 % deviation from target in financing plan
	IRRI		6 % - " -

Source: Reports of the Finance Committee

Table 3. World Bank Funding as Percentage of Centers' Funding in 1988 - 1992

<u>Range</u>	<u>Centers</u>
Always above 15 per cent	ICARDA, IFPRI, IITA, ILCA, ILRAD, ISNAR WARDA
At least one year above 20 per cent	ICARDA, IFPRI, IITA, ILCA, ISNAR, WARDA
At least one year above 25 per cent	ICARDA, ISNAR, IITA WARDA

Source: CGIAR Financial Report, 1992

CGIAR SYSTEM REVIEW PANEL

Main Panel

Maurice Strong (Chairperson): Mr. Strong has held many distinguished positions including Secretary-General for both the Stockholm Conference and UNCED, founding Executive Director of UNEP, and founding President of Canada's CIDA. In addition to serving as Chairperson for the CGIAR System Review, Mr. Strong currently is Special Advisor to the UN Secretary-General and to the President of the World Bank.

Bruce Alberts (Co-Chair, Science and Strategy Panel): Dr. Bruce Alberts is a former Professor of Biochemistry at Princeton University and former Professor and Chairman, Department of Biochemistry and Biophysics, at the University of California, San Francisco. Bruce Alberts is currently President of the US National Academy of Sciences.

Kenzo Hemmi, (Panel Member). Kenzo Hemmi is a renowned agricultural economist. Dr. Hemmi is currently Professor, Department of Social Sciences, Toyo Eiwa Women's University. During 1983 - 1988, Professor Hemmi served as the chair of the IRRI Board of Trustees and from 1989-1994, he served on the ISNAR Board.

M.S. Swaminathan (Co-Chair, Science and Strategy Panel): One of the world's leading agricultural scientists, Dr. M.S. Swaminathan played a catalytic role in India's green revolution between 1960 and 1982. Among his many distinguished credentials, Dr. Swaminathan has served as Director General of the Indian Council of Agricultural Research, President of IUCN, Chairman of several UN panels, Chairman of the Board of ICRAF, and Director General of IRRI. M.S. Swaminathan is currently UNESCO-Cousteau Professor in Ecotechnology and Chairman, M.S. Swaminathan Research Foundation.

Emil Salim (Co-Chair, Governance, Structure and Finance Panel): Emil Salim is former Minister of the Environment for the Government of Indonesia and former Chair of the UNEP Governing Council. He also has served on the Board of the International Institute for Sustainable Development. He currently is Professor of Economics in Jakarta.

Whitney MacMillan (Co-Chair, Governance, Structure and Finance Panel): Whitney MacMillan joined Cargill, Incorporated in 1951, and has served as both Chief Executive Officer and Chairman of the Board of Directors of that company. He has held many directorships of international institutions, including Winrock International, and has numerous affiliations with organizations such as the Commission on International Trade, Development and Cooperation and the Minneapolis Institute of Arts.

Klaus Leisinger: Klaus Leisinger has served in senior positions at Ciba Geigy and in 1980 he became Executive Director and Board Member of the Novartis Foundation for Sustainable Development, a position which he still holds. His many professional affiliations include Founding Board Member of the UNDP Global Development Fund, Expert Adviser to the Swiss National Research Fund, and membership of several corporate and Foundation Boards.

Bongiwe Njobe-Mbuli: Bongiwe Njobe-Mbuli is Director General of the South African Department of Agriculture. Prior to this post, Mrs. Njobe-Mbuli was Professor in the agricultural faculty of Pretoria University.

Yolanda Kakabadse: Dr. Kakabadse is President IUCN; and recently became Minister of the Environment, Government of Ecuador.

Science and Strategy Panel

Gelia Castillo: Dr. Gelia Castillo received her PhD in Rural Sociology from Cornell University and has made important contributions to the agricultural development community throughout her career. During her tenure as Professor of Rural Sociology at the University of the Philippines, Dr. Castillo has served on a large number of national and international boards, advisory committees, and evaluation/review panels. Among these are the Boards of several CGIAR centers, including IPGRI, ICRAF, CIP and ISNAR. Dr. Castillo currently is Professor Emeritus at the University of the Philippines, Los Banos.

Bernard Chevassus-au-Louis: Dr. Bernard Chevassus-au-Louis received his training in Quantitative and Applied Genetics. He has served in various capacities at INRA, including Director General from 1992-1996. He currently is Director of Research at INRA's Laboratory of Fish Physiology in Juoy-en-Josas.

