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Charting the CGIAR's Future – A New Vision for 2010

**Fourth External Programme and Management Review of the
International Centre for Agricultural Research in the Dry Areas
(ICARDA)**

Attached is the Report of the Fourth External Programme and Management Review of ICARDA, together with the transmittal letter from the Chair of TAC and the CGIAR Executive Secretary to the Chairman of the CGIAR, TAC's Commentary on the Review, and the response of ICARDA's Board of Trustees and Management to the Review Report.

This Report will be discussed in parallel session. The Chair of the External Review Panel will summarise the Panel's findings and Centre representatives will respond. Members will be able to ask questions and raise concerns. The Chair of the parallel session will report the outcome of the discussions to the Group in plenary session for decision making.

SDR/TAC:IAR/99/9.1

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH
TECHNICAL ADVISORY COMMITTEE AND CGIAR SECRETARIAT

**REPORT OF THE
FOURTH EXTERNAL PROGRAMME AND MANAGEMENT REVIEW
OF THE
INTERNATIONAL CENTRE FOR AGRICULTURAL RESEARCH
IN THE DRY AREAS
(ICARDA)**

TAC SECRETARIAT
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

April 2000

Consultative Group on International Agricultural Research (CGIAR)

TECHNICAL ADVISORY COMMITTEE

Emil Q. Javier, Chairman

12 April 2000

Dear Mr. Serageldin,

We are pleased to submit to you the report of the Fourth External Management Review of ICARDA, which was conducted under the chairmanship of Donald Plucknett. TAC considered the review report and the response of the ICARDA management and Board of Trustees at its 78th meeting in March in the presence of the Panel Chair. ICARDA was represented by the Chair of the Board of Trustees, Robert Havener, the Director General, Adel El-Beltagy, the Assistant Director General, John Dodds, and the Assistant to the Director General, Mohan Saxena.

In addition to the report of the panel, there are two attachments to this letter. The first contains the TAC commentary which summarises TAC's and the CGIAR Secretariat's reactions to the Panel's report and to ICARDA's response. The second attachment is the response of ICARDA.

We are pleased to report that the review found ICARDA to be well administered, that the Centre has undergone an impressive transformation in its programmes and strategies since the last EPMR, that the overall quality of science is good, and that the Centre has very effective partnerships and high standing in the region. The Panel found that the Germplasm Enhancement and Genetic Resources Programmes are of world-class quality but expressed concerns about the Natural Resources Management Programme and the quality of the social science output. TAC further notes that ICARDA has competent governance and management systems in place. TAC considers that ICARDA should give greater attention to impact assessment. We conclude with the firm belief that ICARDA is well positioned to effectively address the challenges of agricultural development in the CWANA region but would caution it from extending its activities to other dry regions of the world without additional guaranteed support. We are pleased that the Board and management have responded favourably to the recommendations of the Review.

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Mr. Ismail Serageldin
CGIAR Chair
World Bank
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USA.

We believe that ICARDA will continue to have a prominent place within the CGIAR System and, therefore, recommend that Members of the CGIAR maintain their strong support to ICARDA.

Yours sincerely,

Alexander von der Osten
Executive Secretary, CGIAR

Emil Q. Javier
TAC Chair

ICARDA EPMR COMMENTARY

TAC expresses its thanks to the Chair and members of the ICARDA EPMR Panel for a comprehensive review of the Centre and an analytical and well-written report. TAC is pleased with the Panel's findings that, since the last EPMR, ICARDA has undergone an impressive transformation in its programmes and strategies, and that a dedicated staff, and effective management and governance team, are in place. TAC endorses, in general, the recommendations of the Panel and offers the following commentary, prepared with inputs from the CGIAR Secretariat, to supplement the Panel's findings.

Priorities and Strategies

TAC considers that ICARDA's overall mission continues to be appropriate and that it will continue to have an important role in meeting the formidable challenges of poverty and natural resources management in the dry areas of the CWANA region.

TAC shares the Panel's view that the time has come for ICARDA to begin a period of "dynamic consolidation", and agrees with the Panel about the need for the Centre to focus its activities and scope of work. In this respect, TAC urges caution about ICARDA spreading its resources too thinly across all of the dry areas in the developing world, and thinks it would be more prudent if the Centre were to primarily focus its activities on the Central and West Asia and North Africa region.

TAC endorses the Panel's recommendation that ICARDA determine, with its partners, the livelihood strategies of the poor in its region to clarify what research options are most likely to benefit them. It expects this study to be conducted as soon as possible, and that TAC will be informed of its outcome. The Committee sees this as an essential part of the strategic planning process. It considers a comprehensive analysis of the determinants of poverty, and development of potential options for alleviating poverty through agricultural research, critical to the formulation of a comprehensive research agenda.

TAC notes with concern the severe decline in share of unrestricted core funds in the Centre's income in the last five years from 80 to 30%, but draws attention to the fact that growth in the amount of restricted funds has been much stronger than the decline of unrestricted core funds. TAC appreciates ICARDA's innovative approach in responding to this challenge but highlights the need for an adequate priority setting mechanism that ensures all projects, for which funding is obtained, be part of the research agenda.

TAC is sympathetic to the Panel's recommendation that the Committee undertake a study on the implications of the increasing share of restricted funding for the quality of output of the Centres and will give this issue adequate attention in due course in close collaboration with the Finance Committee.

Research Programmes

TAC notes the Panel's findings that the germplasm enhancement, and genetic resources research programmes are of world-class quality. TAC endorses the Panel's recommendations about the need for a vision and strategy exercise of the natural resources management programme. The Committee is also concerned about the Panel's finding of

inadequate quality of the Social Sciences output. TAC urges the Centre to give these two problem areas serious attention and recommends that ICARDA commission a review in about two years time to determine the extent to which the Centre has followed up on the EPMR recommendations.

TAC commends the Panel for its innovativeness in evaluating the quality of ICARDA's science. TAC is also pleased that the Panel found overall quality of science at ICARDA to be good but notes with concern the decline in publication output over the last five years. The Committee is satisfied however with the Management's explanations that the reason for this decline is due to shifts in personnel and that adequate steps are being taken for its reversal. TAC further notes that this decline is also likely to be associated with the lack of critical mass in some of its research programmes which further highlights the need for the Centre to focus and streamline its research activities.

The Panel, as well as TAC, give high marks to ICARDA for the effectiveness of its partnerships, the innovative nature and quality of its collaboration with NARS – including its success in decentralizing research in a continuum from headquarters to NARS - and the standing in the region for its subregional strategy and programmes. Nevertheless, TAC agrees with the Panel about the need for a strategic review of ICARDA's outreach activities in order to ensure that the Centre does not get overstretched and continues to provide adequate scientific and logistic support to those activities.

Impact and Achievements

TAC is impressed with the many achievements of ICARDA as reported by the Panel, in particular in view of the harshness of many of the environments in which it works. Nevertheless, TAC is concerned about the limited impact of the cereal and legume programmes that have been reported to date. TAC reiterates the recommendation of the 1994 EPMR that “ICARDA should conduct impact studies of its major technologies” and which was not fully implemented. The Panel has provided useful suggestions as to how the Centre could go about doing this, and these are linked to the need to improve the quality of the social science programme.

Governance and Management

TAC is satisfied that ICARDA has effective governance and management systems in place but would urge the Centre to address the remaining problems of low staff morale. TAC understands that many of the issues involved are resulting from the period of transformation under very difficult conditions that ICARDA has gone through. However, the Panel has also pointed to the need to further improve human resource management, professional development opportunities and performance evaluation processes at the Centre.

Conclusions

TAC is convinced that if adequate attention is given to the issues listed above, ICARDA is well positioned to effectively address its challenges of agricultural development in the CWANA region. It has good research capacity, much appreciated relations with partners and stakeholders and effective governance and management. TAC recommends that Members of the CGIAR continue to provide strong support to the Centre.

29 February 2000

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Dr Alexander von der Osten
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Dear Dr Javier and Dr von der Osten,

On behalf of the Board of Trustees and Management, we are pleased to respond to the recommendations and observations presented in the Report of the 4th EPMR of ICARDA. First of all, we wish to thank the EPMR Panel Chairman and Members for their cooperative attitude and thorough analysis. We would also like to thank the TAC and CGIAR Secretariats for their assistance during the Review.

The Review Panel made a number of relevant and useful observations. On balance, the ICARDA Board and Management agree with most of them and, indeed, ICARDA has already begun to implement several of the more important and urgent recommendations and suggestions. Not surprisingly, however, we differ to some degree on a few specific issues. ICARDA's response to the twelve recommendations made by the Review Panel is attached.

The Systemwide Review recommendations formed part of the backdrop to the ICARDA External Review process, and we believe the Panel's findings show that the Center's activities are consistent with the recommendations of the System Review.

The Report documents ICARDA's achievements and expresses effectively the Review Panel's positive appreciation of the Center's outputs. They were especially complimentary of the germplasm enhancement and genetic resources activities, noting that it is an exciting program with enthusiastic staff who have been proactive in adopting new approaches and technologies to meet the difficult challenges they face. They were impressed that, in the dry and often harsh environments it targets, the component projects have been successful individually and collectively.

In the area of natural resource management the Panel indicates that the Center has assembled capacity in some of the "tools" needed. The Panel also commends the Center for beginning to develop a new strategic concept 'Anticipatory Long Term Research' as a way to deal with long range sustainability issues, including both water resources and small ruminant research.

In the important area of water resources the Panel also stated that the Center should strive to be "recognized as the lead Center for integrated on-farm water management in the dry areas". It is very much our intention to earn such recognition.

The Panel conclusions on major issues that need additional discussion and attention are wholly consistent with the views of ICARDA, and include:

- Developing increased capacity in integrated gene management (IGM) to embrace the new science opportunities afforded via biotechnology.
- Continuing to focus, refine and standardize multidisciplinary INRM methodologies and tools appropriate to Dry Areas.

- Articulating a comprehensive social science agenda as it relates to integration of social science into ICARDA's research.
- Further developing its innovative work on farmer participatory approaches, by generating user profiles.

The Panel endorsed the Center's decision to work in Central Asia and the Caucasus, which they considered to be congruent with the CGIAR's own interests, and where crops, small ruminants, rangelands and other natural resource issues are appropriately addressed by the Center.

The Panel commended ICARDA for developing and maintaining excellent relationships with its stakeholders and partners in both developed and developing countries. They formally surveyed the views of NARS and the results confirmed the great appreciation of ICARDA's work in the region. The long-standing tradition of forging mutually beneficial relationships with universities was specifically noted.

ICARDA is a Center in transition. The Panel noted that the review period spanned a time of great change at the Center. Indeed, they considered it to be a major transformation achieved through changes both in management and program restructuring, including extensive staff changes. They noted the rather precipitous and profound shift in the funding of the Center. Over the five-year period of the review, core funding declined from 80 percent to 30 percent while total funding increased. Recognizing these pressures, we are very much aware that we continue to strive for more efficient and effective management systems.

The Panel cited the wisdom of placing an international center of excellence in the Central and West Asia and North Africa (CWANA) region and noted that ICARDA holds in trust one-fifth of the plant genetic resources held by the CGIAR System. The Panel concluded that the need for ICARDA is perhaps even greater now than at its founding in 1977.

We conclude with a direct quote from the report:

In short, ICARDA has come through a period of transformation under conditions that would have daunted most institutions. It has learned to live and work – without really wishing it – in a situation where core funding has dropped severely, below the average level today in the CGIAR. Despite that, it has reengineered itself in such a way that it is well positioned to deal with 21st century problems.

We welcome your observations and comments.

Yours sincerely,

Adel El-Beltagy
Director General

Robert D. Havener
Chairman, Board of Trustees

ICARDA's Board and Management Joint Response to the Report of the
4th External Programme and Management Review
August 1999

Recommendation 1

*In view of a diminished expertise in fungal pathology at ICARDA, the Panel **recommends** that the Centre should strengthen its scientific capacity for strategic and applied research in crop pathology, and its pathology support to the Cereal and Legume Enhancement Programmes.*

We agree with the Panel's recommendation to increase the Center's scientific capacity in crop pathology. However, given the scientific profile of current staff, we will address this specifically through legume pathology.

Diseases caused by fungal pathogens are a major factor limiting the productivity of mandate crops in the region. In the case of the kabuli chickpea, lentil and faba bean our ability to produce widespread adoption to diversify the cereal-based farming system will in large part be contingent upon reducing the risk of crop losses from diseases.

Integrated management for key diseases provides the framework for our approach to reducing risk from diseases and raising economic returns. Host-plant resistance will continue to underpin the Center's overall disease management strategy. The Center will further strengthen its ongoing collaboration and outsourcing with NARS, many of which have significant strength in this area. We concur with the Panel that this requires a continued and vigorous pathology input on food legumes, and will seek to strengthen this area of our activities.

Recommendation 2

*The Panel **recommends** that ICARDA should review the opportunities that may be available if it should expand its research role in malting barley in developing countries. In undertaking this review, the Panel would expect ICARDA to complete a social and economic assessment of the potential of work in this area to meet CGIAR priorities.*

In line with the Panel's recommendation the Center will review the opportunities for research on malting barley, for which we will undertake the suggested social and economic assessment.

The Center has a global mandate with respect to Barley. We recognize the importance of malting to some NARS. Within this global context, the Center will undertake the review of the need for assistance with this aspect of barley improvement.

The Center will assess the potential social, nutritional and economic returns of research into malting barley directed toward CGIAR priorities.

Recommendation 3

*The Panel **recommends** that as a matter of priority ICARDA seek discussion with CIMMYT to develop mutually acceptable plans for the incorporation of doubled haploids and marker-assisted selection technologies in their joint durum wheat, spring bread wheat and facultative/winter bread wheat breeding programmes.*

ICARDA will continue to integrate modern biotechnologies into its breeding programmes, including the CIMMYT/ICARDA projects. Further growth in this area, as it relates to wheat, will be through ongoing discussions with CIMMYT.

ICARDA holds annual planning meeting with CIMMYT; we will ensure that the next meeting addresses the technical issues appropriately raised in this recommendation.

ICARDA is already scaling-up existing efforts on marker-assisted selection and doubled haploid breeding for its mandate crops, including for the joint CIMMYT/ICARDA activities. The scaling-up of these biotechnologies is done on a cost-effectiveness basis.

As part of this expanding activity, ICARDA will insure that there is a dialogue with CIMMYT, and that agreement is reached on a relevant plan of action and then seek the necessary financial resources.

Recommendation 4

*Given the reductions in the Genetic Resources Unit staff that have occurred, the demands placed on the Unit for collection and conservation activities, and so as not to threaten its existing activities, the Panel **recommends** the GRU Unit make a concerted effort to seek additional P and RA level staff from either internal or external sources, if it is to undertake an expanded programme of research in *in situ* conservation, pre-breeding and the evaluation of collections using molecular markers.*

We agree with the Panel's recommendation and we will seek appropriate funding to address staffing levels

We concur with the Panel that collection and *ex situ* conservation, particularly of FAO-designated germplasm maintained in the Genetic Resources Unit, **must** be continued. We are pleased that the Panel endorses the new research directions on pre-breeding, *in situ* conservation and molecular characterization, which were highlighted in the Center's Medium Term Plan 1998-2000 (Table 1 p 11). In West Asia we have already begun the implementation of a GEF project to specifically address the *in situ* conservation of dry area agrobiodiversity. A new P- level appointment is part of that project. The

Center has strong alliances with NARS in the area of genetic resources, which are highly valued given the critical importance to the Center of this area of research.

Recommendation 5

*In view of the critical nature of water scarcity in the CWANA region, the Panel **recommends** that ICARDA place more emphasis on strategic issues of water use/ allocation and management at rural community level, and that it join in strategic partnerships to carry out this work.*

We agree with the Panel's recommendation that ICARDA place more emphasis on water management at the rural community level.

ICARDA's primary emphasis will remain on on-farm water management. We also recognize the strategic importance of community-level management mechanisms, particularly in water harvesting and water run-off systems and have already made contributions in that area. Integrated watershed management figures prominently in the current MTP 1999-2001. We are actively seeking, through expanded strategic partnerships, to increase resources devoted to this work.

Recommendation 6

*Regarding social science research, the Panel **recommends** that ICARDA should: (i) reduce its scope and concentrate on fewer issues, selected in close collaboration with the Center's physical and biological scientists and the national programmes - that are central to the operational mandate of the Centre; and (ii) seek to improve the quality of output by among others, (a) judicious recruitment or designation of a lead social scientist, (b) recruitment of high quality support staff, and (c) entering into more cooperative arrangements like those existing with IFPRI.*

We generally agree with the Panel's recommendation, in line with current resource levels, to focus our social science research, and enhance quality by recruitment/designation of a lead scientist and high quality support staff.

The existing three MTP socioeconomics and policy projects have included planned reductions in baseline studies, technology evaluation, and adoption studies by ICARDA scientists. We will continue to collaborate closely with NARS to jointly undertake these important tasks. Reduction of ICARDA's direct input in these areas will result in relatively more emphasis being placed on other strategic subjects such as Center impact, poverty alleviation and gender analysis, which the center is already addressing. Through cooperative agreements with sister Centers and system-wide programs, we will seek to continue our research in policy, property rights, and community management of natural resources.

Recommendation 7

*Recognizing ICARDA's efforts to consolidate its natural resources management research by merging its former projects into a more integrated programme, the Panel **recommends** that ICARDA, together with appropriate partners, articulate a vision, strategy, and an implementation plan for natural resources management research, drawing on CGIAR and other experiences and centered on Unified Research Sites most appropriate for its emerging poverty alleviation focus.*

The Center generally accepts this recommendation and will continue its ongoing program of strengthening research in NRM. The Center will use its Unified Research Sites to further integrate its program activities, especially in relation to poverty alleviation.

Over the last five years ICARDA has greatly strengthened its work in NRM, particularly in the area of on-farm water resource management. Refocusing of its work on crop-livestock interactions and the inclusion of the work on livestock value added products will greatly strengthen its impact on poverty alleviation, particularly on rural women. The Center will continue to be an active partner within the CGIAR in terms of showing its past experiences, such as long-term agronomic and farming systems research, and engaging in the broad debate as to how the CGIAR has impact in NRM.

In the Dry Areas, water and poverty are inextricably inked. The Center will strive to achieve substantial improvement in the sustainable use of water resources in the region, while carefully considering the human needs of the people who survive and work on these lands.

Recommendation 8

*In view of the importance of the Regional Programmes to ICARDA's interactions with its stakeholders and the Programmes' increasing share of the total financial resources of the Center, the Panel **recommends** that ICARDA undertake a strategic review of its outreach activities to examine issues of strategic importance including: regional coverage, devolution/outsourcing, interaction with NARS, interplay between research and outreach, information management and its role in the diverse regions.*

We agree with the thrust of the recommendation to review issues of strategic importance of the Regional Programmes.

We noted that the Panel recognized the substantial positive changes in ICARDA's Regional Programmes with respect to their contribution to the research continuum and staffing. In particular, we are pleased the Panel recognizes the additional financial resources accruing to the Center, as well as the justified geographical expansion. The expansion of regional programmes has been possible because of special project funding, which permits us to fulfill the approved research agenda and allows to further strengthen collaboration with NARS.

ICARDA's research in the region reflects the concept of a "Center without walls" whereby the research venue is based on comparative advantages in terms of human and physical resources available.

Strategic review of interaction with NARS is a continuous process at ICARDA, based on the feedback obtained from NARS through annual national and regional coordination meetings. However, considering the dynamics in the NARS and many developments in the Regional Programmes, ICARDA will further review its regional activities within the framework of the Centers 1997 Strategy.

Recommendation 9

*To improve research quality and relevance, and to help develop a more prominent place for the conduct of multidisciplinary research at ICARDA, the Panel **recommends** that the Management promote quality and multidisciplinary research through recognition, rewards, and other incentives, and by assuring that appropriate criteria are covered in its Performance Evaluation process.*

We agree with the Panel's recommendation for further promotion of multidisciplinary research through a variety of reward and recognition systems.

Multidisciplinary research is a keystone of ICARDA's research strategy. ICARDA will further promote this objective through expansion of its existing reward and recognition systems.

We believe it will be possible to further expand our existing staff recognition procedures. Our current system of awards to Junior and Senior Scientists of the Year will be maintained. Additional recognition mechanisms will be developed and implemented as appropriate.

Staff incentives for quality science production and multidisciplinary activities will be carefully reviewed, and the present system will be amended as required.

Recommendation 10

*Recognizing that ICARDA has conducted a wide-range of studies offering partial insight into poverty, the Panel **recommends** that ICARDA determine, with its partners, the rural livelihood strategies of the poor in its region to clarify what research options, investments, policies, and technologies are most likely to benefit them. Special emphasis should be given to highly vulnerable segments of the population.*

The Center welcomes the recommendation. The well-being of the poor in the dry areas is central to the mandate of the Center. In marginal lands, where water is a scarce resource and climatic conditions are unpredictable the livelihood of the rural poor poses significant human and social challenges. The refinement of strategies to address this central theme is fundamental to the work of the Center.

The Center has already been active in conducting livelihood studies. New projects already approved at the Center in the areas of WANA and Central Asia will allow greater focus and depth on household and community surveys. This data, when linked to other data sources available to the Center should allow for the development and implementation of more comprehensive and integrated livelihood strategies, in partnership with the NARS in the region.

The approach lends itself to the continued integration of activities within ICARDA's diverse research portfolio, ensuring inputs of a broad nature on biological, social, economic and policy research. The Center looks forward to achieving meaningful success in this fundamental area of the CGIAR's and Center's research mandate.

Recommendation 11

*The Panel **recommends** that TAC undertake a comprehensive analysis of the impact of the continuing decline in unrestricted core funds on the Centers' research activities and their outputs and impact, as well as on their interactions with national agricultural research systems and advanced research institutions.*

The Center appreciates the recommendation the Panel makes to TAC. The dramatic shift at ICARDA in unrestricted core from 80% to 30 has had consequential impacts in terms of proposal preparation and reporting requirements. For **all** Centers these changes clearly impact the scientist time and the Center's flexibility.

Over the time these changes can have substantial implications on both medium and long-term research. Sustainable programs at the Centers, such as crop improvement, long-term agronomy and monitoring data collection at benchmark sites are vulnerable under these circumstances.

We endorse the recommendation the panel makes to TAC and we hope that TAC will undertake the analysis and make recommendations for the benefit of all CGIAR Centers.

Recommendation 12

*Realizing that the complexities of managing research at ICARDA require many interactions between project managers and other units, and that staff productivity will be greatly enhanced if a computerized management information system (MIS) is available, the Panel **recommends** that ICARDA implement a purpose-built MIS system for project management, if necessary acquiring the services of a consultant with experience on the recently-commissioned Oracle financial package, so that a user-oriented system is put in place.*

We agree with the Panel's recommendation regarding the implementation of an MIS system for project management.

The Center has already developed the initial phase of a computerized WINDOWS based project management system. It was installed in early 1999, and project managers are beginning to input data.

We will plan to enhance the existing system based on the past experience and taking into consideration the future requirements of the user community. The current MIS system uses ORACLE RDBMS and application object library (AOL) for all of its six modules. The enhanced project management system will be made as another module of the existing MIS suite. The new project management system will also use the AOL to have a user interface similar to that of the existing six modules. It will also be seamlessly integrated with the six modules to share the relevant information like project finance data from the general ledger.

Further, user orientation and training will be an important component to the implementation of a fully functioning system.

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE AND CGIAR SECRETARIAT

**REPORT OF THE
FOURTH EXTERNAL PROGRAMME AND MANAGEMENT REVIEW
OF THE
INTERNATIONAL CENTRE FOR AGRICULTURAL RESEARCH
IN THE DRY AREAS
(ICARDA)**

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Donald L. Plucknett (Chair)
Theodore E. Downing
Don Marshall
Louis R.K. Paul
Dunstan Spencer
Peter Wolff
Mohamed Zehni

Pammi Sachdeva (CGIAR Secretariat)
Mike Collinson (Panel Secretary)
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

April 2000

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February 15, 2000

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Mr. Alexander Von der Osten
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Dear Dr. Javier and Mr. Von der Osten,

I am pleased to submit to you the report of the Fourth External Review of ICARDA. The Panel's work was greatly aided by the excellent cooperation of ICARDA's Board, Management and staff, as well as the Centre's partners, as well as by the gracious hospitality afforded us.

During the review the Panel gained a deeper understanding of the research challenges in the dry areas that ICARDA faces. The Panel benefited greatly from Center Commissioned External Reviews (CCERs), to which the ICARDA Board and Management gave serious attention. Eight such reviews were completed, and these became an important part of the EPMR. Indeed, it could be that ICARDA's EPMR is the first in which CCERs have played a part like that envisioned by TAC as a new way forward in conducting reviews. The Panel commended ICARDA for the attention given to conducting and responding to the CCERs.

The review period has been a time of change and challenge for ICARDA. Nonetheless, during this time ICARDA has been transformed, despite suffering a severe decline in unrestricted core funds from 1994 to 1998, from 80% to 30%, respectively. During this same period, the Centre gained new Board leadership, and saw the appointment of a new Director General, a complete change in the Management team, and considerable restructuring of its programmes and management systems. The 1989 Strategic Plan was revised in 1996 and became the basis of the Centre's 1998-2000 MTP. The new strategy

resulted in the restructuring mentioned above, as well as significant downsizing for reasons of efficiency and changes in priorities and strategies. As might be expected, the degree and pace of change in the Centre caused some uncertainty among the staff and increased their workloads.

Also during the period, ICARDA responded to changes in the CGIAR and the region, and incorporated them into its programmes. Hence, ecoregional research, systemwide initiatives, increased involvement in Central Asia and the Caucasus, increased attention to poverty alleviation, and a project management system were adopted and/or implemented.

ICARDA continues to carry out a strategy of decentralisation of research in partnerships with NARS in CWANA, which includes some 35 countries. The Centre has developed partnership modes in which strategic and applied research in the regions are carried out in NARS/NARS or NARS/IARC relationships. It also tested a strategy of devolution of applied research (and strategic research in specific areas) with NARS, and outsourcing of upstream research to Advanced Research Institutes.

The Panel observed that ICARDA's new structure for programmes and projects provides a continuum of research from the Centre through its regional NARS partnerships. In this way, all of ICARDA's projects can work and have effects across the CWANA region.

The Panel was pleased to see new approaches to research. The Centre is making strides in a scientific approach to participatory research, particularly in barley breeding, and in Natural Resource Management. Also, an innovative approach has been proposed for long-term trials and strategic agronomic research. This approach, termed Anticipatory Long-Term Research, has important implications for early warning purposes and sustainability.

Matters with which ICARDA must deal include: continuing to ensure sufficient core staff competence at headquarters to meet its global and regional responsibilities (e.g., in genetic resources, germplasm enhancement, biotechnology), articulating a vision and strategy for Natural Resource Management Research, strengthening social sciences, and attention to staff concerns.

The Panel recognises that it may be increasingly difficult to support longer-term strategic research and retain necessary core competence at ICARDA in the face of increased special project funding. ICARDA Management is keenly aware of this problem, and has devised strategies to deal with it, including ways to use special funding to support its 'MTP projects'. Because this is a matter of importance beyond ICARDA, the Panel made a recommendation to TAC to explore its implications for the CGIAR.

The Panel concluded that ICARDA is well positioned for the 21st Century, and now needs a period of 'dynamic consolidation' to deal with matters still needing attention after the dynamic time of change which it has experienced.

We commend ICARDA as a Centre ready to meet the challenges of the new Century, and one worthy of donor support. Because the dry areas are the most water-scarce areas of the world, we can only expect their water problems there to worsen, as will the poverty that is so pervasive there. Agricultural research for the dry areas can help, and ICARDA is an important part of the region's agricultural research system.

Our Panel comprised a splendid group of talented and experienced scientists who worked well together. Our work was enhanced by the experience and wisdom of Dr. Michael Collinson, Panel Secretary, and the skills and insights of Dr. Pammi Sachdeva, who served as a resource person on management matters.

Yours Sincerely,

Donald L. Plucknett
Chair, ICARDA EPMR Panel

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FOREWORD

This is the report of the External Review Panel appointed to evaluate the programme and management of the International Center for Agricultural Research in the Dry Areas (ICARDA). The membership of the Panel and their backgrounds are given in Appendix I. The Terms of Reference for this Fourth External Programme and Management Review (EPMR) of ICARDA are shown in Appendix II.

In conducting the Review, the Panel has been guided by its Terms of Reference and the Guidelines for the CGIAR review process. The Panel's assessment of ICARDA's activities was assisted by the excellent Center-Commissioned External Reviews (CCER), which allowed the Panel to devote more time to strategic and cross-cutting themes as these pertained to the projects and programmes. The Centre's response to the recommendations of the 1993 External Review is recorded with Panel's comments in Appendix IV.

The Panel conducted its business in a frank, participatory and open manner. The information on which the Panel based its assessment and conclusions was gathered during staff presentations, individual interviews with staff, Management and the Board. Four sub-panels visited seven countries where meetings were held with government officials, research scientists, farmers and other collaborators with ICARDA. The itinerary of the Panel is outlined in Appendix V. The Panel sought the views of ICARDA's partners through a survey letter to NARS, CGIAR Centres and other institutions collaborating with ICARDA. A staff survey was also conducted.

Finally, the Panel examined published and internal documents produced by ICARDA staff and some collaborators. This material included the full range of information one might expect at an international agricultural research centre. A list of key documents used by the Panel is shown in Appendix VI.

SUMMARY AND RECOMMENDATIONS

This is the report of the Fourth External Management and Programme Review of the International Centre for Agricultural Research in the Dry Areas (ICARDA). The Panel greatly appreciated the quality of preparations by ICARDA for the review. The Synthesis 1993-1999 document provided the Panel a succinct overview of the work and evolution of the Centre during the review period. The Centre was re-organized in 1997 into two programmes, a Germplasm Enhancement Programme and a Natural Resource Management Programme. The report layout follows this new structure.

The Panel was impressed by the attention given by ICARDA Board and Management to Centre-Commissioned External Reviews (CCERs). Eight CCERs, which covered the bulk of the Centre's activities, were conducted during 1995-99, and proved very useful to the Panel in understanding the Centre's work and in its overall assessments of specific areas of programmes and management. This appears to be the first time that an EMPR has had available a comprehensive set of CCERs to use in the manner envisaged by TAC as a new way forward. However a common deficiency in the CCERs was a lack of explicit comment on the quality of science. Clearly this aspect of the commissioning and conduct of CCERs requires attention if they are to meet fully the needs of the EPMR process.

The Germplasm Enhancement Programme

Germplasm enhancement has been a major component of ICARDA's research programme since its establishment in 1977. The five years since the last EPMR have seen radical changes in the organization, funding and the philosophical basis of its programmes. These changes involved a substantial reduction in the size of the programme, from 27 to 20 in 1999, and a significant shift in resources away from traditional plant breeding to biotechnology, principally molecular marker and rapid generation turnover technologies.

The changes also included the development of decentralized collaborative breeding programmes with NARS to produce locally adapted cultivars using elite segregating ICARDA germplasm, and increased emphasis on participatory approaches to breeding. In the case of barley, the Centre has initiated an innovative and wide ranging programme of research in participatory breeding that is world class.

The Germplasm Enhancement Programme at ICARDA is an exciting one developed by enthusiastic staff who have been proactive in adopting new approaches and technologies to meet the difficult challenges they face. In the dry and often harsh environments it targets, the component projects have been successful individually and collectively. In excess of 240 ICARDA-derived varieties of cereals, food and forage legumes have been released since 1993, many with combinations of resistances to biotic and abiotic stresses. The group has published over 500 articles since 1993, of which more than 286 were papers in refereed international journals. Despite the success of ICARDA's work scientifically, its impact in both legumes and cereals, including wheat, has been disappointing, often due to the poor in-country infrastructure for seed production and distribution.

ICARDA has taken positive steps to overcome this problem and is now the only CGIAR Centre with a dedicated Seed Unit. The goal of the Unit is to improve seed supply to farmers of the region through strengthening national seed programmes by training and networking. The seed infrastructure is very weak in much of the region, and ICARDA's involvement is highly appreciated by its policy makers. The Unit continues to service the research programmes of ICARDA by handling all operations associated with variety management and seed production.

The Genetic Resources Programme at ICARDA has also been exceptionally successful. It has modern facilities that are well planned and run. It has established a unique world class collection that is not only a needed and critical global resource but is responsive to the needs of users, both internal and external. This success could not be achieved without the application of good science in an output-oriented programme.

The Natural Resource Management Programme

Over the 1993-1999 period ICARDA was able, through the research efforts of the projects of its Natural Resource Management Programme, to contribute to filling knowledge gaps in the specific fields of the disciplines involved and to produce information and improved technologies for the land users of its mandate region.

When one considers the urgent need to use arable and range land under dryland conditions on a more productive and sustainable basis, there is need to continue research in individual thematic areas. The Panel considers it important that ICARDA should offer its stakeholders a variety of future land use options which include management of small ruminants. However the projects have covered and are still trying to cover a very wide range of questions, despite the reduction in the financial and manpower resources available; and prioritization and concentration seem advisable.

The Panel found that scientific integration across the different projects and disciplines within the Natural Resource Management Programme still has to be achieved. The work is becoming increasingly system oriented and participatory, but remains mostly applied research. Only a small proportion of its individual research projects could be classified as strategic, and a few as holistic. The success of the Centre in increasing the strategic research in its portfolio and improving its multidisciplinary approach will depend on its ability to design carefully an increasing number of special projects to include these elements. Success will also depend on its ability to manage the data collected from different special projects for analysis at headquarters in order to distil strategic research results. To enhance scientific integration within the Programme and beyond, the Panel is of the view that ICARDA scientists working in the Natural Resource Management Programme should develop a clearer vision statement agreed with regional and other stakeholders.

During the period under review, ICARDA's social scientists shifted emphasis from evaluating technological innovations to emphasizing the institutionalization of farmer's participation in all of ICARDA's research. They began to focus on larger units of analysis, especially in the areas of property rights and policy. Their area focus began to shift to more resource-poor farmers, and they helped in initiating collaborative work in participatory barley breeding experiments. However, output levels of the social scientists have been modest, and there is a poor record of refereed journal publications.

ICARDA social scientists have made a major contribution to the institutionalization of farmer participatory research in ICARDA, and throughout the region. The IFPRI/ICARDA partnership broke new ground in the region by integrating research on policy, institutions and property rights with technology testing. This is a good model for ICARDA socio-economic research in the future.

The Panel suggests that a programme of focussed interdisciplinary social science research for the sub-regions should be developed jointly between ICARDA's social, physical and biological scientists and the NARS, after which the research activities would be allocated to partners in accordance with their comparative advantage. It also suggests that the Centre should prepare typologies of types of producers, households or communities for CWANA that would be used as a research framework, *inter alia*, in selection of "unified research sites". The Programme should also focus on a few key issues, and the problem of the quality of output may be best addressed by the recruitment or designation of a lead social scientist, with a major responsibility for monitoring and assuring quality of research.

International Cooperation

ICARDA's outreach activities have evolved over the years into a remarkable collaborative research network comprising seven regional programmes involving some forty countries and numerous collaborating partners from within and outside the region. The Regional Programmes contribute to the strength of the research continuum between ICARDA and its partners and enhance interactions among countries of the sub-regions.

The Centre has continued its policy of devolving some activities to the NARS and has begun outsourcing others to regional Advanced Research Institutes (ARI). The achievements of the regional programmes are considerable in terms of research results, technology generation and transfer, and human resource development. The Regional Programmes have given greater impetus to the work of ICARDA in germplasm enhancement and training and have been successful in generating donor interest and mobilising funds for research activities.

ICARDA has been successful in building and maintaining excellent relationships with its stakeholders and partners in developed and developing countries. The Centre is increasingly devolving the more applied and adaptive research to its outreach locations and establishing links with advanced research

institutes (ARIs) for the upstream work. ICARDA has had, and continues to have, a long-standing tradition of forging mutually beneficial relations with universities. The Centre has not been as successful with the NGO community, in part because of the very small number of active NGOs in the agricultural and rural sector in the Region, but recent developments indicate progress in this regard. ICARDA is collaborating, to some extent, with the private sector, particularly in an effort to accelerate the commercial use of technologies it has identified or developed.

ICARDA co-operates with ten sister centres in one or more ways: centre-to-centre co-operation based on shared mandates and/or mutual research interests, collaboration in multi-centre research undertakings or as part of system-wide programmes. Notwithstanding a few areas of contention discussed in the report, ICARDA now appears to have good collaborative working relations with its sister centres.

ICARDA enjoys excellent and cordial relationship with the host country. ICARDA is maintaining good relations with donors and has developed innovative approaches to search for new funding. ICARDA's working relations with CGIAR sister Centres are mutually beneficial, notwithstanding some differences in the interpretation of global and regional mandates.

NARS Training

ICARDA has a long standing, regional reputation as an institution that links research and training. The objective of this training programme is to transfer knowledge, methodologies, and information from the laboratory, the research stations and farmers' fields to NARS researchers. Since its founding in 1977, ICARDA has trained more than 9000 NARS agricultural scientists from more than 90 countries. The subsequent close relationship between ICARDA's "alumni" and its scientists significantly strengthens regional scientific cooperation. ICARDA aggressively seeks opportunities for donor support for training, and negotiates mutually beneficial, cost-sharing, long-term alliance arrangements with the NARS and other institutes to facilitate a sustained set of training opportunities and to reduce logistical problems.

During the period 1993-98, despite budget cuts and a heavy trimming in the training staff at the Centre, the enrolment has increased and over 4000 people were trained. Budgetary stress has also encouraged innovations in training methods, for example, a 'train-the-trainer' programme. This model not only reduces training costs, but links ICARDA scientists more closely to their NARS counterparts and to decentralized training in the NARS.

The Panel commends ICARDA's response to declining funds for training. The cadre of individual degree students at the Centre represents a particularly useful resource in research and research-related activities for the Centre in these circumstances. ICARDA has taken creative action on the challenges discussed by the CCER on training, and is commended for seeking innovative ways to sustain the flow of technological and methodological information to NARS scientists. It should continue to seek out long-term agreements and to tailor courses to the needs of NARS.

Organization and Management

ICARDA's Board has a reasonable blend of scientific and general administrative expertise, and an appropriate geographical balance of countries. The recommendations of the 1993 EPMR for strengthening Board oversight and internal processes have been fully addressed. Board members are aware of their responsibilities and accountabilities, and are proactive in discharging their duties. The Panel is pleased that the Board seems to have a good grip on its stewardship function, and there is good understanding between the Board and Management on their respective responsibilities and roles. The Panel commends the Board for its strong contribution to strengthening the Centre over the past few years.

The Panel is pleased that the Director General has assembled a highly competent team that works in harmony. The post of Director-Finance and Administration has unfortunately been vacant since July 1998. The Panel finds that the DG in particular, and the management team as a whole, have shown strong leadership in a period when much of the Centre's attention had to be devoted to seeking new funding sources and re-engineering the organization. The Panel commends the Centre on its effective donor relations; and trusts that Management will maintain a prudent balance between intensified fund-raising activities and a coherent research agenda and its management. It also notes that morale among some staff needs improvement, and strongly suggests that the Board and Management address all staff issues identified in the report with priority.

The number of employees at ICARDA has gone down from 591 in 1993 to 412 (30% reduction) at present. This reduction was necessary to accommodate the decline in core (unrestricted) funding. However, Management has ensured that the number of scientists has remained almost constant—93 at present, compared with 95 in 1993. The staffing and disciplinary composition of various programmes need to be reviewed. The Panel is concerned also that ICARDA has not fully addressed the 1993 EPMR's recommendation on personnel management.

Research management at ICARDA is complex—the result of its large mandate, the diverse region covered, and funding challenges. The Panel found that ICARDA's processes for strategic planning, priority setting, and project planning are systematic, thorough, and participatory. The organizational structure, the product of the 1996-97 strategic planning exercise, makes a clear division of responsibility between the managers of research and international cooperation. It is pleased that ICARDA's management structure and modus operandi are well matched; and scientists are expected to work in multi-disciplinary teams.

Scientists and managers engage in intensive and frequent interaction to plan, budget and implement the research programme. Despite the cooperative environment that exists, there is need for a purpose-built MIS system that will increase productivity of scientific staff.

In a period when unrestricted core funds decreased from 80% to 30%, ICARDA has amply demonstrated that the challenge of funding has been met. The Centre has attracted restricted and special project funding from donors, and that more than compensated for the decrease. For the years 1999 and 2000 of the MTP Plan, ICARDA has projected funding patterns on the assumption that the donor community will continue to fund at the levels required to implement the research agenda, but has mechanisms in place to deal with any shortfalls in funding without jeopardizing the integrity of the research programme. ICARDA has also put in place financial management procedures to ensure the prudent management of its financial resources.

LIST OF RECOMMENDATIONS

CHAPTER 3 – THE GERMPLASM ENHANCEMENT PROGRAMME

1. In view of a diminished expertise in fungal pathology at ICARDA, the Panel **recommends** that the Centre should strengthen its scientific capacity for strategic and applied research in crop pathology, and its pathology support to the Cereal and Legume Enhancement Programmes.
2. The Panel, **recommends** that ICARDA should review the opportunities that may be available if it should expand its research role in malting barley in developing countries. In undertaking this review, the Panel would expect ICARDA to complete a social and economic assessment of the potential of work in this area to meet CGIAR priorities.
3. The Panel **recommends** that as a matter of priority ICARDA seek discussions with CIMMYT to develop mutually acceptable plans for the incorporation of doubled haploids and marker-assisted selection technologies in their joint durum wheat, spring bread wheat and facultative/winter bread wheat breeding programmes.
4. Given the reductions in the Genetic Resources Unit staff that have occurred, the demands placed on the Unit for collection and conservation activities, and so as not to threaten its existing activities, the Panel **recommends** the GRU make a concerted effort to seek additional P and RA level staff from either internal or external sources, if it is to undertake an expanded programme of research in in situ conservation, pre-breeding and the evaluation of collections using molecular markers.

CHAPTER 4 – NATURAL RESOURCE MANAGEMENT PROGRAMME (NRMP)

5. In view of the critical nature of water scarcity in the CWANA region, the Panel **recommends** that ICARDA place more emphasis on strategic issues of water resource use, allocation and management at rural community level, and that it join in strategic partnerships to carry out this work.

6. Regarding social science research, the Panel **recommends** that ICARDA should: (i) reduce its scope and concentrate on fewer issues, selected in close collaboration with the Centre's physical and biological scientists and the national programmes - that are central to the operational mandate of the Centre; and (ii) seek to improve the quality of output by among others, (a) judicious recruitment or designation of a lead social scientist, (b) recruitment of high quality support staff, and (c) entering into more co-operative arrangements like those existing with IFPRI.
7. Recognising ICARDA's efforts to consolidate its natural resource management research by merging its former projects into a more integrated programme; the Panel **recommends** that ICARDA, together with appropriate partners, articulate a vision, strategy, and an implementation plan for natural resource management research, drawing on CGIAR and other experiences and centred on Unified Research Sites most appropriate for its emerging poverty alleviation focus.

CHAPTER 6 – INTERNATIONAL COOPERATION

8. In view of the importance of the Regional Programmes to ICARDA's interactions with its stakeholders and the Programmes' increasing share of the total financial resources of the Centre, the Panel **recommends** that ICARDA undertake a strategic review of its outreach activities to examine issues of strategic importance including: regional coverage, devolution/outourcing, interaction with NARS, interplay between research and outreach, information management and its role in the diverse regions.

CHAPTER 7 – CROSSCUTTING THEMES

9. To improve research quality and relevance, and to help develop a more prominent place for the conduct of multidisciplinary research at ICARDA, the Panel **recommends** that the Management promote quality and multidisciplinary research through recognition, rewards, and other incentives, and by assuring that appropriate criteria are covered in its Performance Evaluation process.
10. Recognizing that ICARDA has conducted a wide range of studies offering partial insights into poverty, the Panel **recommends** that ICARDA determine, with its partners, the rural livelihood strategies of the poor in its region to clarify what research options, investments, policies, and technologies are most likely to benefit them. Special emphasis should be given to highly vulnerable segments of the population.
11. The Panel **recommends** that TAC undertake a comprehensive analysis of the impact of the continuing decline in unrestricted core funds on the Centres' research activities and their outputs and impact, as well as on their interactions with national agricultural research systems and advanced research institutions.

CHAPTER 8 - MANAGEMENT

12. Realizing that the complexities of managing research at ICARDA require many interactions between project managers and other units, and that staff productivity will be greatly enhanced if a computerized management information system (MIS) is available, the Panel **recommends** that ICARDA implement a purpose-built MIS system for project management, if necessary acquiring the services of a consultant with experience on the recently-commissioned financial package, so that a user-oriented system is put in place.

CHAPTER 1 - PERSPECTIVES ON AGRICULTURE AND POVERTY ALLEVIATION IN DRYLANDS

Global and Regional Issues

The International Centre for Agricultural Research in the Dry Areas (ICARDA) uses the FAO definition of dry areas as those environments with a crop growing season which is less than 180 days, where water scarcity is the principal constraint to agriculture. Using that definition, five agroecological zones can be recognized: i) the cool subtropics with winter rainfall; ii) the warm, seasonally dry subtropics with summer rainfall; iii) the highland subtropics; iv) the seasonally dry tropics in Central and West Asia and North Africa¹ (CWANA); and v) the dry temperate areas. Almost a billion people live in the dry areas of the world and overall population growth rates are high.