Jacqueline McGlade: A Zoologist and Aquatic Scientist, Dr. Jacqueline McGlade currently is Professor of Biological Sciences at the University of Warwick, UK. Her professional affiliations include Co-Chair of the World Fisheries Congress (1992), World Bank Advisory Committee on Agricultural Research and Policy (1989-91), and Professor and Institute Director at the Forschungszentrum Jülich, Germany (1988-95). She has served as Advisor to the CGIAR in the past, and is now on the ICLARM Board of Trustees.

Pat Roy Mooney: Mr. Pat Mooney is Executive Director of the Rural Advancement Foundation International (RAFI) in Winnipeg, Canada.

Francesco Salamini: Mr. Salamini is a PhD in Plant Genetics, and is currently Director, Department of Plant Breeding and Field Physiology, Max-Planck Institut für Züchtungsforschung in Köln. He has served as Honorary Professor, University of Köln, Germany, since 1985. Dr. Salamini has also served on the Board of Trustees of CIMMYT.

Jozef Schell: Dr. Jozef Schell is Director of the Max-Planck Institut für Züchtungsforschung. He brings to the Review Panel expertise in genetics, molecular biology, mutagenesis and genetic engineering. His professional affiliations include the European Molecular Biology Organization, the National Academy of Sciences, and the Royal Swedish Academy.

Ren Wang: Dr. Ren Wang received his PhD in Entomology from Virginia Polytechnic Institute and State University. Since 1995, he has served as Vice President of the Chinese Academy of Agricultural Sciences. Prior to this, Dr. Wang was Deputy Director for Programme Development at the International Institute of Biological Control, CAB International.

Governance, Structure and Finance Panel

Mayra Buvinic: A Chilean national, Dr. Mayra Buvinic received her PhD in Social Psychology from the University of Wisconsin in 1975. A founding member, she was President of the International Center for Research on Women from 1978-1996. She has served on boards and advisory councils for numerous international organizations including CGIAR centers, UNDP, and the Global Fund for Women. Mayra Buvinic currently is Chief of the Women in Development Program at the Inter-American Development Bank.

Antonio Quizon: Antonio Quizon is Executive Director of the Philippines-based Asian NGO Coalition for Agrarian Reform and Rural Development (ANGOC).

Graham Blight: Graham Blight is a rice, cereals and sheep producer from Whitton, New South Wales, Australia. He is currently Director of the Ricegrowers Co-Operative Mills Ltd. (RCL), and Chairman of the MID Farmers Co-Operative Ltd. Mr. Blight was elected President of the International Federation of Agricultural Producers at the 1994 World Farmers' Congress in Turkey. In this role, he is responsible for presenting the farmers' policy position to world organizations such as the United Nations, World Bank, OECD, FAO, UNCTAD and WTO.

System Review Secretariat

Mahendra Shah (Executive Secretary): Dr. Mahendra Shah brings to the CGIAR System Review significant international experience in the areas of food security and sustainable development. He has held numerous distinguished positions, including Senior Advisor to the Secretary-General of UNCED, Senior Advisor to the Director General's Panel at WHO, and Senior Advisor of the Earth Council.

Vo-Tong Xuan (Science and Strategy Panel): An agronomist, Dr. Vo-Tong Xuan is currently Vice Rector of the University of Cantho, Vietnam, and Director of the Mekong Delta Farming Systems Research and Development Centre. Dr. Xuan is well-regarded in the international agriculture community for his innovative work on community germplasm conservation.

Bo Bengtsson (Governance, Structure and Finance Panel): Dr. Bo Bengtsson brings considerable experience with the CGIAR to the System Review Panel. He has served on the Boards of Trustees of several CGIAR centers, including ICRAF and CIFOR. He also led the Swedish delegation to the CGIAR for many years. Bo Bengtsson currently is Professor of Crop Production Science at the Swedish University of Agricultural Sciences, Uppsala.

Michel Griffon (Science and Strategy Panel): Trained in Research and Development Economics, Michel Griffon is Chief Economist and Director of the Agricultural Policies and Forecasts Research Unit at CIRAD. Mr. Griffon has considerable international experience, primarily in Africa. In Latin America, he worked with the Nicaraguan Agrarian Institute in 1972-73 setting up agricultural experimentation and economic analyses for agrarian reform.