Poverty

Poverty is pervasive in dry areas. Over 80 percent of the population live in countries with an average per capita Gross Domestic Product (GDP) of \$1.10 per day.² More than 70% of the impoverished people live in rural areas and largely depend on agriculture as a source of income. But income is not the sum total of people's lives. Poverty alleviation is a process of enlarging people's choices by expanding their capabilities. As stated by UNDP *"At all levels of development the three essential capabilities for human development are for people to lead long and healthy lives, to be knowledgeable and to have access to the resources needed for a decent standard of living. If these basic capabilities are not achieved, many choices are simply not available and many opportunities remain inaccessible. But the realm of human development goes further: essential areas of choice, highly valued by people, range from political, economic and social opportunities for being creative and productive to enjoying self-respect, empowerment and a sense of belonging to a community. Income is certainly one of the main means of expanding choices and well-being"*³

There is a wide variation in the incidence of poverty among and within the countries in the dry areas. The 23 low-income countries in ICARDA's Central and West Asia and North Africa (CWANA) region have a total population of 455 million, with an average annual per capita GDP of \$600. Of these, 100 million (in Eritrea, Ethiopia, Somalia and Sudan) have a per capita GDP of \$88 only. The other 5 low-income countries outside the region have 241 million people, with an average per capita GDP of only \$280. The 3 medium income countries in CWANA have a total population of 143 million, and a per capita GDP of \$2320, while those outside the region have a total population of 112 million, with GDP of \$4440. The 8 high-income countries, generally oil-rich and all in CWANA, only have 30 million people (less than 5% of CWANA population) with an average per capita income of \$8100.

¹ The reader should take note that the panel has purposely used two terms in this chapter, WANA (West Asia and North Africa) and CWANA (Central and West Asia and North Africa). This distinction is used because ICARDA has now included Central Asia in its operational mandate, but many past statistics refer only to WANA per se and do not include Central Asia

² Rodriguez, A. and Thomas, N. 1998. Mapping rural poverty and natural resource constraints in dry areas. ICARDA Social Sc. Paper No. 6 ICARDA, Aleppo, Syria

³ UNDP (1999) Human Development Report

Agriculture and Poverty Reduction

For most of today's poor, it is access to food because of limitations on income, not the availability of food, that is the operative limitation on food security. For the poor especially, food security accompanies the alleviation of poverty. Increase in productivity in the agricultural sector leads to increase in incomes in both rural and urban areas because it raises returns to farmers, and reduces the real price of food to consumers.

There is evidence that for poorer countries, increases in incomes in the agriculture sector have larger impact on countrywide income than increases in other sectors, and that economic growth and higher incomes reduce poverty.⁴ Focus on increasing incomes of the poor as a means of increasing food security and general welfare, gives added importance to the agricultural sector even in economies of relatively rich countries in CWANA, where the rural areas accommodate a disproportionate share of the poor.

Water resources

The dry areas are characterized by unpredictable spatial and temporal variability in its most precious resource, water, creating inherent variations in food security. In dry areas, the vicissitudes of the spatial and temporal distribution of water increase risks and uncertainty. The region is dotted with abandoned ancient cities and farmlands, offering silent witness to the importance of having sustainable access to scarce resources as a first-principle for continuous habitation of dry areas, as well as the short-sightedness of the human race in depleting and failing to maintain the natural resources on which life depends. Sustainable use of natural resources based on better technologies will foster peace and avert future conflicts. Several CWANA countries depend heavily on rainfed agriculture, while some of the driest depend almost entirely on irrigation for crop production in irrigation systems of variable efficacy.

The dry areas' share of the world's fresh water resources is very small. Per capita water supplies are lowest in the West Asia and North Africa (WANA). A recent study by the International Water Management Institute (IWMI)⁵ found that the WANA region is the most water-scarce region in the world. For the countries classed as most water-scarce – mostly in WANA – the study concluded, “...*water scarcity will be a major constraint on food production, human health, and environmental quality. Many will have to divert water from irrigation to supply their domestic and industrial needs and will need to import more food*”. The report further states: “*In a growing number of countries and regions of the world, water has become the single most important constraint to increased food production*”.

⁴ See for example, K. Deininger and L. Squire (1996). *A new data set measuring income inequality*. The World Bank Economic Review: 10, 565-591; C. Delgado (1996) *Bringing previously disadvantaged rural people into the economic mainstream: The role of smallholder agricultural production in sub-Saharan Africa*. IFPRI, Washington DC; Winkelmann, D. L. (1998) CGIAR activities and goals: Tracing the connections.

⁵ Seckler, D. , Amarasinghe, V., Molden, D., de Silva, R., and Baker, R. (1998). *World water demand and supply, 1990-2025: Scenarios and issues*. IWMI Research Report No. 19, Colombo, Sri Lanka.

Over seventy-five percent of available water in the dry areas is used for agriculture, but competition among various sectors is increasing each year, depriving agriculture of substantial amounts. In the next century, available water will barely satisfy basic human needs in many countries in dry areas. Scarce water is used inefficiently in many agricultural and domestic circumstances, and hydrological systems are beset with serious environmental problems. Water quality is declining in many areas because of low river flows, inadequate treatment of wastewater, agricultural runoff, depletion of aquifers, pollution from industry, and seawater intrusion.

Land Use

Of the 1.8 billion hectares of land in CWANA, only 8 percent is arable. Some 70% of the agricultural lands in the region are desert and semi-desert (steppe). Annual rainfall in steppe land is mostly below 200 mm and the lands are usually used for communal grazing. Degradation in the steppe can be severe because of over-grazing.

Agricultural production environments can be divided into three general categories: rainfed cropping, irrigated, and rangelands of differing potential based on water availability. Rainfed cropping environments can be further sub-divided into lowlands, highlands, and temperate. Within each of the five resulting production environments, there are broad patterns of farming systems, socio-economic characteristics, production constraints, and threats to sustainability of resource use (see Box 1.1).

Biodiversity and Genetic Resources

Ever increasing demographic pressures are threatening the natural resources in the dry areas including the biodiversity. Among dry areas, the CWANA region is exceptional with 25,000 species of higher plants native to this region. As a Vavilovian Centre of Origin, it contains important genetic diversity in wheat, barley, lentil, pea, chickpea and other food and forage legumes which were domesticated here, and played an essential role in the rise of Near East civilizations. Sheep and goats were domesticated in the region soon after the first crops. Today, approximately 38% of the world's food dry matter is provided by crops which originated in arid regions of the Near East. Wheat alone makes up one-third of global food production. Habitat destruction and changes in farming systems in dry areas threaten plant biodiversity.

Agriculture in CWANA

There is a perplexing anomaly in CWANA; why did this region, the cradle of agriculture, eventually lag behind in food production? Periods of plenty in the past gave way to deforestation, overgrazing, monoculture, unwise irrigation and large food imports - all of this in the centre of origin of some major food crops and farm animals.

Adjacent to high wage European employment opportunities, and located in a region with high-wage oil-producing Gulf states, many CWANA countries have high temporary male out-migration, thereby increasing the significance of women in day-to-day agricultural operations. Remittances into the region provide substantial support to rural populations but appear to be funneled mainly into non-agricultural activities.

The increased emphasis on free trade in World Trade Agreements will have an effect on the economies of CWANA countries. Those that are increasingly dependent on food imports will find their food bills rising as their suppliers reduce production and export subsidies. Agricultural incomes may be reduced as existing protective tariffs are reduced. With the increased integration in world markets CWANA countries must increase investments in human capital, infrastructure including seed supply systems, natural resource management and technology development. CWANA countries, rich or poor, should not be striving for food self-sufficiency. Rather they should be striving for a healthy balance of resources across the various economic sectors and optimising water-use efficiency.

Agriculture is integral to the economies of CWANA, and is especially significant to the rural poor. Within the region, agriculture, especially among the poor, is managed and mobilized by highly diverse social actors and groups. Access and rights to resources critical to agriculture are mediated through diverse institutional and cultural arrangements with deep histories and social alliances, especially those related to water and access to rangelands. Changes in policies, rights to resources, and institutional arrangements have to be tailored to the cultures, on increasingly scarce and female-dominated rural labour supply, and the agricultural calendar.

Opportunities for expanding cultivated rainfed or irrigated lands in CWANA are minimal. Sustainable increases in food supplies must come from increased productivity of both rainfed and irrigated agriculture. Food and feed demands have out-paced domestic production in most WANA countries, and are projected to continue to do so⁶. The resource bases for traditional livestock raising (native pastures and crop residues) have come under serious pressure. However, wise use of natural, human and financial resources will allow agriculture to make sustainable contributions to rural income growth and poverty alleviation.

Challenges for International Agricultural Research in CWANA

Increases in productivity of agriculture come largely from improved technologies, enabling policies, appropriate infrastructure and institutions, and more education. While each of the four rests on research to some degree, improved technologies and policies are most demanding. The challenge of agricultural research is to produce improved technology that can be adopted over well defined areas, that increases productivity in the area without damaging the natural resource base, and that results in a decline in the real price of the products. Agricultural researchers should continuously look for solutions that simultaneously favour natural resources and the poor, i.e. solutions that seek to reduce the trade-offs between the two.

⁶ El-Beltagy, A. (1997). West Asia and North Africa, a Regional Vision. ICARDA, Aleppo, Syria

Box 1.1: Agricultural Land Use in Dry Areas

Rainfed lowlands are of two general types: cool, winter rainfall and warm, summer rainfall (most such lands are in Africa). At the lower end of the rainfall gradient, small ruminants are the dominant enterprise, and cereals are the predominant crops. In the winter rainfall zone, wheat is grown in higher rainfall areas and barley in drier areas. Food legumes are rotated with wheat but rarely cover more than 20% of the cropped area. In the summer-rainfall zone, the dominant crops are sorghum and millet. There is great pressure today to intensify production on rainfed lowlands as human populations increase and available land per capita decreases. The challenge is to direct the intensification into systems that are both sustainable and economic. Alternatives to cereal monoculture are needed, incorporating legumes, both to improve soil fertility and enhance income from increased productivity, and crop diversification.

The highlands (over 1,000 m) in CWANA constitute approximately 40 % of the region's arable land and contribute about 30% of production output. Highlands are subject to extreme winter cold and summer heat and characteristically have poor infrastructure, are remote from national markets, and subsistence farms and poverty prevail. Cropping patterns are diverse, but wheat and barley predominate. External input levels are low, and farmers rely almost exclusively on locally adapted landraces. Crop residues are used to supplement natural mountain pastures and forests for feeding household flocks of sheep and goats. Population increases cause deforestation and overgrazing, and push cultivation limits to extremes of altitude and slope, resulting in major erosion problems. Male labour migration has led to reduced use of traditional systems of erosion control. Damage to watersheds downstream can be severe.

Rainfed temperate areas contain vast areas of rainfed cereals, with characteristically low yields due to water and temperature constraints. Most moisture comes from snowfall, and cereals must grow quickly to take advantage of very short growing seasons. Although some such areas in Central Asia are undergoing rapid political and economic change, there is understanding of the need for agricultural intensification through more efficient use of land and water in crop production.

Rangelands in the developing world are vast, and estimated at some 1,000 million hectares. They are used mainly for free-range grazing of wild and domestic animals, as a source of wood, medicinal plants, water, wildlife and recreation. An important characteristic of rangelands in the CWANA region is their close links with croplands through migrating flocks of small ruminants. Because arable farming tends to encroach in more favoured rangelands, and remaining rangelands are suffering increased grazing pressure from increased livestock numbers, rangelands are providing a decreasing amount of animal feed requirements. Policies to subsidize feed as well as deep wells, increased accessibility to rangelands by motor vehicles, and cutting of shrubs for firewood all contribute to degradation.

Irrigated areas in CWANA constitute only 2% of the region's total land area, but comprise 27% of the cultivable land. Irrigated lands are of immense importance to agriculture in dry areas, particularly in increased food production and rural employment. Where water is very limited, farmers tend to grow high value crops (e.g. fruits and vegetables), whereas where water is more abundant, field crops predominate. Irrigated farming is usually more market oriented than the rainfed farming in dry areas. Irrigated agriculture tends to use more inputs than rainfed systems, and such areas need careful management to reduce pollution. In many irrigated areas, poor drainage can cause the build-up of soil salinity.

People consume food, they produce food, and they make decisions about the relevance of technologies. They must therefore participate fully in the agricultural research systems aiming to produce technologies for their use.

Continuing globalisation and trade liberalisation not only significantly reduce domestic policy options, but also emphasise the concepts of comparative advantage and competitiveness. This exacerbates the apparent dichotomy between subsistence, sustainability and equity-oriented research aspects on the one hand, and productivity enhancing, market-oriented research aspects on the other.

There is a world-wide tendency to redefine the role of the State and to promote wider participation of the private sector in economic life. As a consequence, there is strong pressure to emphasise market-oriented agricultural research, and to connect research to product development. Agricultural research will become increasingly globalised with the private sector conducting most biotechnology research.

There is evidence of a slowing down of agricultural R&D spending globally, and a shift in favour of the industrialised countries. But the needs of the resource poor farmers in the dry areas are unlikely to be met adequately by the private sector. This implies the need for the public sector, including international institutions like ICARDA, to fill the gap.

In the ever more dynamic external environment in which ICARDA has to operate, it is of paramount importance that the Centre continues to convey a compelling vision of its work. This vision must be based on careful analysis of the factors affecting the dry areas, consideration of ICARDA's comparative advantage, the development needs of its mandate countries, and the changing priorities and strategies of the Consultative Group of International Agricultural Research to which it belongs, as was done when the Centre developed its recent strategy⁷.

1.2 CGIAR Changing Priorities and Strategies

Over the past decade, and particularly since the 1992 Priorities and Strategies paper was adopted, the CGIAR has made three major changes that affect ICARDA and its work. First, the CGIAR decided to accept the TAC recommendation to adopt the ecoregional approach and to develop and deploy paradigms for carrying out such research. Second, expanded collaboration with NARS and advanced research institutions (ARI) has been given increased attention as an important factor in enhancing scientific excellence. Third, the CGIAR adopted the concept of supporting Systemwide programs to bring together centres and other relevant institutions with common interests.

⁷ Relevant references include: (1) Bailey, Elizabeth, Aden Aw-Hassan and Richard Tutwiler. 1997. Project formulation and in-house priority assessment at ICARDA. 23 January, 1997. ICARDA, Aleppo, Syria. (2) ICARDA Medium-Term Plan 1998-2000, March 1998.

The CGIAR has endorsed the concept of a broader partnership with developing countries and their NARS, and encouraged a donor-client relationship to an equal-partner approach in setting and implementing the research agenda. It also decided to include the newly independent republics of Central Asia and the Caucasus within its mandate. The establishment of the Global Forum on Agricultural Research and the establishment of regional fora have created mechanisms to implement the broader partnership concept.

In 1997 at its mid-term meeting in Cairo, the CGIAR adopted its “CGIAR Priorities and Strategies for Resource Allocation During 1998-2000”. That report discussed changes in priorities and strategies under which the System would operate, as well as its changes in thinking over time. Some of the major conclusions of that report and of other developments will be summarized.

The CGIAR System affirmed its three main areas of focus: i) poor people, especially poor women; ii) poverty alleviation and protecting the environment in order to achieve sustainable food security; and iii) efficiency and effectiveness. Further, the CGIAR recognized that increased productivity and more effective management of natural resources (especially biodiversity, land, and water) would be central to achieving success in these areas. The System also recognized that increased productivity leads to increased growth in agriculture and to growth in real incomes of urban dwellers, and that under-investment in research aimed at increasing productivity and ensuring appropriate environmental safeguards opens a major threat to the environment.

The increased emphasis on poverty alleviation led to important statements relating to priorities and strategies: hence, *“The goal of the renewed CGIAR is to conduct research that will help liberate the deprived and disadvantaged from the grip of extreme poverty and hunger. The central themes of the CGIAR vision are: less poverty; healthier, better nourished families; reduced pressure on fragile natural resources; and people-centered policies for sustainable development”*; also, that the CGIAR is concerned with *“. . . a more central role for poor people than that of the past, and reflects a new appreciation for the role of agriculture and research in alleviating poverty”*. Regarding the second statement, TAC noted that commodities making up the CGIAR research portfolio were initially selected because of their importance to poor producers and consumers, reflecting the CGIAR’s long-term concern with poverty.

In evaluating CGIAR research activities, TAC uses three primary considerations: i) center products should be international public goods; ii) whether there are alternate sources of supply for center products; and iii) the possibility of creating an impact.

Presently, CGIAR activities are classified as follows: i) increasing productivity, ii) protecting the environment, iii) saving biodiversity, iv) improving policies, and v) strengthening national research programs. In these activities, *“. . . emphasis is now focusing on the links between poverty, productivity and natural resources, with poverty alleviation as the guiding impulse”*. Changes in CGIAR strategies that affect the conduct of the activities include: the ecoregional approach to

conducting research, Systemwide initiatives, widening of partnerships, and inter-center collaboration.

Regarding natural resource management, TAC concluded: “. . . *a renewed emphasis on natural resources management requires a further expansion of the conceptual framework that integrates data, information and knowledge on land-use research for agriculture, forestry and fisheries*”, and expressed special concern regarding: “. . . *a lack of standardized methodologies and the frequent absence of appropriate statistical techniques, the frequent absence of distinction between levels of degradation easily corrected and those notably difficult to correct; and, the inconsistencies sometimes found between expert opinion and production data*”. TAC urged that emphasis in natural resource management should be given first to the implications of resource conservation on present and future productivity, and secondly to broader global environmental effects.

The CGIAR System Review in its Recommendation No. 2 emphasized that the IARCS “*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*”⁸.

⁸ CGIAR. (1988) CGIAR System Review Report. ICW/98/06A. Washington, D.C., U.S.A.

CHAPTER 2 - MANDATE AND STRATEGY

2.1 Recent Changes in the Mandate

At ICARDA's establishment in 1977, its Charter entrusted it with "... promoting improved and more productive agriculture in less-developed countries having a dry subtropical or temperate climate, through research and training activities conducted primarily in the countries of the Near East and North Africa and the Mediterranean region, in order to raise the standard of living and promote the social, economic and nutritional well-being of developing countries".

Within this broad mandate, ICARDA began working at international level on research to improve barley, lentil and faba bean, and at regional level to improve wheat and chickpea. Research on small ruminants and natural resource management, particularly soil, water and plant genetic resources were to be an integral component of the Centre's research. Hence, as the 1993 EPMR stated, "*ICARDA has interpreted its mandate in the context of the physical and social environments of its region and the challenges they pose*"; and as a result, "*ICARDA's initial strategy focused primarily on the description, quantification and evaluation of the physical, biological and socioeconomic problems that determine and/or constrain agricultural production systems in the WANA region*". Within the world's dry areas ICARDA identified five agroecological zones: i) warm, seasonally dry subtropics (with summer rainfall); ii) cool subtropics (with winter rainfall); iii) highland subtropics; iv) seasonally dry subtropics; and v) dry temperate areas.

In its early days, ICARDA was discouraged from being involved in irrigation research or water management, and was limited to rainfed farming regimes. Recently, in response to the 3rd EPMR, the Centre has increased its work in on-farm water-use efficiency in dry areas. Other recent changes include more emphasis on animal genetic resources, increased work in natural resource management, and collaborative activities in Central Asia and the Caucasus. ICARDA strongly encourages transferability and spill-over of its relevant technological and methodological outputs to dry areas outside CWANA.

In preparing a 1996 revision of strategy, ICARDA reviewed the term, Dry Areas, and its relationship to the ICARDA geographical mandate. Because 'dry' is a relative term, ICARDA used an FAO aridity index which uses length of growing period (LGP) as a major parameter in identifying world agro-climatic zones, and 'dry areas' are delimited as having an LGP of less than 180 days. With this dry area parameter in mind, the 1996 revision of strategy elaborates: *Although the dry areas are clustered within the subtropical zone, there are substantial extensions into some temperate and tropical areas. Within this context, there are three major rainfed agroecologies of relevance to ICARDA:*

- *Lowland dry areas in the subtropics and tropics, including cool, winter rainfall (Mediterranean type) and warm, summer rainfall areas,*
- *Highland dry areas in the subtropics, including winter rainfall areas and tropical highlands on the southern periphery of the winter rainfall subtropics,*

- *Temperate dry areas, including lowlands and highlands.*

The countries included in ICARDA's mandate are those developing countries having large and important subtropical and temperate dry areas, together with the following tropical countries: Sudan, Ethiopia, Somalia, Yemen and Oman.

The most recent statement of ICARDA's geographical mandate is as follows: *the eco-regional scope of ICARDA's research covers the countries of West Asia and North Africa including the newly independent states of Central Asia and the Caucasus of the former Soviet Union. Hence the region is called CWANA. ICARDA works in other developing countries with dry areas, where its global crop and resource mandates are relevant.*

While ICARDA has long had a commitment to the poor, like other CGIAR centres, it has followed the CGIAR decision to increase attention to poverty alleviation. Hence, the following statement in ICARDA's 1998-2000 MTP: *"ICARDA is committed to working with farmers and pastoralists through partnerships with NARS to develop technologies that are both more productive and sustainable and contribute to the alleviation of poverty in the dry areas".* To contribute to poverty alleviation the Centre has adopted *"... four strategic approaches: i) technologies that simultaneously improve productivity and sustain natural resources and can be applied by poor people using low levels of external inputs; ii) resource management practices that conserve soil, water, and vegetation and do not decrease productivity; iii) more diversified farming systems that reduce economic risk, contribute to greater resource use efficiency, and provide higher returns to the farm community; and iv) improved vertical integration from producer to consumer, including enhanced quality and added value of farm products, improved post harvest processing and storage, and employment generation".*

Since its inception ICARDA has re-interpreted its broad mandate in response to changes in the external environment and the CGIAR. Hence, following a recommendation of the 2nd EPMR, faba bean improvement was devolved to Morocco. When this devolution proved ineffective, ICARDA has once again assumed responsibility for faba bean. Other changes have also occurred as a result of a number of driving forces, including: regional consultative processes, awareness of needs of subregions including the Newly Independent States of Central Asia and the Caucasus, and discussions and actions of the ICARDA Board.

The present operational mandate of ICARDA is:

ICARDA serves the entire developing world for the improvement of barley, lentil and faba bean; and dry-area developing countries for the on-farm management of water, improvement of nutrition and productivity of small ruminants (sheep and goats), and rehabilitation and management of rangelands. In the Central and West Asia and North Africa (CWANA) region, ICARDA is responsible for the improvement of durum and bread wheats¹, chickpea⁹, pasture and forage legumes, and farming systems; and for the protection and

⁹ The Panel wishes to point out that in CWANA, ICARDA shares responsibilities for wheat with CIMMYT and for chickpea with ICRISAT.

enhancement of the natural resource base of water, land, and biodiversity. ICARDA's research contributes to poverty alleviation through productivity improvements integrated with sustainable natural resource management, and the Centre's research outputs constitute international public goods.

ICARDA's mission is to improve the welfare of people through research and training in the dry areas of the developing world, by increasing the production, productivity, and nutritional value of food, while preserving and enhancing the natural resource base.

[Stated as the evolving strategy of ICARDA as embodied in MTP 1998-2000, and approved by TAC. Source: The Synthesis 1993-1999, A Special Report Submitted to the EPMR Panel, ICARDA, 1999]

The Panel agrees with ICARDA's move to Central Asia and the Caucasus (CAC), which is congruent with the CGIAR's own interests, and where crops and natural resource questions are similar to those within the Centre's research responsibilities.

2.2 ICARDA: Evolution of Priorities and Strategies

ICARDA's priority setting process has evolved. Priorities and strategies are now identified from an interplay of national programme needs, ICARDA's capabilities and comparative advantage.

The Centre's first Strategic Plan was produced in 1989 in response to a requirement of the CGIAR just after the Centre completed its first decade. During this decade it worked with its mandated crops and, within the WANA region, it targeted well defined areas of dryland agriculture: wheat based mixed farming systems with more than 300 mm of rain, barley/livestock systems with 200-300 mm of rain, and highland systems with these same rainfall levels but with crop growth constrained by lower temperatures and a shorter growing season. Most of the research and training was focussed here but ICARDA also embraced the Nile Valley programme which commenced in Egypt and the Sudan in 1979, and Ethiopia in 1986.

The 1989 Strategic Plan proposed greater attention to the extensive lower rainfall and highland areas in WANA and, paralleling this, enhanced investment into natural resource management research through the then Farm Resource Management Programme. The 1989 Plan pointed to implications of the shift to drier areas as an "increased focus on the poorer, smaller producers for whom farming is a high risk enterprise." It highlighted the Centre's recognition of poverty as a target for research and also, elsewhere, demonstrated a concern for gender. The 1989 Plan Paper provided a context for the 1990-94 Medium Term Plan, and, together with the 1993 EPMR of ICARDA, a background for the 1994-98 Medium Term Plan which covers the first four years of the period now under review. A number of other events influenced the 1994-98 Medium Term Plan:

- The shift to natural resource management in the 1992 Review of the CGIAR Priorities and Strategies, and the emergence of the ecoregional concept.

- A 1992 Aleppo seminar on emerging research priorities in the WANA region.
- Two rounds of consultation on priorities with NARS partners.

The 1994-98 MTP envisaged a cut in funding and the loss of 8-14 'P' level posts over the five year period. It stated that new initiatives and emphases (listed below) would largely be dependent on special project funding, and confirmed that the devolution of faba bean research to the Moroccan national programme had occurred. Hence, the MTP proposed:

- Geographical expansion into the Newly Independent States justified by the similarity in agroecological conditions.
- A modest start into on-farm water use efficiency research in irrigated areas, to be carried out with national partners and special funding as far as possible.
- The introduction of work on oilseeds and forage shrubs, particularly those suitable for the rangeland.
- More resources for the highland areas, agro-ecological characterization, ruminant nutrition, with special emphasis on supplementary feeding.
- A shift of emphasis from the collection and conservation of germplasm to characterization and evaluation studies and to in situ conservation.
- A decentralization of training from ICARDA Centre to NARS.

Due to the declining funding situation throughout the CGIAR, expectations for the 1994-98 period were not realized and the medium term planning process was modified. From 1998 a new process instituted three-year rolling programmes. To date ICARDA has published three rolling MTPs; for 1998-2000, 1999-2001, and for 2000-2002.

Before embarking upon the development of the first rolling Medium-Term Plan, the Centre undertook a detailed exercise to develop a new strategy, taking into consideration the evolution of global agricultural research, the problems and needs of dry area producers and consumers, ICARDA's past achievements, and its comparative advantages in research, and institutional priorities within the agreed CGIAR agenda. The process started with the WANA NARS forum meeting at ICARDA and the CAC NARS meeting in Tashkent, Uzbekistan in December 1995, accompanied by local and regional priority setting for agricultural research and institutional strengthening. The whole process was highly iterative and involved all stakeholders. The strategy was included in the MTP for 1998-2000, which was approved by TAC in March 1997.

The MTP for 1998-2000, in implementing the new strategy, also announced a major change in Centre organization in which existing research activities were merged into two programmes: Genetic Enhancement Programme and the Natural Resource Management Programme. Finally, the 1998-2000 MTP identified the following shifts of emphasis in ICARDA priorities.

Table 2.2.1: Increased & Decreased Attention in the Research Agenda

Increase	Decrease
<ul style="list-style-type: none"> • On-farm water management • Rangeland rehabilitation and management • Small ruminant nutrition and management • Agroecological characterization • Land & water resource management • Pre-breeding and biotechnology for crop improvement • Farmer participatory approaches • End use quality and added value • Faba beans improvement 	<ul style="list-style-type: none"> • Cereals with assured moisture • In house production of ‘finished’ cultivars • Agronomy in high rainfall zones • Wheat/Medic systems • Evaluation of <u>Rhizobium</u> strains • In-house software development • Technician training in crop improvement

Source: ICARDA Medium Term Plan 1998-2000

Table 2.2.2: Shifts in emphasis within projects

From	To
<ul style="list-style-type: none"> • Centralized breeding • IPM screening in isolation • In-house rotation trials • <u>Ex situ</u> germplasm collecting • Long-term, non-degree training • Headquarters stress physiology • Farming systems diagnostic survey & economic evaluation of on-farm trials • Technical seed production in the formal sector. 	<ul style="list-style-type: none"> • Decentralized breeding • IPM in systems • NARS rotation trials • Biodiversity: <u>in situ</u> conservation • Degree training • Decentralized stress physiology • Adoption, impact assessment & rural poverty analysis • Alternative seed production systems, seed security, & economics of seed production

Source: ICARDA Medium Term Plan 1998-2000

The Panel has commented on several of these recent changes of emphasis in their assessments.

2.3 ICARDA – Centre and Regions

ICARDA's physical and programme development has been influenced by two concepts. The first is that of a Research Centre, supported by satellite experimental sites representing different environments. This development was to replace the original concept of a Centre based on three stations, which had to be abandoned for political and pragmatic reasons. The second concept is decentralization of activities through sub-regional groupings that offer more cohesion amongst member countries due to socio-economic and cultural affinity and/or physical similarities. In this concept, the sub-regions serve as the main hubs for operational and collaborative research programmes and projects. Thus, ICARDA has a strong central research programme at headquarters and an extensive, decentralized outreach programme for collaborative research and other activities strongly linked to programmes at the headquarters. In earlier years the outreach received considerable support from core funds, but now is almost entirely dependent on non-core funding.

The Research Programme: ICARDA's research programme is conducted by two major programmes and carried out in 19 research projects. The two programmes are:

- Germplasm Enhancement
- Natural Resource Management

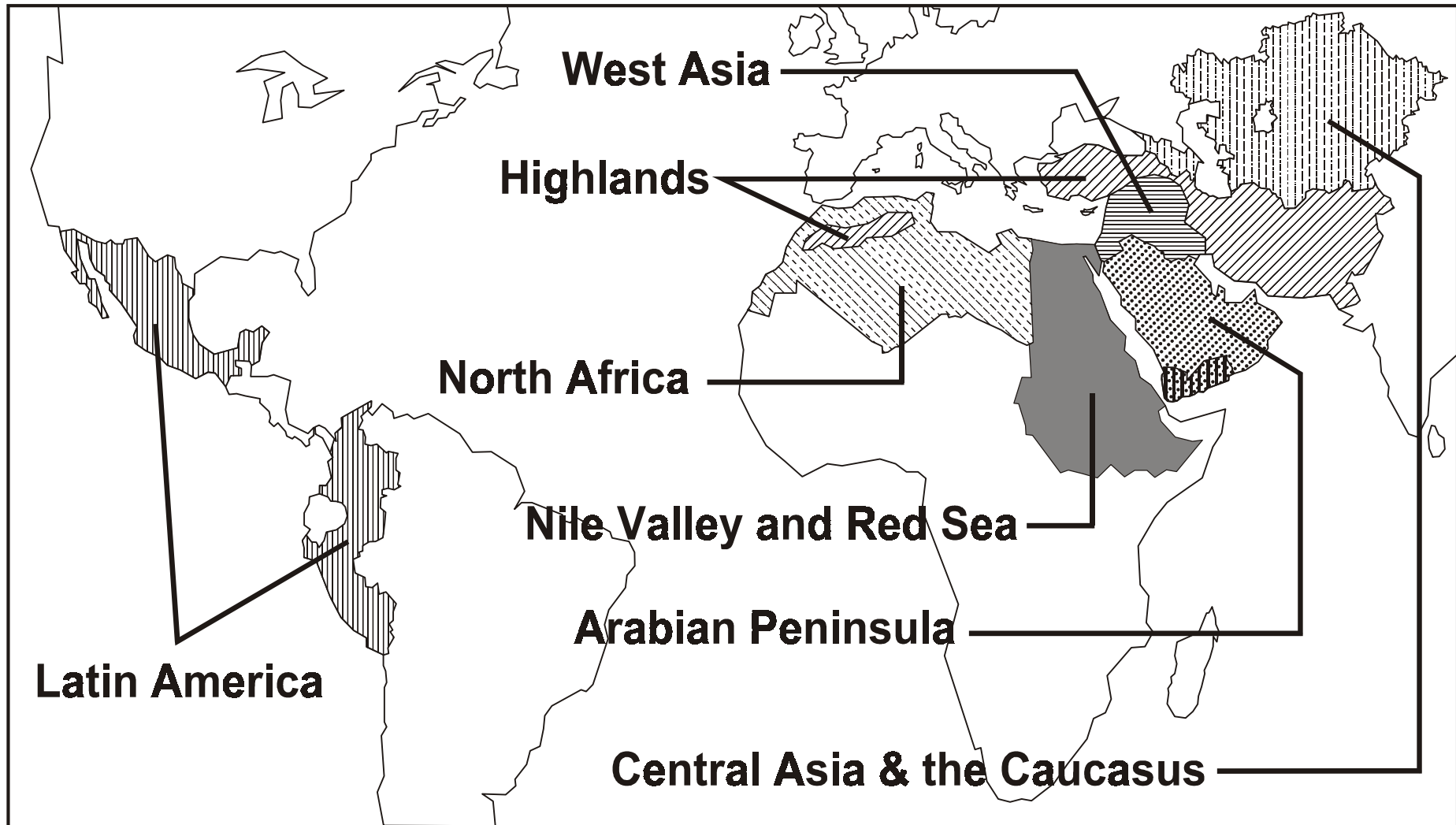
The Programmes are backed by six research-support units: Genetic Resource Unit; Seed Unit; Human Resources Development Unit; Communication, Documentation and Information Services (CODIS); Computer and Biometrics Service Unit (CBSU); and Station Operations.

The Outreach Programme: In partnership with national, regional and international research organizations, many activities are implemented in seven Regional Programmes, each headed by a Regional Co-ordinator, with modest physical infrastructure and a small management and technical team. In the last five years, the number of professional staff in these Regional Programmes has doubled. The Regional Programmes have attracted national scientists and institutions as collaborators. The various Regional Programmes are listed below (see map) and are described in more detail in Section 6.1.

- **North Africa Regional Programme (NARP):** Located in Tunis, Tunisia with the following participating countries: Algeria, Libya, Mauritania, Morocco and Tunisia.
- **Nile Valley and Red Sea Regional Programme (NVRSRP):** Located in Cairo, Egypt, with the following participating countries: Egypt, Sudan, Ethiopia, Yemen and Eritrea.

- **Central Asia and the Caucasus Programme (CACP):** Located in Tashkent, Uzbekistan, with the following participating countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Armenia, Azerbaijan and Georgia.
- **West Asia Regional Programme (WARP):** Located in Amman, Jordan, with the following participating countries: Cyprus, Iraq, Jordan, Lebanon, Palestine, Syria and the lowlands of Southern Turkey.
- **Arabian Peninsula Regional Programme (APRP):** Located in Dubai, UAE with the following participating countries: Bahrain, Kuwait, Qatar, Saudi Arabia, the Sultanate of Oman, the United Arab Emirate and the Republic of Yemen.
- **Highland Regional Programme (HRP):** Located in Ankara, Turkey with the following participating countries: from West Asia (Afghanistan, Iran, Pakistan and Turkey) and North Africa (Algeria, Morocco and Tunisia).
- **Latin America Regional Programme (LARP):** Located at Centro Internacional de la Papa (CIP) in Lima, Peru, participating countries: Latin American countries with dry land areas (e.g. Bolivia, Chile, Ecuador, Mexico, Peru). Earlier, the LARP was operated from CIMMYT, Mexico, where the ICARDA barley breeder also coordinated the regional activities of the Centre in Latin America.

ICARDA's Regional Programs



CHAPTER 3 – THE GERMPLASM ENHANCEMENT PROGRAMME

3.1 Germplasm Enhancement

Germplasm enhancement has been a major component of ICARDA's research programme since its establishment in 1977. ICARDA currently undertakes global germplasm enhancement projects in barley, lentil and faba bean, and regional programmes for forage legumes and, in association with other centres, for bread wheat, durum wheat and kabuli chickpeas.

While ICARDA's germplasm activities are long standing, the five years since the last EPMR have seen radical changes in the organization, funding and philosophical basis of its programmes. These changes include:

- The consolidation of the former Cereals Programme (CP) and Legumes Programme (LP), along with Integrated Pest Management (IPM), into a single Germplasm Enhancement Programme (GP).
- A substantial reduction in the size of the programme due, in part, to a reduction in the level of total support available to ICARDA and, in part, to a shift in resources to other priority programmes (e.g. the Seed Unit and Regional Programmes). In 1993, 27 scientific and 94 support staff were involved in germplasm enhancement research. By 1998, this had dropped to 20 scientific staff and 50 support staff. Nevertheless the programme is still relatively large, costing US\$9.22 million (or 37%) of a total ICARDA budget of US\$ 24.5 million in 1998.
- A significant shift in resources within the programme away from traditional plant breeding to biotechnology, principally molecular marker and rapid generation turnover technologies, including double haploids and single seed descent protocols. ICARDA now has 4 biotechnologists in its germplasm programme, compared to 2 in 1993.
- The development of decentralized collaborative breeding programmes with NARS to produce locally adapted cultivars using elite, segregating ICARDA germplasm.
- A major shift in focus in the germplasm enhancement activities at ICARDA, away from the development of fixed elite lines to the generation of segregating populations developed in response to the needs of the NARS collaborative breeding programmes.
- An increased emphasis on participatory approaches to breeding. In the case of barley, the Centre has initiated an innovative and wide-ranging programme of research in participatory breeding that is world class.

Yet, while the germplasm enhancement programmes at ICARDA can claim to have gone through a period of rapid but constructive evolution, it is clear that further significant changes will be required in the next five years, fuelled by the simultaneous world-wide revolutions in biotechnology and information technology.

While many of the past and potential future changes to ICARDA's Germplasm Enhancement Programme affect all mandate crops, others do not. In this section, as a consequence, we first review the enhancement programmes for each crop or group of crops individually, and then provide an overall assessment of the entire programme in light of the major future challenges.

3.1.1 Barley

3.1.1.1 Evolution

Approximately 27% of the world's sown area of barley is in the dry areas of developing countries. In such areas it is the cereal adapted to the driest conditions, and is often the major crop grown at the limits of cultivated agriculture by resource-limited farmers who use the grain and straw for livestock feed. In large areas of the Tropical Highlands, food barley is a vital staple for poor communities. As the CGIAR shifts its focus to food security and poverty alleviation, it is, therefore, not surprising and fully justified that barley is one of ICARDA's globally mandated crops.

The programme has four barley breeders, of which three are stationed at Tel Hadya. Of these, one is responsible for the CAC and highland areas, one for North and Central Africa and one for the Near and Far East. The CAC/highlands breeder is currently in the process of relocating to Tashkent where it is believed he will be better able to tailor his programme to meet the needs of the regional NARS. The fourth breeder is located in Mexico, and in a joint ICARDA/CIMMYT programme addresses the needs of Latin America and favourable environments in Asia.

Barley germplasm improvement at ICARDA has undergone a significant change in emphasis over the last three years. While the broad aim of the programme is still the sustainable increase in barley production in dry areas, greater attention is now being given to: (i) direct selection in target environments; (ii) decentralized cultivar development with NARS collaborators and (iii) farmer participation.

3.1.1.2 Achievements

- 49 varieties were released in 19 countries in the period 1993-1999.
- Further implementation of decentralized breeding and adoption by national programmes of the breeding strategy developed by the barley improvement project. Implementation of farmer-participatory breeding in Syria, Tunisia, Morocco and Yemen.
- Development of molecular markers for resistance to powdery mildew and scald and for brittle rachis and height under drought.

3.1.1.3 Future Directions

Emphasis will be given to the full implementation of the decentralized breeding approach, and a greater focus at ICARDA research sites on pre-breeding and the incorporation of improved resistance to biotic and abiotic stresses in elite, segregating populations. Ambitious plans have been developed for the increased use of molecular markers and rapid breeding technologies. Developing germplasm with improved quality characteristics for food and feed will also be targeted.

3.1.1.4 Assessment

The barley germplasm enhancement programme at ICARDA has been very successful in terms of the numbers of released varieties in developing countries. The scientists in this group have established a good international reputation for research in plant breeding and have published widely in refereed journals. However, there is a widespread perception that the ICARDA barley programme has had significantly less impact than comparable programmes on other major crops.

The reasons for this lack of adoption and impact are several and varied. They include the fact that the ICARDA global barley breeding effort has, in total, been modest. Further, that this effort in the past appeared to consist of three small regional programmes with limited coordination, rather than one effective global programme. It is also due to the often slow and bureaucratic variety evaluation protocols in most cooperating countries and the lack of effective seed distribution systems. Nevertheless, whatever the reasons, at a time when technology permits the release of elite varieties in as little as 6-7 years from the final cross, and widespread distribution to farmers in 3-4 years, to continue to take 10-12 years or more to add an exciting new cultivar to a recommended variety list followed by as much as 10 years to achieve even limited distribution, is clearly unacceptable. Yet this extended period of adoption has happened with some ICARDA varieties. The Panel strongly urges ICARDA to continue to seek to understand and ameliorate, to the extent possible, the constraints to farmer adoption of its improved germplasm.

The CCER of Cereal Germplasm Improvement and Genetic Resources was conducted in February, 1997. This review was critical of some aspects of the barley enhancement programme, particularly an apparent lack of coordination and planning. It recommended, with respect to barley germplasm enhancement: *“that ICARDA move quickly to define clearly its long-term strategy to carry out its global mandate in barley. This includes an evaluation of the Centre’s valuable germplasm, staff needs at Tel Hadya and elsewhere, global strategies to meet continental, regional and national needs, necessary partnerships, involvement of biotechnology and molecular genetics, and the leadership needed to conduct this multi-disciplinary programme.”*

The new leadership of the Genetic Enhancement Programme has moved decisively to overcome past problems and has radically restructured the programme, increased coordination, added a new emphasis on cutting edge science as well as farmer participation, and decentralized variety development with NARS partners. There is also greater interaction with the significantly enhanced Seed Unit. Whether these moves will break the shackles limiting adoption and impact is too early to say.

However, ICARDA should be congratulated for its innovative and wide ranging attack on the problem.

3.1.2 Wheat

ICARDA serves as a regional centre for bread and durum wheat improvement in CWANA in collaboration with CIMMYT. Bread and durum wheats are the major staple food crops in the region. Approximately 70% of the wheat sown in CWANA is bread wheat and the remainder is durum, which amounts to 75% of the durum wheat sown in developing countries worldwide.

Wheat germplasm improvement and breeding at ICARDA has three components:

- i. A durum wheat component undertaken under a joint CIMMYT/ICARDA umbrella. The mode of collaboration between ICARDA and CIMMYT is spelled out in the agreement signed in 1996. The salary and employment costs of the breeder/project leader are paid by CIMMYT. All salary and employment costs of other staff and all operational costs for the work at ICARDA, and with the CWANA NARS, are covered by ICARDA.

In creating a germplasm, the durum wheat programme at ICARDA places particular emphasis on using the CWANA durum landraces and wild relatives, which have been identified as having resistance to various biotic and abiotic stresses, better quality, and adaptability.

- ii. A spring wheat component, again a joint CIMMYT/ICARDA project with CIMMYT funding the salary and employment costs of a senior breeder, and ICARDA the salary and employment costs of the rest of the staff and the regional operating costs. This project is also strongly linked with complementary research at CIMMYT.

The project's main goal is to enhance the productivity of spring bread wheat in the low rainfall areas of CWANA, in close partnership with NARS. Emphasis is given to the key target stresses of importance to the region (drought, heat, cold, cereal rusts, Hessian fly, septoria leaf blotch and Russian wheat aphid).

- iii. A winter/facultative bread wheat component conducted in partnership with CIMMYT and the Turkish National Wheat Improvement Programme (NWIP). This project is conducted under the umbrella of the International Winter Wheat Improvement Programme (IWWIP) which facilitates close collaboration with a range of NARS, including Iran, the Central Asia Republics and the Caucasus (CAC) countries, in the region.

Following the 1996 agreement between ICARDA and CIMMYT, a senior ICARDA wheat breeder was moved in 1997 from headquarters to work more closely with other scientists in the tripartite Turkey-CIMMYT-ICARDA partnership. This project seeks to develop improved winter and facultative bread wheat germplasm and technology, with a particular focus

on the highlands of the CWANA region which represent some of the most marginalized areas, and are home to some of the regions poorest communities.

3.1.2.1 Achievements

Durum wheat

- 29 durum wheat varieties released in 11 countries from 1993 to 1998.
- Total production of durum in Syria was tripled, while a 25% increase was recorded in Morocco, Algeria, Tunisia, Turkey and Iraq.
- Notable progress was made in improving resistance to a wide spectrum of abiotic and biotic stresses.
- Development of the West Asia and North Africa Dryland Durum Improvement Network (WANADDIN) in 1996 to facilitate the setting up of national durum research teams and strengthening the current collaborative effort by using the comparative advantages of each main durum-producing country.

Spring Bread Wheat

- A total of 37 varieties have been released in 9 countries in collaboration with NARS in the last 5 years. The new releases are resistant to stripe rust and several represent the first generation of Hessian-fly resistant varieties resulting from collaborative work with INRA Morocco.
- Previously the programme focussed mainly on grain yield, particularly in low-rainfall areas. However, increased emphasis is now being given to end-use quality for flat and raised bread.
- Sources of resistance to the major diseases and insect pests limiting spring wheat production in WANA have been identified and used in breeding.

Winter and Facultative Bread Wheats

- A total of 25 winter/facultative wheat cultivars were released by cooperating NARS in the last 5 years.
- Increased levels of yellow rust resistance in elite germplasm have been made available to NARS programmes. The resistance level to current field strains has increased from less than 10% of the tested germplasm in 1995 to over 40% in 1998.
- Particular efforts have been made to work with NARS in CAC. Wheat researchers from CAC and WANA countries have participated in travelling workshops organized in Iran, Turkey, Uzbekistan, Kyrgyzstan

and Kazakhstan since 1993.

3.1.2.2 Future Directions

Durum Wheat: The focus of this project has been on breeding durum cultivars with dual characteristics: the ability to withstand biotic and abiotic stresses and to respond when weather conditions are favorable. This has been successful, and the future aim is to build on this success by (i) broadening further the genetic base for resistance to diseases, insects, drought, heat and cold through the use of durum land races and wild relatives; (ii) development of effective breeding methods for unpredictable environments with emphasis on molecular marker-assisted selection; and (iii) building better linkages and capacity with cooperating NARS. It is also planned to give increased attention to improved nutritional quality (B-carotene, amino-acids, and micronutrients such as zinc) and processing quality.

Spring Bread Wheat: The joint CIMMYT/ICARDA spring wheat programme will continue to focus on the development of bread wheat germplasm with high yield and stability for the low-rainfall areas of WANA, with effective resistances to the prevailing pests and diseases. Increased emphasis will be given to resistance to common bunt, common root rot and nematodes, as well as the greater use of marker-assisted selection and biotechnological tools in the programme.

Winter and Facultative Bread Wheats: Future activities will continue to build on the strengths and benefits of the tripartite IWWIP project in Turkey, with the IARC breeders (1 ICARDA, 2 CIMMYT) working together in a team with the Turkish colleagues. Emphasis will be given to widening the genetic base of the programme by accessing new winter wheat germplasm and expanding links with the spring programme. A research network for yellow rust has been established to monitor the evolution of the disease in the region and to develop host plant resistance and other management tools for its control. High priority will be given to the use of DNA markers to tag cold tolerance, resistance to yellow rust and resistance to Russian wheat aphid, and improved selection efficiency.

3.1.2.3 Assessment

The joint CIMMYT/ICARDA wheat enhancement and breeding projects have been highly successful in developing improved cultivars. These cultivars have also had a significant impact on production and farmers incomes in the region. Improved varieties cover a significant proportion of the wheat acreage in the WANA region; in the case of spring wheat the figure is about 90% of the sown area. Wheat yields in Morocco increased from 1.3 to 1.7 t/ha, in Syria from 1.9 to 2.5 t/ha, and in Egypt 4.8 to 6 t/ha, with a consequent rise in self-sufficiency from 43% to 57%. Not all these increases can be attributed to new germplasm, but high-yielding disease resistant varieties obviously provide a platform for farmers to invest in improved agronomic packages.

However, while the penetration of improved cultivars has been greater in wheat than barley, in many countries such penetration is still relatively slow. Many of the improved cultivars commonly grown are more than a decade old, suggesting that it takes new varieties an unacceptably long period to reach the bulk of farmers.

Unless this situation is changed, variety adoption will become an increasing impediment to continued development. There would appear to be a growing need for a set of “rapid impact variety deployment” protocols, along the lines of those developed for “rapid impact farming systems” protocols. The Panel suggests that ICARDA/CIMMYT seek innovative ways to get new germplasm more quickly into farmer fields, for example, by providing, in association with NARS, advanced samples to village heads and/or leading farmers.

The CCER of Cereal Germplasm Improvement and Genetic Resources, completed in February, 1997, reviewed all three components of the ICARDA/CIMMYT wheat germplasm enhancement programme. The CCER was very positive about the quality of the wheat programme, but it did not specifically evaluate the quality of science.

The Panel concurs with the views of the CCER, and further concludes that the overall scientific quality of the wheat programmes is good. The publication records of the scientists involved vary, but are competitive with other IARC’s. This group, like others, has shown a keen interest in adapting and exploiting the benefits of new biotechnologies in their programmes and this raises a number of significant challenges which are discussed in Section 3.1.5.

A significant question which can be asked with respect to the CIMMYT/ICARDA Wheat Germplasm Enhancement Programme is whether the joint programme offers any advantage over one conducted by CIMMYT alone, as part of its global mandate, or ICARDA alone, as part of its regional mandate. In considering this question, the Panel accepted that either Centre could successfully conduct some or all of the elements of the current joint programme. Nevertheless, the Panel felt that the joint programme offered more than the sum of what the individual Centres could offer due to the complementarity of (i) germplasm sources (ii) scientific knowledge and skills, especially in the biology of regionally important pests and diseases (iii) testing locations and regional networks and (iv) funding sources.

While the Panel acknowledges there have been operational difficulties in the conduct of the programme in the past, both Centres agree these have largely been resolved. However, there are still some tensions but this is to be expected in a programme dealing with the most important food crop in the region where difficult decisions have to be made on research priorities. The Panel takes the view that there would be little justification to give up the scientific and operational advantages offered by the joint CIMMYT/ICARDA wheat enhancement programme for the small and likely ephemeral management advantages offered by assigning parts of it to one or other Centre.

3.1.3 Food Legumes

3.1.3.1 Evolution

The cool season food legumes – lentil, faba bean, and kabuli chickpea – have protein rich seeds and are important in the diets of many poor people. The straw is also often used for livestock feed. In addition, as nitrogen fixing legumes, such crops can be vital components of sustainable farming systems with cereals and cash crops.

Food legume germplasm enhancement at ICARDA has a chequered history, and at various times has covered lentils, faba bean, kabuli chickpea and dry pea, or a subset of these. At the present time food legume enhancement at ICARDA has three components:

- (a) A lentil component, a global programme undertaken by ICARDA. This is a long standing programme that, according to the CCER of Projects Concerning Cool Season Legumes and Seed Production, March 1996, “has adopted a breeding and selection approach which may well serve as a model for a crop breeding programme by an international centre.” The breeding programme is highly decentralized, and was one of the first to operate in this mode, with crosses decided together with national cooperators, but made at Tel Hadya with its substantial genetic resources base. Segregating populations in early generations are made available to national cooperators. Emphasis is given to the development of cultivars with greater biomass, greater height and better standability, to allow machine harvesting, as well as resistance to biotic and abiotic stresses.
- (b) A kabuli chickpea component, conducted in cooperation with ICRISAT. Again this is a long-standing programme. However, a decentralized approach to breeding was implemented after the CCER in 1996 in the WANA region and will be implemented in South Asia in 2000. The primary focus of the programme is the development of elite germplasm which combines large seed size with *Ascochyta* blight resistance to allow winter sowings, and the substantial yield increases winter sowing offers compared to the traditional spring sowings.
- (c) A faba bean component, is a global programme undertaken by ICARDA. Following a recommendation of the Second ICARDA EPMR, the faba bean improvement programme was devolved to Morocco in 1989. Since this devolution was ineffective, it was restarted at Tel Hadya in 1997 in response to the CCER of Projects Concerning Cool Season Legumes and Seed Production in 1996, the repeated requests from NARS, and the overestimation by TAC of the capacity of the programme in China. The programme at ICARDA is concerned primarily with pre-breeding and provides biotic stress-resistant materials (populations and lines) to NARS.

3.1.3.2 Achievements

Lentil

- A total of 32 cultivars have been released by NARS in 15 countries since 1993. Rust-resistant cultivars with high yield are rapidly replacing traditional varieties in Bangladesh, Pakistan and Ethiopia.
- Molecular genetic markers for resistance to vascular wilt and radiation frost tolerance have been developed.

Kabuli Chickpea

- A total of 34 cultivars have been released in 14 countries since 1993.
- Pathogenic variability in Ascochyta blight and Fusarium wilt has been characterized in cooperation with ARI's in Europe.
- More than 150 microsatellite molecular markers have been developed to tag genes for economic traits in chickpea.

Faba beans

- A total of 16 cultivars have been released in six countries since 1993.
- Sources of resistance to chocolate spot, Orobanche, Ascochyta blight and viruses have been identified and crossed with elite germplasm nominated by NARS.

Peas

- A total of 10 cultivars have been released in five countries since 1993.

3.1.3.3 Future Directions

Lentil: This project will continue to focus on the development and delivery to NARS of production technologies, based on genetic material with appropriate combinations of increased biomass, machine harvestability and resistance to key stresses. Winter sowing technology will be extended in highland Turkey and Iran, with winter hardiness and Ascochyta resistance being the key enabling breakthroughs.

Increased emphasis will be given to marker assisted selection for winter hardiness and rust resistance. Transformation technology, now under development, will be used to assist in Orobanche and Sitona weevil resistance breeding where classical methods are ineffective.

Kabuli Chickpea: Decentralized breeding for WANA and South Asia will be further developed. Resistance to Ascochyta blight in combination with large seed size will continue to be the major thrust. Wide hybridization of chickpea with non-crossable annual wild Cicer species will be further explored to introgress desirable genes into the cultigen. Populations of recombinant inbred lines for Ascochyta blight, Fusarium wilt, cyst nematode and cold resistance are being developed to assist in the identification of useful molecular markers.

Faba Bean: This project will continue to focus on sources of resistance to the main biotic stresses and their incorporation into NARS-selected elite germplasm. Development of transformation systems will be undertaken with German and Egyptian institutes.

3.1.3.4 Assessment

In assessing the food legume germplasm enhancement programme, the Panel had for its consideration the report of the CCER of Projects Concerning Cool Season Legumes and Seed Production conducted in March, 1996. This CCER was very positive in its support of the outputs from the food and forage legume programmes as well as the quality of the underpinning science. It rated the publication records of those involved from good to excellent.

This CCER made 5 key recommendations, 3 of them related to the food legume germplasm enhancement programme, as follows:

- i. Establishment of a single well-resourced and well-coordinated Food Legume Project.
- ii. Re-establishment of the faba bean project at ICARDA.
- iii. Development of decentralized breeding programmes for both food and forage legumes.

All three recommendations were accepted by ICARDA. The first two have been fully implemented, within the available funds, the third is being implemented.

The Panel concurs with the positive sentiments of the CCER, noting that the food legume programmes at ICARDA have, like their counterparts in other crops, developed an extensive suite of improved cultivars, in collaboration with NARS partners. These cultivars have achieved significant adoption rates in a range of countries including Egypt, Ethiopia, Iraq, Lebanon, Sudan, Syria and Turkey. This achievement is based on a strong programme of strategic and applied science which is reflected in an above average publication record within ICARDA in refereed international journals.

Despite these successes, however, the WANA region has yet to see a fundamental broad-based shift towards greater use of legumes. Estimates of the ratio of cereal: legume cultivation in North Africa is 20:1, which is not considered to be sustainable in the long term. This is still due, in a large part, to unreliable legume yields because of biotic and abiotic stresses and the higher economic risks these pose for poor farmers. The Panel believes this situation will only change with further improvement in the resistance of legumes to biotic and abiotic stresses, and suggests breeding of these crops for such resistances must remain a high priority for ICARDA.

Plant diseases remain among the most important readily rectifiable constraint on legume production both regionally and globally. ICARDA scientists have made signal progress in developing resistance to some of the more devastating of these diseases, such as Ascochyta blight and Fusarium wilt in lentils and chickpeas, and chocolate spot and rust in faba bean and lentils. However, in many cases, the durability of the resistance in current cultivars is unknown, and the knowledge base in terms of the genetic structure and evolutionary capacity of the pathogens is woefully lacking. Yet, at the time of the EPMP, the Food Legume Enhancement Programme had only one fungal pathologist to cover 8 major fungal pathogens of 3 crops.

In view of a diminished expertise in fungal pathology at ICARDA, the Panel recommends that the Centre should strengthen its scientific capacity for strategic and applied research in crop pathology, and its pathology support to the Cereal and Legume Enhancement Programmes.

3.1.4 Forage Legumes

3.1.4.1 Evolution

Forage legume germplasm enhancement was until 1989-90 part of the Pasture, Forage and Livestock Programme (PFLP). Its transfer to the Legume Programme (LP) coincided with the transfer of faba bean germplasm enhancement to Morocco. The net effects of these decisions were not only the loss of an excellent faba bean programme, but the reorientation of the forage legume work away from their place in farm and animal production systems towards a more classical breeding approach. ICARDA has had to spend considerable time and effort in reinvigorating the faba bean programme and rebuilding linkages between forage legume breeding and production systems management.

This project has, nevertheless, made substantial progress with a striking range of dual-purpose and forage Vicia and Lathyrus species:

- Vicia narbonensis, V. palaestina, Lathyrus cicera, and L. sativus especially for dry areas;
- V. villosa, V. pannonica for high cold areas;
- V. sativa for general use in less cold environments;
- V. ervillia a species with cold tolerance and easy harvest ability;
- V. ochrus a potentially valuable, pea-like forage legume, for milder climates.

The broad aim of the project is to develop improved cultivars of these species which enhance mixed crop/livestock farming systems. Particular attention has been given to developing grasspea (L. sativus) genotypes low in the neurotoxin B-ODAP which causes Lathyrism, a crippling disease in humans. Grasspea is an important subsistence food in Ethiopia, the Indo-Gangetic Plain and China and may have much wider application because of its good adaptation to drought as well as waterlogging.

3.1.4.2 Achievements

- 12 cultivars released in 6 countries since 1993 (9 vetches and 3 chicklings). These have encouraged farmers to reduce cereal monoculture and/or fallow.
- Identification of germplasm of grass pea with low neurotoxin and adaptation to drought and waterlogging;
- Development of high-yielding lines of common and narbon vetch with improved nutritional characteristics.

3.1.4.3 Future Directions

Future priorities include the gradual decentralization of germplasm enhancement and greater emphasis on end-uses and nutritional aspects of grasspea for food and feed. As part of the decentralization process, more attention will be given to the development of germplasm and production techniques for high elevation areas and the CAC region, where the potential of forage legumes to replace fallow and achieve productivity gains is considerable.

3.1.4.4 Assessment

Overall this project is operating effectively and generating exciting new advanced germplasm despite the challenge of the wide range of species under consideration.

The work on grasspea *L. sativus* is innovative and exciting. As noted by the CCER of Cool Season Legumes, however, Tel Hadya is not a suitable site for selection work on this crop as a food legume because it is usually grown in rotation with rice in Bangladesh, Ethiopia, Nepal, Pakistan and India which have their own national programmes. Hence, the programme at ICARDA has taken the decision to focus on developing segregating populations with low B-ODAP content which will be transferred to the NARS for *in situ* selection. The place of *L. sativus* in farming systems in WANA as a dual purpose legume has appeal but requires verification. The Panel urges the Centre to seek this verification as a means of establishing the continuing need for further research on *L. sativus* in areas where ICARDA has a strong comparative advantage.

The *Vicia sativa* programme is world class. New high-yielding types with reduced pod shattering and resistances to some of the key biotic stresses are opening up new opportunities for this species. Since the species already has a significant place in some farming systems in the WANA, the impact of these new genotypes is likely to be more immediate than for grasspea.

The CCER of Cool Season Legumes in 1996 raised three issues. The first was the less than adequate interaction between this project and PFLP (now the Natural Resource Management Programme [NRMP]). ICARDA has responded by forming a Task Force on Forage Utilization with appropriate NRMP staff which considers all aspects of species selection, production, forage quality and animal use. The second was the large number of species under study and the need to reduce these and to focus on fewer more promising species. ICARDA has responded by significantly reducing the range of species in the programme to the most promising in each production system. The third issue related to seed production. The CCER recommended that priority be given to the production of adequate seed for promising lines for on-farm use and assessment. ICARDA has significantly increased its seed production of promising forage lines (in 1999 about 4.5 ha of seed increase plots) and supplies seed to NARS cooperators for evaluation.

With these changes, the forage legume genetic enhancement programme is now better focussed and more effectively linked to users.

3.1.5 Overall Assessment of Germplasm Enhancement Programme

The Germplasm Enhancement Programme at ICARDA is an exciting one developed by enthusiastic staff who have been proactive in adopting new approaches and technologies to meet the difficult challenges they face. In the dry and often harsh environments it targets, the component projects have been successful individually and collectively. In excess of 240 ICARDA-derived varieties of cereals, food legumes and pasture plants have been released since 1993, many with combinations of resistances to biotic and abiotic stresses. The group has published over 500 articles since 1993, of which 286 were papers in refereed international journals.

However, despite the success of ICARDA's work in a scientific sense, its impact in the field in some cases has been disappointing. The response of the Germplasm Enhancement Programme to this disappointment has been to refocus its efforts and adopt new approaches that should enhance impact. Briefly these have involved:

- i. adoption of fully decentralized breeding with elite germplasm generation in ICARDA and cultivar development in NARS;
- ii. increased use of endemic landraces and wild relatives as sources of stress resistance and adaptation, and
- iii. a greater focus on farmer participatory selection methodologies.

If successful, and the Panel recognizes this is a significant "if", the approaches pioneered at ICARDA will develop for the CGIAR a new paradigm for successful crop improvement in marginal environments.

Despite the adaptive changes that have been made to the programme, several significant questions and challenges remain and these are considered below.

Continuation of Barley Enhancement

A significant issue facing this Panel was the question of the future investment in barley research. While the barley programme has been successful in developing varieties with the NARS, they have had limited impact as far as can be judged by ICARDA's own studies. Approximately, one million ha of the more than 18 million ha of barley in developing countries are sown to ICARDA varieties. This is a penetration rate of a little more than 5%. For wheat, by contrast, CIMMYT suggests that varieties derived in whole or part from its germplasm occupy about 55 million ha and account for 80% of developing country production. While there are marked differences between the two crops in their farmer clientele, growing environments and end-uses, this difference is striking. Add to this, the failure of developing country barley yields to increase substantially over the last decade and a significant reduction in barley consumption/capita in all developing countries (from about 3.5 to 1.2 kg/capita/year on average since 1975), and it is not difficult to see why the question of further investment in barley research should arise.

Nevertheless the Panel takes the view that barley should be retained as a major focus of research in ICARDA, in part, because of its major importance as a world crop (fourth in production globally after wheat, rice and maize) for which ICARDA has a global mandate. In part, also, because of its importance as a food and feed in dry areas and as an important component of the crop-livestock system in low rainfall areas in CWANA. The Panel acknowledges that, in the short term, barley production may become even more concentrated in the drier cropping margins. The Panel was concerned about the sustainability of much of the supplemental irrigation based on ground water supplies in the WANA region. This, coupled with rapidly increasing meat production and consumption based on coarse grain feeds (Delgado *et al* 1999)¹⁰, could reverse in the downward consumption trend for barley in the medium term

Regardless of the future trends in barley consumption, the Panel takes the view that in CWANA barley is, and will remain, an important crop (and in some cases the sole crop) of a significant segment of poor farmers in marginal dry lands. Clearly, if the priorities of the CGIAR are on poverty alleviation and food security, then it is surely these farmers it is seeking to help. The Panel also took into account the fact that to date farmers in the dry marginal areas have received little direct benefit from CGIAR research as the yields of the mandate crops of all Centres have remained relatively static in the dry margins despite several decades of research. The Panel does not take the view that because the problem has so far proved intractable, research and these farmers should be abandoned. Rather the Panel was persuaded that the barley enhancement team at ICARDA had developed and was putting into practice an innovative approach to breeding for marginal environments based on decentralised selection and farmer participation. In addition to gains in grain yields, improvements in agronomic and quality traits such as improved drought tolerance, disease resistance and straw palatability, which are of great interest to poor farmers, may result from this breeding approach. If successful, and the Panel acknowledges this is a significant “if” given several decades of failure in the past across a range of crops, it would demonstrate a paradigm of global significance in breeding methodologies for dry environments.

While supporting continued investment in barley enhancement at ICARDA, the Panel accepts that the Centre has not helped its cause, or the Panel’s deliberations, by (i) failing to complete the quantitative impact studies of its barley research recommended by the 1993 EPMR and (ii) failing to initiate studies of the potential role of barley research in poverty alleviation. Both these deficiencies need to be rectified as a matter of priority (see Sections 7.3 and 7.4, respectively).

Research on Malting Barley

ICARDA in the past has not undertaken research on malting barley, restricting itself to the development of varieties for animal feed, and more recently, for human food. There seems to be little logical reason for this arbitrary restriction, as a significant amount of barley that fails to make malting quality is sold as feed. Further, malt is widely used in the food industry, although it is acknowledged that the great bulk of malt is used in beer production. The lack of focus on what is a major value-added industry for barley appears to limit ICARDA’s capacity to interact

¹⁰ Delgado, C., Rosegrant, M., Steinfeld, M., Ehui, S. and Courbois, C. (1999). Livestock to 2020: The next food revolution. IFPRI Discussion paper 28. IFPRI, Washington, D.C.

effectively with some developing countries and some advanced research institutes. It also reduces its capacity to attract private sector funding from a significant global industry.

The Panel, recommends that ICARDA should review the opportunities that may be available if it should expand its research role in malting barley in developing countries. In undertaking this review, the Panel would expect ICARDA to complete a social and economic assessment of the potential of work in this area to meet CGIAR priorities.

Implementation of new Biotechnologies in Germplasm Enhancement

ICARDA has established a good working capacity in a range of new biotechnologies. The laboratory space assigned for biotechnology has more than doubled since the last EPMR. Routine application of DNA markers for germplasm characterization and durum wheat improvement and the production of doubled haploids in cereals have already been moved into separate facilities to allow concentration on marker development and exploiting of new technologies in the main biotechnology facilities. The Panel recognizes this and commends the Centre for its initiative.

However, the Panel is also of the view that exciting progress will continue to be made in this area in the foreseeable future. In particular, new developments in molecular genetics and genomics, further improvement in DNA marker technologies and their automation, and more efficient genetic transformation systems will have the potential to enhance the scope, speed and impact of plant improvement programmes in the medium term. If ICARDA is to maintain a position of scientific leadership in the region, it will need to embrace and adapt these technologies for use with its mandate crops and to help facilitate their transfer to, and adoption by, their NARS partners. Further, the wide applicability of these DNA technologies in all aspects of biological research will ensure growing pressure for their expansion. Indeed, many ICARDA scientists have ambitious plans to incorporate DNA and other technologies in their programmes.

However, the current facilities for biotechnology, although improved, are insufficient for the anticipated 'scaling-up' associated with widespread marker use and the routine large-scale rapid generation turnover technologies (doubled haploids and single seed descent) into ICARDA's germplasm enhancement programmes, especially given the lack of first class growth rooms and glass-house facilities at Tel Hadya. To match supply with the expected demand as stated in the 2000-2002 MTP and preserve cost-effectiveness, additional upgrading, planning and coordination are required.

The Panel suggests that ICARDA seek to rectify the imbalance between its capacity and the expected demand of its scientists for biotechnology facilities and equipment as a matter of priority.

Grain Legume and Cereal Transformation

Although ICARDA is currently involved in a modest way in transgenic research in legumes, through its research collaborations with ARI's in Europe, U.S. and Australia, ICARDA has taken the decision not to proceed with transgenic work in Syria, or other countries in the region, until appropriate legislative and regulatory protocols governing the safe production, testing and release of genetically modified organisms (GMO's) are in place. The Panel strongly endorses this decision, as it ensures that work on GMO's will only be undertaken under internationally accepted safety protocols in line with CGIAR policy.

The Egyptian NARS has taken the lead in the region in developing legislation and protocols to cover the development and release of GMO's in the WANA region. The Agricultural Genetic Engineering Research Institute (AGERI) in Cairo has excellent facilities, an exciting programme of research, and strong policy support. No other developing country in the WANA region has such protocols in place or a well developed research capacity in genetic engineering. ICARDA has outsourced its genetic engineering activities to AGERI since 1999, in addition to outsourcing to ARI's outside WANA (University of Hannover, Germany; University of Naples, Italy; CLIMA, Australia) pending enactment of biosafety legislation in the host country.

However, the outsourcing of genetic transformation research from AGERI has some limitations for ICARDA. First AGERI is focussing on crops that are high priority in Egypt and/or relatively easy to engineer genetically (corn, cotton, tomato, potato, carrot and faba bean). Only one of these is a mandate crop of ICARDA. This means the other mandate crops are not covered. Barley, in particular, is not a priority crop in Egypt but is very important in other parts of the region. ICARDA has a global mandate for barley and it is currently the easiest of the winter cereals to transform, hence it should be a high priority for the Centre. Second, even if ICARDA is successful in producing, or gaining access to, exciting transformants in any of its mandate crops, the only developing country in which they can be tested or released in WANA under its current policies is Egypt.

ICARDA has responded to these limitations in two ways. First, it has developed transformation technologies with developed country ARIs and then transferred the results to AGERI for further work on priority problems. The Germplasm Programme is planning to locate in AGERI an ICARDA scientist, trained in chickpea and lentil transformation, later this year. Second, ICARDA has organized public forums in regional centres on the issues surrounding biosafety legislation. The Panel supports this approach but would urge ICARDA to put greater effort into liaison with appropriate policy makers in all collaborating countries in the WANA region, in conjunction with the recent inter-centre efforts in this direction, to encourage the broader introduction of appropriate biosafety legislation. Otherwise ICARDA's capacity to make progress in this important topic over much of its mandate area may remain severely restricted for many years.

Biotechnology in the CIMMYT/ICARDA Wheat Programmes

The CIMMYT/ICARDA wheat programmes have occasionally suffered difficulties due to friction over operational issues between the staff of the two Centres. These problems have largely been overcome in recent years by periodic re-negotiations of the formal agreements between the two centres and the personal inputs of the respective DGs.

An issue which has the potential to cause friction in the future is the incorporation of marker assisted selection and dihaploid production (or its alternatives) into the yearly breeding cycle of the joint CIMMYT/ICARDA wheat programmes. As noted above, the ICARDA barley breeders have ambitious plans to incorporate the routine use of doubled haploids and marker-assisted selection into their programmes. The CIMMYT/ICARDA wheat breeders have similar ambitions. The reason is simple. These technologies potentially offer very substantial gains in time and efficiency in breeding programmes. Further improvements in these technologies are occurring continuously.

The problem is that ICARDA's investment in this area is limited and the demand already outstrips this capacity. In the case of the wheat programme the question assumes greater importance because of the joint nature of the programme between CIMMYT and ICARDA. These biotechnologies can be relatively costly, and if widely applied are likely to impact significantly on the operational costs of the programme (compared to the cost of the breeder) and therefore to distort the relative contributions of ICARDA and CIMMYT into the programmes. Hence, this issue has the potential to cause severe friction between ICARDA and CIMMYT, if it is not faced squarely and collaboratively in the near future.

The Panel recommends that as a matter of priority ICARDA seek discussions with CIMMYT to develop mutually acceptable plans for the incorporation of doubled haploids and marker assisted selection technologies in their joint durum wheat, spring bread wheat and facultative/winter bread wheat breeding programmes.

3.2 Genetic Resources Unit

The Genetic Resources Unit (GRU) was established in 1983 with a Unit Head reporting directly to the DDG (Research). The GRU is responsible for the operation of the Genebank at ICARDA and the Seed Health Laboratory (SHL) which is active in the export and import of healthy germplasm under appropriate quarantine conditions. The GRU established both medium- and long-term seed storage facilities in 1989. A regional collaborative network (WANANET: Network on Plant Genetic Resources in the WANA Region) was developed between the NARS in WANA and ICARDA, jointly with FAO and IPGRI, in 1992 to strengthen the national genetic resources programme. Training programmes have been offered to NARS since 1990.

The GRU programme at ICARDA is far more than an exploration, collection, storage and documentation programme. From the beginning, strong emphasis has been given to characterization and evaluation and the use of germplasm resources in pre-breeding. In recent years increased attention has also been given to *in situ* and on-farm conservation in close collaboration with NARS and participatory communities.

3.2.1 Achievements

Ex-situ conservation: ICARDA's genebank holdings are now about 120,000 and 80,000 in the active and base collections, respectively. About 70% of holdings are duplicated for safety elsewhere. A major part of the ICARDA genebank collections (106,020 accessions) has been placed under the auspices of FAO.

Germplasm collection: 32 collection missions were undertaken with collaborating NARS in 15 countries since 1993. These missions yielded a total of 4,692 new accessions.

Germplasm documentation: All genetic resources activities and operations are fully computerized, and ICARDA databases are now accessible through SINGER (the System-wide Genetic Resources Programme) via the internet.

Molecular characterization of collections: A marker application laboratory has been set up and staffed by the GRU for the molecular characterization of genebank collections and natural populations, with the help of the ICARDA biotechnology group. The laboratory has the capacity to run RAPD, AFLP and microsatellite-based markers.

Germplasm distribution: A total of 191,257 seed samples was distributed from the ICARDA genebank since 1993. Demand for these valuable resources continues to grow.

In situ conservation: ICARDA provided technical input into the project proposal on "Agro-diversity conservation and management in the Near-East" which was submitted to GEF/UNDP for funding. The project, now approved, will bring US\$ 8.1 million to the region for *in situ* and on-farm conservation activities and human resources development in 1999-2002.

Collaboration with Central Asia and Caucasus (CAC) Republics: In 1996, ICARDA jointly with IPGRI and five Central Asia countries established a network on Plant Genetic Resources collaboration (CAN/PGR) which was expanded in 1999 to include three Transcaucasian republics. ICARDA through this network has facilitated further collection of germplasm, computerization of genebank operations, and training in CAC.

3.2.2 Future Directions

Germplasm collection, conservation, characterization and documentation are continuing activities. However, because of past successes the GRU is now in a position to give greater emphasis to:

- the evaluation of material and its use in pre-breeding;
- establishing better linkages with other groups which hold complementary collections. ICARDA has already established close linkages with the Vavilov Institute (VIR) in Russia. The joint activities include multiplication and safety duplication of VIR unique collections at ICARDA, characterization and evaluation of VIR germplasm by VIR scientists visiting ICARDA and the organization of joint collection missions. This programme could serve as a model for other initiatives in this area;
- development of automated DNA marker systems for germplasm characterization;
- significantly strengthen *in situ* and on-farm conservation systems through participation in the GEF/UNDP project on agrodiversity.

3.2.3 CCERs

The GRU has been reviewed on three occasions since 1993, so that it has the dubious distinction of being the most reviewed group in ICARDA. The first review, held in June 1995, was part of an external review of the CGIAR's genebank operations commissioned by the SGRP. The purpose of the review "*was to make a technical assessment of the constraints and opportunities of Centre genebank operations in scientific and financial terms. In so doing, the Panel reviewed adherence to international genebank standards and compliance with the FAO agreements*".

Overall, the report of this review was positive and concluded that in its technical operations, the ICARDA genebank was well run and adhering closely to international genebank standards. However, they did note some weaknesses and made 7 recommendations for improvements. ICARDA has responded positively to all recommendations, except the call for more staff, notably the appointment of a cereals germplasm curator to the GRU. The head of the GRU currently carries this responsibility along with his other duties.

The legume component of the GRU activities was reviewed by the CCER of Projects Concerning Cool Season Legumes and Seed Production in March 1996. This review was extremely positive, and concluded that the legume germplasm activities were "*an example of a well managed and properly implemented programme that provides a valuable and essential service*". This review made several recommendations with respect to the GRU operations. All have been accepted and implemented. The most important recommendation related to additional cold storage capacity to meet future conservation needs.

The cereal component of the GRU activities was reviewed by the CCER of Cereal Germplasm Improvement and Genetic Resources in February 1997. This review was also positive about the key role of the GRU in ICARDA and the quality of its activities. This CCER made two recommendations in relation to the GRU:

- i. that ICARDA develop a systematic multi-disciplinary, smooth planning approach to germplasm evaluation, identification of traits and pre-breeding centered on its cereal germplasm collections;
- ii. that, given the storage facilities for germplasm were nearing full capacity, planning for enlarging the facilities be initiated soon.

ICARDA responded positively to both recommendations.

3.2.4 Assessment and Future Challenges

The Genetic Resources Unit at ICARDA has been exceptionally successful. It has modern facilities that are well planned and run. It has established a unique world class collection that is not only a needed and critical global resource but is responsive to the needs of users, both internal and external. This success could not be achieved without the application of good science in an output orientated programme.

Nevertheless, the GRU faces several challenges in the future. Perhaps the most important of those is the growing conservation needs of the region. To meet these needs will require not only an expansion of the *ex situ* collections, but a growing involvement by the GRU, in partnership with IPGRI, GEF, NARS and others in developing *in situ* and on-farm conservation strategies for useful plant species within the agricultural landscapes of WANA. *In situ* and on-farm conservation of agrodiversity are, for ICARDA, relatively new fields and will require innovative approaches and the acquisition of new skills and expertise. Since the GRU has had its P and RA level staff reduced from 6 to 4 in the last five years, it will not be possible for the GRU to undertake new initiatives in this area unless it has access to additional P/RA level staff to oversee such initiatives. Otherwise, the GRU staff will not be able to make the same commitment to quality as they have in the past to their current activities and this is likely to have significant carry over effects on germplasm enhancement. Similar arguments can be made if the GRU, as has been suggested by the CCER's, is to:

- i. seek to make use of its existing collections by evaluating the variation they contain and ensuring it is incorporated into breeding programmes;
- ii. undertake more upstream research and link the biotechnology capability in the Centre and more closely to the germplasm collections.

The Panel believes that expanded activities in both these areas should only be initiated if new funds become available for additional P/RA level staff from either internal or external sources.

Given the reductions in Genetic Resource Unit staff that have occurred, the demands placed on the Unit for collection and conservation activities, and so as not to threaten its existing activities, the Panel recommends the GRU Unit make a concerted effort to seek additional P and RA level staff from either internal or external sources, if it is to undertake an expanded programme of research in in situ conservation, pre-breeding and the evaluation of collections.

CHAPTER 4 - NATURAL RESOURCE MANAGEMENT PROGRAMME (NRMP)

CGIAR Centres have been involved in elements of natural resources management research (NRMR) since the establishment of the system. In fact Centres that pre-dated the CGIAR, such as IITA and CIAT, had it in their mandates. However, there is as yet no universally accepted paradigm for NRMR that embraces the physical, biological and human dimensions of long-term sustainability. Developing such a model is of truly international importance, and ICARDA must make a contribution. The Panel believed it useful to spell out briefly some elements of the evolving CGIAR paradigm, as a basis for assessing NRMR at ICARDA; this is done in the Section 4.1. In sections 4.2 - 4.4, the individual projects in ICARDA's NRMP are reviewed under the three sub-programme groupings – Natural Resource Management, Production Systems Management, and Socio-economics, followed in Section 4.5 by an overall assessment of how the Centre is progressing in applying the evolving paradigm of NRMR in the CGIAR system.

4.1 Towards a Paradigm for NRMR in an International Centre

As part of the world-wide push to sustainability issues given by the Brundtland report in 1987, the CGIAR began to refine its approach to NRM. There has been ongoing discussion within the system.¹¹ In 1990, TAC developed the concept of an ecoregional approach to international agricultural research embracing NRMR. It is based on the fact that soil and water processes are largely managed through enterprises that farmers find attractive for their farming systems. The crop varieties and animal types, and the techniques used in their production, are the component tools for wider resource management. As components they are shaped by criteria important for the productivity of the whole farm system.¹²

Over the years the systems approach to research has evolved in the CGIAR and allows NRMR to follow a coherent, manageable approach to problem solving. Three main dimensions of the approach are:

- The agroecosystem represents a more logical level of systems hierarchy to deal with NRM problems, than that provided by a single commodity.
- Elucidation of the effects of variations in soil and water processes and their effect on crop growth is now possible with systems modelling.

¹¹ See for example: Integrated Natural Resource Management in the CGIAR – A CDC Discussion Paper; Towards defining a pro-poor Natural Resource Management Strategy in the CGIAR - Conclusions and recommendations from the CGIAR-NGOC Consultation on Natural Resources Management, Washington D.C. October 22 – 23, 1998; Izac, A-M., and P.A. Sanchez. Towards a Natural Resource Management Paradigm for International Agriculture - example of Agroforestry Research, ICRAF, Nairobi, Kenya; Sayer, J. (Chair CDC/CSE): Integrated Natural Resource Management - A Framework for the CGIAR; and, Henzell, Forthcoming report from the Technical Advisory Committee.

¹² CGIAR, TAC Secretariat, (1992). Expansion of the CGIAR System.

- Understanding of factors affecting decision making in small farm agriculture is increasing, through participatory research.

Human interaction with the resource base causing land degradation has drawn the dimensions together, resulting in three levels of NRMR:

- i. Strategic research concentrating on the effects of increasing human pressure on the soil, water, and biological processes of an ecosystem.
- ii. A combination of strategic and applied research which should identify a broad range of technical options for sustaining the natural resource base, appropriate to the generic economic and social characteristics of farming populations of the agroecosystem.
- iii. Adaptive research through station and on-farm experimentation to modify those technical options identified as appropriate to the circumstances of particular farming communities in the agroecosystem.

IARCs could contribute at all levels. However, adaptive research is clearly the responsibility of NARS, and IARCs can only be involved where NARS are weak, and then mainly in training and methodology development. As NARS become stronger, the interface with IARCs should shift to higher levels.

The resulting NRMR model is based on research at local sites since the manifestation of degradation and options for its solution are location specific. Yet there is crucial need for a full understanding of the effects of physical, animal and human systems that extend beyond a site, but influence the situation at that site.

Central to work of IARCs using this framework is the selection of appropriate sites where all three types (levels) of research can be undertaken. There is absolute need to avoid a proliferation of sites which spreads scientific capacity too thinly. Clearly sites selected must feature the problems which NRMR is designed to address and must be based on consensus among collaborating partners. One principle to apply in selection is that experiences of communities under dense population and natural resource pressure, unless distorted by a uniqueness of their location, are relevant in an ever-widening number of communities. Extremes, as long as they are not atypical, have a clear tale to tell.¹³ Fundamental are agroecological characterisation and preparation of farming systems typologies that include the poverty element, in order to address the new focus of the CGIAR.

Two principal sets of products are sought from IARC research at each site. First is improved strategic understanding of biophysical processes of the resource base and the interactions with plants and animals. At a given site this understanding will be gained in the context of a selected, location specific production system. The socio-economic dimension of the research will provide an understanding of how human decisions, at farm, community and policy levels impact those biophysical processes and the interactions with crops and livestock. This understanding will necessarily be specific to the culture and policy environment of the site. The second

¹³ CGIAR, TAC (1993). The ecoregional approach to research in the CGIAR. Report of the TAC/Centre Directors Working Group.

set of products will be the methodology for understanding both the biophysical processes, including the indicators identified at different scales, and the human decision making at different scales.

4.1.1 Evolution of NRMR at ICARDA

ICARDA has dealt with aspects of natural resource management since it was founded, and is responding to the evolution of the NRMR paradigm within the CGIAR. It responded positively to the recommendations in TAC's 1995 report on *Priorities and Strategies for Soil and Water Aspects of Natural Resource Management Research in the CGIAR*, which called for the strengthening and expansion of NRMR, by concentrating all relevant activities under a Integrated Natural Resource Management Programme. This was achieved by merging the former Farm Resource Management Programme (FRMP) and the Pasture, Forage and Livestock Programme (PFLP) in July 1997 to create the Natural Resource Management Programme. A Programme Leader was appointed in April 1998.

ICARDA believes that its basic challenge is to achieve productivity increases in rainfed areas and irrigated systems within its mandate region at the same time as poverty alleviation and protection of the environment, while focusing on resource-poor farmers, especially smallholders in marginal conditions. The Centre is therefore mainly concerned with agroecosystems and not with natural ecosystems or with landscape ecology of dry areas.

ICARDA is in the process of incorporating natural resource management aspects into its research programmes and projects. Its goals in integrated natural resource management are to:

- promote greater efficiency, integration and sustainability of production;
- enhance resource quality and quantity; and
- display transparent contributions to poverty alleviation and better food security.

The focus of future strategic research at ICARDA should include drawing generic lessons from its many applied research projects conducted with NARS in the past. This is both a unique advantage and a source of difficulties. Success requires the formulation of rigorous hypotheses, systematic data collection and documentation, and the use of research methods that will subsequently allow comparative analysis for which use of relevant theories and methodologies are essential. Success also requires that the headquarters research programme, country research, institutional strengthening activities, and introduction of improved land and water management practices are integrated into a coherent overall programme.

Water is seen by ICARDA as the central issue in its region, and is therefore accorded highest priority in NRMR. However, use of soil and vegetation, are closely linked to water; and all are subject to climate. Each forms the basis of a project of the core NRM group: water (capture, conservation and efficient utilisation); land and soil (their protection and management for efficient utilisation); and vegetation (conservation and biodiversity). Climatic parameters, along with the spatial

distribution of the other natural resources and the systems utilising them, are studied in an overarching, integrated fashion in agro-ecological characterisation (ICARDA MTP 1998 - 2000). The production systems management group, which draws together the components of research with a farming system perspective, focuses on the enhancement and sustainability of the most relevant production systems in the CWANA region.

A Water Interest Group, an Integrated Feed Livestock Group, and a Socio-economics Interest Group have been formed to enhance co-operation in NRMR. Also, “unified research sites” are being identified that (i) exemplify natural resource management problems, (ii) are relevant to the local population, (iii) benefit from ICARDA's comparative advantages and (iv) have potential for impact. Research work has started at sites in Syria, Egypt and Central Asia. Other potential sites are being considered.

4.2 Natural Resource Management

4.2.1 Evolution

ICARDA's research on natural resource management aims to promote more efficient, integrated and sustainable utilisation of resources for improved production, productivity and poverty alleviation. In agreement with the MTP 1998 – 2000, the following four projects come under the theme, Natural Resource Management:

- 3.1 Water resources conservation and management
- 3.2 Land management and soil conservation
- 3.3 Biodiversity collection and conservation
- 3.4 Agro-ecological characterisation.

At present, Project 3.3 is located within the *Crop Germplasm Enhancement Programme*, and is reviewed in Chapter 3, while Projects 3.1, 3.2 and 3.4 are located in the *Natural Resource Management Programme*, and are dealt with in this section.

Projects 3.1, 3.2 and 3.4 have a long history within ICARDA. Until the establishment of the *Natural Resource Management Programme*, these projects were located in the former *Farm Resource Management Programme*. Projects 3.1 and 3.2 evolved out of a project on *Resource Conservation Management* and Project 3.4 was formerly a project called *Agro-ecological Characterisation*.

4.2.2 Agro-ecological Characterisation (Project 3.4)

4.2.2.1 Current Focus

Agro-ecological research aims to assist NARS with characterisation of their diverse agro-ecologies and associated land use systems. Assistance includes actual studies, new methodologies, and technology transfer through training and joint projects. Major activities are: creation and compilation of environmental databases and information systems; research on spatial distribution and generation of climatic data; developing crop simulation models; applying GIS and remote sensing

techniques for agro-ecological characterisation; training; and operating and maintaining a network of meteorological stations in Syria and Lebanon.

4.2.2.2 Achievements

During the period 1993 – 1999 the Project:

- created and compiled an environmental database, particularly climatic data;
- linked spatial weather generators to crop models and soil data, allowing the assessment of site-specific potentials and constraints due to climatic and soil conditions;
- developed new capabilities in using GIS and remote sensing techniques for agro-ecological characterisation and linked these tools with weather generators, simulation modelling, and informal information systems at farmer and community level.

4.2.2.3 Future Strategies and Plans

The long-term objectives of this project are the establishment of digital databases of spatial and temporal information on climate, land resources, land cover, crop requirements and genetic characteristics, linked to databases describing the socio-economic environments. The Project aims to develop knowledge systems based on modelling of the interactions between environments, crops or production systems and land management, linked to GIS and attribute databases.

The role of ICARDA's agro-ecological research is to assist NARS. Such assistance constitutes international public goods, including new methodologies, technologies, and technology transfer through training and joint projects. The objectives of characterisation research are to allow geo-referenced interpretations about types and severity of abiotic stresses, types and severity of land degradation, suitability for specified production systems, and recommendations for land management. Agro-ecological characterisation is intended to provide essential frameworks for the extrapolation of site specific research. As ICARDA will target breeding and land management packages to more specific environments, there is an increasing need for agro-ecological characterisation methodologies and techniques.

4.2.2.4 Assessment and Future Challenges

The 1995 CCER suggested: (i) focus project resources on describing and characterising homogeneous eco-regions within the region; (ii) ICARDA scientists should rely on models already developed and utilise their time and expertise in evaluating and adapting them to the region; (iii) little, if any, development of models at ICARDA; (iv) work on impact of climate change on agriculture should be limited, if at all; (v) a stronger justification and more systematic approach of risk analysis; and (vi) ICARDA should develop as soon as possible a map and supporting documentation delineating homogeneous eco-regions for the WANA region, and this should take priority over all other activities in the project.

ICARDA responded positively to the recommendations. A senior agro-ecologist was appointed in 1996, and the Agro-ecological Characterisation project was reformulated for the MTP 1998-2000. Different mega-environments have been identified by ICARDA's crop improvement projects. A map and supporting documentation delineating homogeneous eco-regions for the WANA region are in the final stage of preparation and should soon be released.

The project has made a noticeable contribution towards the creation and compilation of environmental databases at ICARDA, particularly climatic data. Also it has undertaken innovative research for spatial characterisation of climatic variables, which should be of particular importance for data-sparse areas, such as CWANA. The project has succeeded in linking spatial weather generators to crop models and soil data, allowing assessment of site-specific potentialities and constraints due to climatic and soil conditions. It has also developed a robust vision on how to link sophisticated information technology - such as remote sensing, GIS, weather generators and simulation modelling - with informal information systems at farmer and community level, and is well equipped to undertake multi-scale studies. The Panel gained the impression some ICARDA projects and only a limited number of stakeholders are fully aware of the contribution agro-ecological characterisation could make to their research and development efforts. In that regard, the Panel suggests the project should be more aggressive in communicating its potential contribution, and be aware of its potential to expand its collaboration, including service, for other projects.

The Panel believes ICARDA's research needs an operation framework that is based on identified typologies that allow stratification and a more focused analysis. Agro-ecological characterisation can help provide tools and methods for such work.

4.2.3 Water Resources Conservation and Management (Project 3.1)

4.2.3.1 Current Focus

ICARDA's water resource conservation and management group focuses on the capture of water, sustainable use of renewable resources and improving water-use-efficiency at farm level. Major activities are supplemental irrigation, water harvesting, on-farm-water-use efficiency, non-conventional water resources, sustainable utilisation of renewable groundwater in agriculture, and capacity building of NARS. Recently the subject of using unconventional water resources (saline and treated sewage effluent) was added to project activities.

4.2.3.2 Achievements

During the period 1993 – 1999 this project:

- developed optimal on-farm strategies for supplemental irrigation under various conditions of dry areas. Proven technologies have been put in a process of transfer to farmers, by which a great impact on wheat production in Syria was achieved. Options for optimising WUE in supplemental irrigation were developed;

- within the eco-regional initiative "*On-farm Water Husbandry in WANA*" developed packages for optimising the use of water and a methodology for proper selection of water harvesting sites and methods in co-operation with NARS and ARIs. Awareness has been enhanced of the potential of water harvesting in improving agricultural production and combating desertification.

4.2.3.3 Future Strategies and Plans

The Project's long-term objective is: Water resources in the dry areas that are potentially available for agriculture are efficiently and sustainably utilised in agricultural production.

Efforts to develop methodologies for the efficient capture, storage and utilisation of rainfall (water harvesting) will continue, as will improved strategies and practices for using limited water resources with rainfall through supplemental irrigation. Improved strategies, practices and inputs will be developed to improve on-farm water use efficiency, particularly in irrigated areas. Research will be extended to develop strategies, methods and techniques for the safe, sustainable, long-term use of marginal water, and for the conservation and sustainable utilisation of renewable groundwater resources.

4.2.3.4 Assessment and Future Challenges

With regards to the former *Resource Conservation Management Project*, the 1995 CCER identified the danger that supplemental irrigation would become the main focus of the project, and expressed concern at the lack of a specific definition of water harvesting. The CCER panel supported limited work in supplemental irrigation, with preference for water harvesting, and recommended expanding supplemental irrigation studies to other countries as a means of increasing water use efficiency. Further, the CCER Panel suggested that ICARDA's role should be restricted to water use efficiency as it relates to the soil-water-plant complex, and not become involved with determining the extent of groundwater in various aquifers or the rate of recharge or withdrawal. It also suggested that ICARDA should (i) carry out exploratory research on the intercropping of fruit and nut trees with wheat as a means to increase total water use efficiency; (ii) investigate the use of marginal waters and saline land for the production of forage, fodder and wood; (iii) focus on water harvesting, where runoff is held in close proximity to where it occurs, is stored in the soil, and used by plants growing there; (iv) design long-term research programmes for research co-operation with NARS in water harvesting; (v) research programmes with NARS should include the assessment of zonal suitability of the various techniques of runoff farming; and finally (vi) investigate the use of marginal waters and salt-tolerant plant species in viable production systems.

ICARDA accepted some, but not all, of the CCER recommendations. Research in water harvesting and supplemental irrigation continued, concentrating on questions of water use efficiency. A senior marginal-water-management specialist was recruited in 1998. ICARDA established linkages with nine countries through the Eco-regional Programme, *On-farm Water Husbandry in WANA*, and initiated co-operative research on water harvesting systems. The work in groundwater hydrology

is supporting ICARDA's land and water management projects, especially in research on management issues of small watersheds.

Under the water scarce conditions of the CWANA region and other dry areas of the world, it is foreseeable that in future there will be less and less water available for agriculture. The upcoming questions are (i) how can agriculture deal with a decreasing availability of water; (ii) what are the consequences of a restricted water supply for food security, alleviation of rural poverty and the sustainability of ecosystems; and (iii) what production strategies may be less vulnerable to uncertain supply? The possibilities to solve these problems by increasing the efficiency of water use in irrigation are limited - and in most cases - capital intensive. ICARDA research in supplemental irrigation has shown ways and means to achieve high water use efficiency at field level as well as ways to increase productivity. In appropriate situations NARS can use the methodologies developed, and build on ICARDA's research results and advice, to carry out adaptive or applied research to answer upcoming, mostly site-specific questions. ICARDA should devote its future efforts in water resources management to strategic issues.

Inevitably, there will be new water allocation between sectors and within the agricultural sector, at watershed, community, and farm levels. Present allocations will change because the area presently under irrigation in water-scarce areas around the world is likely to decrease, and some irrigated lands will be returned to rainfed agriculture or go out of production. Strategies are needed not only for managing the upcoming reallocation of water resources, but also for land use changes and their effects on farm income, rural livelihoods and agro-ecosystems. Methodologies are needed to identify 'hot spots' in CWANA where such changes in water and land use will most probably appear and to monitor the respective developments. One or more case studies of selected sites where farmers have had to adjust to a major decrease in water availability would be very useful, and stakeholders should be enabled to react in a timely way. Criteria based on sound research results are needed for the reallocation of water resources within the agricultural portions of a watershed. There is also a need for strategies at farm level to cope with the implications of reallocated water resources.

The issue of water quality is recognised by ICARDA. Believing water quality is important, the Panel sees two areas of primary importance: (i) the quality of water used in agriculture, which should not cause crop damage and affect agricultural yields and (ii) sustainable agricultural activities which should not adversely affect the quality of surface and groundwater such that their subsequent use for other purposes must be curtailed.

The use of marginal and sewage water in agriculture is of local importance within CWANA. With its partners, ICARDA should investigate the spatial dimension and long-term contribution that marginal water resources can make to overall agricultural production in CWANA.

In supplemental irrigation, as well as in water harvesting, important sets of strategic problems are the off-site effects of water management technologies, including the methodological problems to assess the effects.

In view of the critical nature of water scarcity in the CWANA region, the Panel recommends that ICARDA place more emphasis on strategic issues of water resource use, allocation and management at rural community level, and that it join in strategic partnerships to carry out this work.

4.2.4 Land Management and Soil Conservation (Project 3.2)

4.2.4.1 Current Focus

The project's long term objective is to develop a rational framework for increased awareness on land degradation and to develop land-management options for sustainable use of drylands, based on the appraisal of land management and soil conservation issues in CWANA.

This project focuses on on-site research in development and adoption of land conservation technologies to prevent and reduce the degradation of productive drylands. Its major activities are: wind erosion and land degradation; baseline studies at the NRMP "unified research site" in Syria; farmer-participatory trials in degraded steppelands; and erosion hazard assessment methodology.

An interesting aspect of the research focus of this project is the assessment of land value, related to land degradation, in a Syrian village, with the aim to see if and how farmers' assessment of 'land value' differs from that of scientists.

4.2.4.2 Achievements

During the period 1993 – 1999 the project:

- developed a framework proposal with NARS, ARIs, UNEP, ICRISAT and WMO with the aim to develop collaborative and inter-institutional research activities on wind erosion and land degradation in CWANA;
- identified, selected and carried out baseline studies at ICARDA's unified research site in the Khanasser valley, Syria;
- set-up farmer-participatory trials in degraded steep land on four sites in northern Syria. Several simple measures to enhance soil fertility and soil moisture regimes are being tested by farmers, and an approach was designed for participatory land valuation to understand farmer's land management decision-making;
- with the intention to improve erosion hazard methodology, a spatial database was compiled on agricultural and biophysical data relevant to land degradation.

4.2.4.3 Future Strategies and Plans

The project will continue to develop methodologies to assess land degradation hazards, preferably on a generic level, and will further develop its stakeholder-based (participatory) research strategies to prevent and combat land degradation. Also, it will develop options for improved and sustainable land use, preferably on a generic level.

4.2.4.4 Assessment and Future Challenges

The 1995 CCER concluded that the objective of the soil conservation component of Project 2 - *Resource Conservation and Management* – was not being met and commented that no information was presented on the geographical extent and severity of erosion. The CCER recommended: (i) immediately fill a core position with a soil conservationist to initiate and co-ordinate a regional project to halt, and possibly reverse, land degradation; and (ii) initiate additional work on land degradation assessment and evaluation of arid rangelands degradation using remote sensing and GIS techniques in conjunction with field studies and ground truth.

In response to the CCER, in 1996 a senior soil conservation and land management scientist was recruited, and the Land Management and Soil Conservation Project was implemented. Linkages were established with the most important institutions dealing with soil conservation in CWANA and beyond. In 1997, *an International Expert Meeting on Wind Erosion in Africa and West Asia* was held in collaboration with ICRISAT, WMO and UNEP, with the intention to develop a framework for wind erosion research. A draft land cover/land use map of Syria has been developed from satellite images with significant ground truth information. A spatial database for Syria on agricultural and other biophysical data relevant to land degradation has been compiled, and ten thematic digital maps have been produced. Currently, arid rangelands degradation assessments incorporating GIS techniques are being pursued in sites in Morocco, Egypt, Syria, and Uzbekistan.

The research approach is strongly solution-oriented, focuses on technology improvements that are directly beneficial to land users, and the research is people-centred. At off-station research sites, participatory approaches are used that involve all stakeholders - farmers, researchers of different disciplines, extension specialists, and other people and institutions. The Panel endorses the multidisciplinary, participatory research approach, developing strategies to prevent and combat land degradation, and developing options for improved and sustainable land use on a generic level. The Panel suggests that the socio-economic component of the project be strengthened.

4.3 Production Systems Management

4.3.1 Evolution

ICARDA's sub-programme on *Production Systems Management* draws together a number of components of research using a farming systems perspective. This approach provides the means to evaluate the findings of site-specific research and to translate them into recommendations that can be applied to other farming

systems. ICARDA believes that its accumulated experience and methodological expertise are particularly important for long-term research on optimising cropping sequences and developing appropriate ways to intensify production.

In accordance with the MTP 1998 – 2000, the following 5 projects are carried out under the theme, Production System Management:

- 2.1 Integrated Pest Management
- 2.2 Agronomic Management of Cropping Systems
- 2.3 Sown Pasture and Forage Production
- 2.4 Native Pasture and Range Improvement
- 2.5 Small Ruminant Production

Project 2.1 is carried out under the *Crop Germplasm Enhancement Programme*; while projects 2.2, 2.3, 2.4 and 2.5 are located within the *Natural Resource Management Programme*.

These five projects have a long history within ICARDA. Until the establishment of the *Natural Resource Management Programme* these projects came under the former *Cereal Programme* (2.1), the *Farm Resource Management Programme* (2.2) and the *Pasture, Forage and Livestock Programme* (2.3, 2.4, 2.5). Until they were integrated into the new *Natural Resource Management Programme*, the projects - with the exception of the farming system studies – worked predominantly on a disciplinary basis with a reductionist approach. Despite existing linkages to other ICARDA projects, the projects under consideration were asked to work more on a multidisciplinary basis using holistic approaches when they became part of the *Natural Resource Management Programme*. This approach is seen as being essential in natural resource management.

4.3.2 Integrated Pest Management (Project 2.1)

4.3.2.1 Current focus

In its early days ICARDA placed strong emphasis on genetic resistance to pests and diseases as the only worthwhile strategy for crop protection, and used chemical pesticides as an alternative, where host-plant resistance proved hard to achieve. This original approach has been broadened especially during the last five years. During this time there has been a growing emphasis at ICARDA on Integrated Pest Management (IPM), within the framework of natural resource management, for more sustainable development. The *Integrated Pest Management (IPM) in Cereal and Legume-based Cropping Systems in Dry Areas* Project deals with these aspects. The focus of ICARDA's IPM research is the development of strategies suitable for different agro-ecological zones and cropping systems in the Centre's mandate region.

4.3.2.2 Achievements

During the period 1993 – 1999 this project:

- developed disease control components from which integrated disease management packages have been assembled for the major cereal and

legume diseases. They were tested in on-station trials in different agro-ecological zones of WANA in collaboration with NARS;

- screened food and forage legume germplasm and breeding material from which cultivars have been identified with good levels of resistance to virulent pathotypes of *Ascochyta* blight, different races of wilt pathogens, rusts, chocolate spot and to a number of viral pathogens, and shared with NARS;
- identified sources of disease resistance in wheat and barley among cultivated and wild relatives. Breeders in germplasm development are using the material. Furthermore, germplasm pools for disease resistance to major cereal diseases were developed and dispatched to NARS. Pathotype identification of major cereal foliar diseases was carried out, and virulence shifts for some diseases across the WANA region were monitored;
- produced and made available diagnostic kits for the detection of 14 legume viruses and 3 cereal viruses to NARS partners;
- identified several sources of resistance to Hessian fly, Russian wheat aphid, wheat stem sawfly in cereals and to leafminer in chickpea. These have been incorporated into adapted germplasm and NARS collaborators have released some wheat varieties resistant to Hessian fly.

4.3.2.3 Future Strategies and Plans

The project intends to continue its work in developing IPM packages for different cropping systems and agro-ecological zones of WANA comprising (i) host resistance, (ii) crop rotation and other agronomic practices, (iii) chemicals, (iv) biological agents, and (v) healthy seed. The project focus will continue to shift from pest control in individual crops to pest management in farming systems.

4.3.2.4 Assessment and Future Challenges

Pests and diseases remain a serious constraint to crop production in the CWANA region, and many of these problems cannot be solved purely by genetic means. Hence the Panel commends the shift in this area from factor oriented reductionist research to a more farming systems approach, and the attempts to integrate this research with other aspects of production systems management. Training of NARS staff will remain a priority for the project, which the Panel applauds, as will an increase in the number of NARS scientists collaborating with ICARDA staff in developing and testing IPM packages in their respective countries.

Most of the current and planned research undertaken in this project remains focused on components of IPM, with the greatest emphasis on genetic components. Limited progress has yet been made in the integration aspects of IPM in ICARDA. Staffing levels and changes have constrained progress significantly. The project was reviewed by the CCER on Cereal Germplasm Improvement, Genetic Resources, and Integrated Management of Pests and Diseases of Cereals & Legumes in February, 1997. At that time, the project was being managed by a cereal pathologist, supported by a post-

doctoral fellow, a legume pathologist supported by a post-doctoral fellow, a cereal and legume virologist and an entomologist with one technician. The CCER then concluded that the Programme appeared to be understaffed. Since then both post-doctoral positions and the legume pathologist have left. The project is now managed by the virologist (5 months/year) with part-time inputs (6 months/year) from the entomologist and cereal pathologist.

In light of the above situation, and because the recruitment of additional staff did not appear to be an option, ICARDA has tried to solve this problem, partly by being creative in attracting graduate students on IPM from local Universities, and partly by writing proposals for special funding. ICARDA has been successful in this to some degree and will continue in this way to attempt to correct the under-staffing problem. However, while it is to be commended for these measures, the recruitment of students or short-time postdoctoral staff is unlikely to provide the leadership needed to overcome the deficiencies in developing effective integrated packages that are so evident currently. In view of sharp reductions in staff resources in IPM, the Panel suggests either: (i) that ICARDA restore the staffing to the required critical mass from internal or external sources to ensure it can meet its stated outcomes and objectives in the MTP, or (ii) it close the project and reassign the remaining staff to other priority areas.

4.3.3 Agronomic Management of Cropping Systems (Project 2.2)

4.3.3.1 Current focus

The project *Agronomic Management of Cropping Systems for Sustainable Production in Dry Areas* is based on the philosophy that there is a continuous need to develop new soil and crop management practices, and to integrate available knowledge, for transfer to farmers, and to keep pace with the growing demands for food and feed, but without harming natural resources. The focus is on the development of efficient, locally adapted, arable systems for field crops.

4.3.3.2 Achievements

During the period 1993 – 1999 the achievements of this project included:

- improved strategies for the maintenance of phosphate availability;
- a description of the dynamics of soil and crop nitrogen through ¹⁵N studies;
- a determination of the effects of cropping sequences and nitrogen and stubble management on soil organic matter and soil aggregate stability as sustainability indicators;
- assessment and comparison of reduced tillage with conventional deep tillage practices on fuel use efficiency and sustainability of cropping systems;

- establishment of long-term crop sequences, management trials and long-term monitoring systems in co-operation with the NARS in Egypt for input-use efficiency, sustainable production systems, and conservation of natural resources.

4.3.3.3 Future Strategy and Plans

The long-term objectives of this project are: efficient, locally-adapted, arable systems for the biophysically and economically sustainable production of field crops – appropriately integrated and in balance with local tree-crop or animal production systems – to make efficient and conservative use of natural resources and externally-derived inputs. In addition to longer-term agronomic research, the project intends to validate cropping systems simulation models, to assess potential spatial extrapolation and generalisation of limited agronomic trial results through the use of GIS.

4.3.3.4 Assessment and Future Challenges

The research mostly follows a traditional agronomic approach, and seeks, adapts or tests technologies that will increase crop yield, optimise use of soil moisture and sustain soil productivity. As in the past, the work covers a wide range of agronomic questions, despite limited financial resources and available manpower. As a result, problems and gaps were identified by the 1995 CCER, in the management of the long-term wheat-based study at Tel Hadya and the barley-based experiment at Breda. In both cases, only a very limited number of soil analyses had been made, and no baseline data were taken when the experiments first started. This was corrected following the CCER, and both trials were intensively sampled for chemical and physical analysis to monitor the long-term changes resulting from different rotations.

ICARDA staff are aware that productivity is only one measure of system performance. The integration of the project into ICARDA's Natural Resource Management Programme should change the project's approach beyond the field-crop ecosystem to encompass at least the whole farm and its interactions. The project continues to develop new approaches. With their involvement in designing and backstopping long-term farming systems research of NARS in CWANA, the project is adjusting its research approach within the new perspective,

Anticipatory Long-Term Research (ALTR) (see Box 4.3.3.4 overleaf). The latter puts a stronger time dimension and dynamism into traditional agronomy, enhances ties to socio-economic and resource management disciplines, and links current priorities for increased productivity with strategic long-term issues concerning the production sustainability and the natural resource base. The Panel endorses this innovation and commends ICARDA for this change in emphasis and direction.

**Box – 4.3.3.4 - Anticipatory Long-Term Research (ALTR):
a new concept of agronomic research**

To secure a sustainable agricultural development there is urgent need to identify underlying long-term threats to agro-ecosystems and their resource base, which - left unrecognised or unchecked - could later trigger urgent productivity crises. Therefore, it is essential that modern agronomic research should be strategic, anticipating change. The need then, is not for less long-term research, but for new, more efficient designs that include objectives and potential outputs useful at farm level. Such research should include time-scales and sufficient built-in flexibility to accommodate change.

The above thinking leads to a new concept to plan and conduct research that supports agricultural production systems in a rapidly changing world. The new concept, Anticipatory Long-Term Research (ALTR), puts a stronger time dimension and dynamism into traditional agronomy, and links current priorities to increase productivity with strategic issues concerning the sustainability of production and the natural resource base. An essential feature in the choice of research issues is anticipation of - and precaution against - biotic or abiotic problems that may arise from an increasing intensity of production and resource use and rapid agricultural development. Major deliverables will include technical interventions and policy options to avoid, and solve, future problems of decreases in production and/or degradation of the resource-base.

The concept incorporates such ongoing research approaches as long-term trials but is altogether a broader concept, based on prior environmental characterisation and encompassing a wider range of objectives and methodologies. Early problem identification will be essential, including an ability to respond to early warning signals. Research venues will range from research-station trials and farm plots to full catchments and landscapes, with appropriate linkage between them. At larger scales, one may envisage data coming from an array of georeferenced sites, backed by appropriate remotely-sensed databases, agro-ecological characterisation and GIS systems. Particularly at larger scales, ALTR will often be closely linked to rural development or resource conservation activities. Research-development liaisons on long-term effects, particularly follow-up and monitoring of earlier development projects, could be an important mode of ALTR activity.

At all scales, the design of new ALTR should build in relevance to evolving farming systems and the socio-economic and policy climates within which they are embedded, and seek to combine:

- a focus on technologies for immediate transfer, along with,
- anticipation of future problems in the light of what farmers actually do or could do.

This concept has been initiated as an early example of long-term research in Egypt, in a collaborative effort between ICARDA and a group of national research institutions. On-farm monitoring is an important part of this concept to see how dynamic farming systems evolve, causing positive or negative changes in natural resources.

Source: Jones, M.J. (ed.), 1998: The Challenge of Production System Sustainability. Long-Term Studies in Agronomic Research in Dry Areas.- International Centre for Agricultural Research in the Dry Areas (ICARDA), Aleppo/Syria.

4.3.4 Sown Pasture and Forage Production (Project 2.3)

4.3.4.1 Current Focus

The project *Improvement of Sown Pasture and Forage Production for Livestock Feed in Dry Areas* helps to solve serious problems caused by replacement of cereal/fallow rotations with continuous cereal cultivation. It seeks alternative crop rotations to maintain adequate levels of cereal crop health and grain yields, while at the same time meeting the feed requirements of livestock. The emphasis over the last five years has been on the extension and transfer of information on rotations involving forage legumes.

4.3.4.2 Achievements

During the period 1993 – 1999 this project:

- assembled evidence to support the adoption of forage and pasture technologies. It was demonstrated that vetch is well adapted to the farming systems in Northwest Syria. The number of farmers growing vetch in the vicinity of the on-farm research area increased remarkably;
- initiated a project in co-operation with NARS in Turkey to rehabilitate degraded rangelands. With the acceptance of the pastoral community, rehabilitation techniques were successfully applied on rangelands, and feed resources were improved by introducing Hungarian vetch Vicia ervillia;
- developed and tested simple and low cost harvesting machines. The availability of rollers and mowers in Northwest Syria added to farmers' enthusiasm about vetch. Three manuals for seed production were developed and distributed to NARS.

4.3.4.3 Future Strategy and Plans

The project's long-term objective is to develop options to overcome serious problems associated with inadequate feed supply, declining soil fertility, and reduced cropping diversification in the semiarid and arid zones of CWANA. One option is the increased use of pasture and forage species - with special emphasis on forage and pasture legumes - in rotation with cereals and improved use of permanent pasture. The project will continue to identify species and select adapted cultivars of annual pasture and forage legumes, and develop forage and pasture seed production technologies for small farmers. The project will demonstrate through on-farm trials, the high and sustainable system productivity of barley in rotation with pasture or forage legumes, compared to continuous barley cropping or barley in rotation with other legumes, clean fallow, weedy fallow, or other relevant crops.

4.3.4.4 Assessment and Future Challenges

This project mostly follows a traditional, disciplinary approach to research. In response to the 1994 CCER, work on medic/wheat (ley farming) systems has decreased considerably, and more emphasis is being given to vetch as a replacement for fallow and cereal monoculture. Small-seeded legumes are also being used to improve the productivity of degraded rangelands in Syria and Lebanon.

Also, as the 1994 CCER recommended, efforts to promote forage legumes have been strengthened. Increasingly more attention is paid to working directly with farmers through partnerships with NARS. Also, farm surveys were carried out in which primary data were collected, and economic analysis to look into the profitability of forage legume production was included. In the process the project began to overcome its former disciplinary and factor oriented research approaches. There are very strong linkages to other relevant projects (2.2; 2.4; 2.5; 4.2). A significant shortcoming is that the project relies on short-term profitability and productivity, which are only some of the measurements of system performance for agro-ecosystems, especially in the context of integrated natural resource management. This needs to be changed and the type and level of inputs required, the environmental on-site/off-site effects, and the long-term sustainability should be taken into account.

4.3.5 Native Pasture and Range Improvement (Project 2.4)

4.3.5.1 Current Focus

As the demand for food and grain in ICARDA's mandate region is expanding, and as the drought tolerance of cereals is improved by breeding, increasingly more of the best rangelands are used for cultivation of cereals. The net result is that the pastoral communities and their flocks are pushed into poorer and poorer rangelands, which together with the increasing livestock population, heightens natural resource degradation. The project *Rehabilitation and Improved Management of Native Pasture and Rangelands in Dry Areas* attempts to meet the needs of NARS by assisting in describing and monitoring range resources so as to manage better what is left and possibly rehabilitate the degraded zones.

4.3.5.2 Achievements

During the period 1993 – 1999 this project:

- observed on marginal lands of the WANA region the positive effects of phosphate fertilisation. The technique is being transferred to common grazing land of Northwest Syria;
- completed a survey and mapping of vegetation and land use of the Aleppo-Hama steppe, leading to the identification of degraded areas to be restored on priority, in collaboration with local authorities and pastoral communities;

- obtained, over three seasons, an indication of the potential seasonal range stocking rate by measuring monthly biomass and soil water budgets of six major range vegetation types on Syrian and Balochistan rangelands;
- completed the conception, development and testing of two low-cost and low-input range seeding machines for range rehabilitation operations;
- identified for different range environments (Egypt, Syria, Uzbekistan) valuable range of plant material for fodder reserves and fuel wood; identified and successfully used native range species for range improvement in Syria.

4.3.5.3 Future Strategy and Plans

The project's long-term objective is the sustainable management of feed resource productivity of rangelands by farmers and pastoralists within the semi-arid and arid zones of CWANA. To achieve this, the project intends to develop management plans and test them at regional sites, and low cost techniques to rehabilitate rangelands and marginal land. It will also continue an inventory of useful native and exotic plants, and will formulate measures to introduce fodder shrubs into rangelands settings, based on assessment of success and failure in past projects.

4.3.5.4 Assessment and Future Challenges

The 1994 CCER encouraged ICARDA to strengthen its programme in fodder shrubs and trees, particularly with regard to germplasm collection and evaluation. Under the System-wide Livestock Programme, ICARDA has a project with eleven NARS on *Production and Utilisation of Multi-purpose Fodder Shrubs and Trees in West Asia, North Africa, and the Sahel*, which became operational in 1996. In 1997, a major international workshop in Tunis on the use of fodder shrubs was organised by ICARDA. ICARDA has joined with INIA in Spain to collect and evaluate fodder shrub germplasm.

The 1994 CCER recommended new experimental sites be selected for stocking rate P fertiliser trials. Because of its management policy in respect to long-term trials, ICARDA did not accept this recommendation, but will reconsider at the request of NARS partners, using appropriate site characterisation and selection of techniques. The Panel agrees with the Centre.

In response to the CCER recommendation to extend its work into the cold dry rangelands of West and Central Asia, ICARDA has been active in Central Asia since 1997.

Given the degraded conditions of some of the rangelands in the region and their effects on poverty, improving rangeland feed supplies and rangeland rehabilitation are obvious research priorities. ICARDA has attempted to meet these priorities by designing and developing rehabilitation techniques and technologies, and by selection of suitable species. However, the Panel suggests that simultaneous efforts should be made to develop and test, on a participatory basis, practical management and efficient utilisation methods for rangelands that presently are

considered in fair or good condition, so they can be maintained and even improved by controlled utilisation. A strong linkage with Project 4.1. *Socio-economics of Natural Resources Management in Dry Areas* will be essential, as will be the linkage with Project 3.2 *Land Management and Soil Conservation to Sustain Agricultural Productive Capacity of Dry Areas* in relation to range land rehabilitation efforts. Such efforts should be co-ordinated with those targeting the conservation of degraded lands and watersheds.

The Panel further suggests that:

- ICARDA should give more attention to the collection, characterisation and evaluation of perennial grasses and legumes for future use in (i) rangelands rehabilitation and improvement, (ii) establishment of improved pastures, (iii) growing forage crops using marginal quality water, and, (iv) soil conservation.
- ICARDA efforts in the production and utilisation of multi-purpose fodder shrubs and trees in West Asia, North Africa and the Sahel should continue. This effort should be complemented by:
 - a) establishment of national and sub-regional nurseries to cover habitats and environments encountered outside Syria;
 - b) extension of the present experience of direct seeding fodder shrubs instead of planting nursery-raised seedlings which are more costly, labour demanding, require watering and may have poor survival rates in the field;
 - c) expansion of collaboration to collect, characterise and utilise fodder shrub germplasm to cover additional areas, particularly the highlands of Afghanistan, China, Iran and Pakistan;
 - d) establishment of a network on multi-purpose trees and shrubs in the region to facilitate the exchange of material, experience and information;
 - e) practical steps to establish/activate collaborative research on multipurpose trees and shrubs with ACSAD, ICRAF and ILRI;
 - f) identification of management options and information currently used by pastoralists.

By nature, this project is strongly ecology-oriented and therefore fits very well into ICARDA's Natural Resource Management Programme. The project at present deals predominantly with production ecology of rangelands. The Panel considers it advisable for ICARDA to approach the identified problems in a more holistic and participatory manner

4.3.6 Small Ruminant Production (Project 2.5)

4.3.6.1 Current Focus

Through its *Small Ruminant Production Project*, ICARDA attempts to contribute to the solution of problems confronted by small ruminant (SR) production systems. The challenge is to find approaches to accelerate adoption of adequate

feeding strategies and low-cost management practices to improve productivity and income, while reducing overgrazing, parasite loads and inbreeding.

4.3.6.2 Achievements

During the period 1993 – 1999 this project:

- linked systematic research on feed quality of barley straw to on-going research on barley breeding. Respective screening methods were developed and transferred to NARS, thereby enhancing their ability to improve local feeding systems;
- successfully promoted improved feeding systems under the ambit of the M&M (Mashreq and Magreb) project in WANA, based on the use of feed block technology;
- synthesised data from on-farm monitoring in WANA, identifying an alarming low fertility of SR flocks in the region. This finding will permit a better target in problem solving and the identification of low-cost technologies with direct implications on alleviating the pressure on the land by eliminating infertile animals;
- initiated studies on the nutritive value and consumption rates of salt- and drought-tolerant shrubs. Studies on the effect of shrub feeding on milk quality of SR were also initiated;
- initiated range-based research on sheep production in Central Asia, through a survey of production performance of Karakul sheep in Uzbekistan and a preliminary fattening trial with crop by-products;
- incorporated improved genotypes of Awassi sheep from Turkey along with a small herd of Syrian Shami goats into ICARDA's experimental SR flock, to allow genotype x environment interaction research, in particular for production systems where feed resources are available, in view of a high market demand and good prices for SR products.

4.3.6.3 Future Strategy and Plans

Increased attention will be given to: i) trade and markets to identify opportunity niches, and ii) assessment of the potentials and specialisation of small ruminant breeds, as part of the characterisation of production systems. With the assistance of modern on-farm monitoring, participatory techniques and molecular biology tools, ICARDA will focus greater attention on the transformation of primary products such as milk into derivatives (i.e. cheese and yoghurt) to capitalise added value.

Information obtained by this project will be synthesised to match the potential genetics of the small ruminant breeds with their market and production potentials, in order to maximise farmers' income.

4.3.6.4 Assessment and Future Challenges

The 1994 CCER did not find any evidence that ICARDA had clearly formulated a research strategy for livestock or increased livestock research as recommended by the 1993 EPMR. In response, during 1996/1997, several consultations were conducted with NARS of CWANA and regional and international organisations. The results were used to reformulate ICARDA's project on small ruminants for the MTP 1998 – 2000. In October 1997, ICARDA, in collaboration with ILRI, organised a major *International Consultation on Setting Livestock Research Priorities in WANA* that produced a comprehensive research strategy consistent with ICARDA's own objectives and investments in small ruminant research.

The CCER stated that priority given to nutritional aspects of feed was very relevant, and that the involvement of an economist was appropriate in preparatory technology transfer work. Meanwhile a senior agricultural economist has been working closely with the Small Ruminant Project, and various economic studies involving production and role of small ruminants have been published.

The 1994 CCER recommended strongly that no work be started on animal genetics or health. In response, ICARDA pointed out that no formal work on animal genetics had been done. Limited work on animal health, such as assessments of parasite loads on production, was carried out by a Japanese team at ICARDA. It is anticipated that work on the genetic (molecular) characterisation of regional breeds will be initiated shortly, and ICARDA has consulted with ILRI in this regard. ICARDA does not intend to go into breeding.

The hypotheses behind the strategy and plans of the SR project are that improved marketing opportunities will lead to: (a) higher incomes and reduced poverty among herders and their families, and (b) improved sustainability of NRM systems within the rangelands of CWANA. The Panel agrees that the hypotheses are highly relevant for the integration of NRM into the SR production systems in the region. To test the hypotheses effectively, strong links must be maintained with Project 4.1 (*Socio-economics of NRM in Dry Areas*), and Project 3.2 (*Land Management and Soil Conservation*). There must be truly multidisciplinary and holistic research in this project.

4.4 Socio-Economic Research

4.4.1 Background

ICARDA's charter calls for the assembly and evaluation of information relative to the socio-economic problems that impose constraints on the widespread adoption of improved systems of cropping, farming, and livestock husbandry.

The changes in the CGIAR and ICARDA missions and priorities call for increases in research focused upon poverty alleviation, with an emphasis on beneficiaries, especially rural women, as well as increased attention to on-farm participatory approaches in the whole ICARDA research agenda.

Historically, the emphasis of social science research at ICARDA falls into four phases corresponding somewhat with the periods of the external reviews. In the first phase, emphasis was on diagnosis of farming systems in Syria, Sudan and Egypt and the identification of constraints and possible solutions. During the second period, collaboration with biological scientists increased in experimental design and economic analysis of implications of experiments. After the 1988 EPMP, adoption and impact studies were initiated, and after the 1993 EPMP, much more attention has been put on participatory research approaches, as well as policy and property rights analysis, mainly through special project funding.

ICARDA presently has 14 social scientists that spend a large proportion of their time on research, and a resource economist is under recruitment. This represents an increase from 9 in 1993, a move that was commended by the TAC. Currently social scientists represent 18% of ICARDA's research staff, compared to 11% in 1993. The proportion of PhDs has increased from 50 to 70%, and the proportion of non-economists has remained around a third since 1993. The non-economist group consists of a mix of disciplines including anthropology, human geography, property rights, and nutrition. About two thirds of social scientists are funded from the restricted budget.

4.4.2 Current Focus and Achievements

Between 1994 and 1998 social scientists conducted over 180 individual studies. The proportion of field studies to desk studies decreased from over 70% to less than 45%. About 20% were adoption and impact studies, while policy, methodology development and participatory research studies accounted for about 15%, 10%, and 5%, respectively. Social science financing changed significantly from over 50% being funded from the unrestricted core in 1994 to less than 15% in 1998. An even lower proportion of non-economic social science research was funded from the unrestricted core.

ICARDA's social scientists shifted their emphasis from evaluating technological innovations to emphasising the institutionalisation of farmer's participation in all of ICARDA's research. They began to focus on larger units of analysis, especially in the areas of property rights and policy. Their area focus began to shift to more resource-poor farmers, and they initiated co-operative work in participatory barley breeding experiments.

Between 1993 and 1998, ICARDA social scientists published 128 items. Most were conference papers mixed with a few book chapters (52%), followed by journal articles (14%) and research reports (13%). The remainder appeared as reference books, workshop proceedings, special studies, articles in newsletters, and theses. In 1995 ICARDA launched a Social Science Papers Series which is averaging one publication per year, including two informative West Asia and North Africa (WANA) regional overviews.

4.4.2.1 : Socio-Economics of Natural Resource Management in Dry Areas (Project 4.1)

There is some attempt to develop appropriate methodologies for market and non-market valuation of natural resources, and some analyses of the social, institutional and economic factors that influence resource management. The methods employed attempt to incorporate resource users' perspectives and objectives, in order to assist in the design of interventions and to reveal where opportunities may exist for community and co-operative management of natural resources.

Investigations have begun into the nature and extent of poverty and determining the most appropriate ways in which research could contribute to alleviating different kinds of poverty. Specifically, ICARDA scientists constructed and mapped national-level rural poverty indicators. These are similar to the UNDP Human Development index, and are based on per-capita GDP, adjusted for differences in purchasing power, differences in income distribution, and the proportion of rural poor in a particular country. They are weighted by the number of poor people in a country, the proportion of total labour force in agriculture, and the amount of arable land per agricultural worker. Because the indicators only deal with national level data, they do not allow targeting of poor areas or people within a country or across the agroecological zones of ICARDA, which cut across national boundaries.

4.4.2.2 : Socio-economics of Agricultural Production Systems (Project 4.2)

Farming systems diagnosis: Socio-economic factors operating at farm, village and national levels that influence technology adoption continue to be studied. A handful of investigations continues on ways in which women could have increased access to productive resources (e.g., credit, land), and identification of appropriate income-generating enterprises in which women have a comparative advantage. There is also work on documentation and analysis of farmer's indigenous knowledge through participatory research methods in barley breeding, and estimation of the potential payoff from such activities.

Evaluation of adoption and impact of new technologies: These involve investigations of the nature of demand by small farmers of improved varieties and how to enhance uptake where obvious productivity gains could be realised. There is also work on development of farm level risk-mitigating strategies and effects on technology choice and use, as well as assessment of the impact of technology use on the environment. Analysis focuses on farm household variables that constrain adoption of improved technologies, and investigation of the differential effects of gender on technology adoption. Research on the economics of seed production involves quantification of the economic efficiency of contracting of small growers and privatisation of state owned enterprises. A few studies to estimate the regional impact of technologies have been undertaken.

4.4.2.3 : Policy and Public Management (Project 4.3)

Investigation has begun of how policy research findings influence the direction of changes in national policy formulation, particularly in countries implementing significant economic reforms and privatisation. The focus is on developing and promoting new policy instruments and collaborative research with NARS, since policy making takes place at national levels.

There is trend analysis of ICARDA's mandate commodities, with key macro and micro data projections, and identification of policy and property rights environments under which rural producers and communities make their decisions.

Effort is being put into development and use of sector, economic and bio-economic community models. These are being used to assess the effects of policy reforms (domestic price reforms, trade liberalisation, drought mitigation policies, etc.), and property rights and institutions, on the uptake of improved technologies and sustainable resource management practices, on producers, households and communities in the dry areas.

4.4.3 Future Strategy and Plans

Development of a database and analyses of the different socio-economic surveys conducted at ICARDA over the last 10 years, will continue. ICARDA plans to collect data on natural resource management from "unified research sites" in selected, but representative, communities in the region. The intention is also to promote and institutionalise further the *ex-ante* impact assessment of natural resource management interventions.

The emphasis of research on socio-economics of production systems will continue to be *ex-ante* and *ex-post* assessments of the adoption and impact of improved technologies at farm, national and regional levels. Seed economics research will focus on developing proposals for seed policy reforms, especially for the improvement of the efficiency of the informal seed sector. To complement formal methods of quantitative analysis already institutionalised in the NARS, there will be more emphasis on non-formal, participatory research. Greater attention will be given to incorporating into the analyses farm household variables such as gender, and off-farm income sources, as well as community level and environmental variables.

There will be a general shift from farm level to community level analysis in order to promote stronger linkages between biological, physical, and social variables, and allow investigation of relevant policy, institutional and technology recommendations. Bio-economic community models will be further developed to evaluate the combined effects of various policy, institutional and technology options on the welfare of rural households, on communities, and on natural resource management. Increasing the number of test communities and transferring the methodologies to other ICARDA mandate regions will broaden the activities of the M&M project.

4.4.4 Assessment and Future Challenges

Social science research at ICARDA was a part of the CCER on NRM (Production Systems) in June 1994. In general, the CCER was thorough and analysed the programmes in some detail. Because of the time lapse between the CCER and this EPMPR, it has been necessary for the Panel to review the programmes in some detail. Many of the problems highlighted by the CCER have persisted. In the rest of this section the Panel highlights these and other more recent issues.

Staffing: There is high demand for the time of the social scientists by the NARS as well as other scientists in ICARDA. The Panel commends the Centre for having increased the number of social scientists during a period of decline in total staff numbers, and urges that the vacant position be filled as planned.

Administratively, most ICARDA socio-economic scientists are based within the NRMP. The current Programme Leader is a social scientist. There is no separate social or socio-economic administrative unit, and interaction occurs in thematic networks, informal networks, and in the implementation of regional programme activities in co-operation with NARS. From their support position, the social scientists have helped the Centre to stay abreast of some of the advances in their fields and have encouraged their fellow biophysical scientists to adopt them. However, as indicated below, the research output during the period under review has not been commensurate with the number of social scientists engaged in research.

Farmer participatory research: ICARDA social scientists have made a major contribution to the institutionalisation of farmer participatory research in ICARDA, and throughout the region. Emphasising farmers' participation in the technology development process is leading to the development of technologies, especially germplasm, with due consideration to multiple consumption (grain quality, feed quality) and production (yield potential and stability) needs of subsistence resource-poor farmers.

ICARDA/IFPRI partnership in the M & M project: This partnership broke new ground in the region by integrating research on policy, institutions and property rights with technology testing. This has fired the interests of NARS sufficiently to induce some that had no socio-economic research component to start developing and institutionalising such research. The project also gave prestige and high visibility to NARS social scientists. IFPRI brought methodological expertise and drive for quality of scientific output, while ICARDA brought in regional and biological focus. This is a good model for ICARDA socio-economic research in the future.

Collaboration with NARS: There is varying social science research capacity in the CWANA region. Some of the universities and the NARS have strong human resource capacity, while others have virtually none. In developing and executing the research programmes, social scientists at ICARDA have had to adopt a pragmatic approach involving contracting, training and mentoring in fostering linkages with the NARS.

NARS social scientists have played an important role in providing socio-economic input into ICARDA's programmes. At the same time ICARDA has helped NARS use relevant tools for socio-economic analysis of technology adoption, property rights evaluation, participatory methods, etc. However, ICARDA has not articulated a comprehensive social science research agenda for the region focused on issues within its mandate, an agenda to which NARS could buy in. Rather, most projects based on restricted funding, including post doctoral research fellowships, have been short-term in nature, and national programme scientists have been recruited to serve as consultants providing socio-economic input. Several NARS are calling for a more formal relationship similar to that which exists with the biological scientists

Farmer profiles: ICARDA has conducted well over 80 diagnostic, adoption and impact assessment studies since 1988. Quite a few of the studies have not been completed, or there have been long delays between completion of fieldwork and publication of results. With the exception of a few publications in departmental monographs and conference proceedings, most of the results are inaccessible.

Apart from standard production-defined typological distinctions (irrigated/rainfed, large/small, crop-livestock, etc.), the social scientists have yet to define types of producers, households or communities for CWANA. Nor have the more than 80 studies been synthesised into clear producer/adopter/impact profiles for the region. Production scientists express a desire for simple typologies for use in sampling frames. The Panel was unable to determine whether or not the findings had an impact on subsequent design of projects, but sees a pressing need to develop profiles of the adoption patterns and types of CWANA producers from existing NARS and ICARDA research, as well as a simple typology of types of organisations of production, including, but not limited to property systems. Without these, it will prove difficult to determine the representativeness of on-farm research. Also, without first laying down a typology of types of producer and farming systems in the region, it is difficult to determine how research results might be extrapolated from the "unified research sites" to different areas within the mandate of ICARDA.

Most of the adoption and impact assessment studies have used standard methodologies, and little attempt has been made to innovate and develop methods adapted to the special conditions of the region. Consequently, opportunities have been missed, for example, in developing methodology that would allow for partitioning of the benefits of the products of joint research between ICARDA and NARS on the one hand, and the research and extension systems on the other hand.

Focus of socio-economic research: Too many issues are stated as being addressed in work plans, and are insufficient social science financial and human resources are available to address fully the present agenda. This partly explains the long delays in bringing projects to closure and the publication of results. In the face of limited funding for the Centre's overall programme, one solution is to consolidate research topics and focus on more regional issues. The other is for projects requiring social science support to build in budgets for recruitment of additional social scientists, as has already been done in some projects (M&M, WANADDIN, etc.).

The programme could consider focusing on a few key issues such as:

- Desk studies to mine and synthesise the wealth of information on farmer's profiles in the past diagnostic, adoption and impact studies.
- Summary review and synthesis of the options presently available for ameliorating the moisture constraint and sustainably improving crop and livestock productivity. Since moisture is the main limiting factor to productivity growth in rainfed agriculture in dry areas, opportunities for shifting the crop productivity frontier will have to come from greater investment/research in the development of moisture conservation techniques, improved water-use efficiency and increased labour productivity at the farm level.
- Policy research to determine the short and long-term trade-off between the imperatives of crop production increases in the face of steady growth in food demand and the imperatives of resource-base conservation and/or rehabilitation.
- Measurement of the relevance and effects of the Centre's research products (germplasm, crop and resource management) on poverty, income distribution and welfare changes of dryland farming communities. It is especially important to assess the effect on female members of the household who often must resort to non-farm activities to complement their agricultural income.
- Strengthening the capacity of the NARS through training in advanced, non-parametric, social science analytical techniques and methods to improve their abilities to extrapolate and better analyse survey data.

Quality of output: Social science impact is evident in programme identification, adoption studies, impact on centre programme direction and planning, policy analyses, and the ability to assure awareness of CGIAR-mandated social science programme directions. Despite their diverse and sustained contribution, ICARDA social scientists have yet to develop an internationally recognised and defined focus. With a few exceptions, the analytical tools used in the socio-economic work have been basic, standard and non-innovative.

CGIAR centres with geographical mandates face regional differences in the social and cultural patterns. In addition to economic constraints, social and cultural patterns shape agricultural production, consumption and distribution patterns, access to land and labour, information systems, and management. While ICARDA social scientists routinely collected information on social variables, the Panel finds that this information was too often not analysed in a timely fashion, synthesised, and published - thereby reducing its usefulness. Developments in international social science research relevant to ICARDA's biophysical and resource management concerns, such as the emergence of cultural ecology and non-parametric analytical methods, have not been incorporated into the ICARDA portfolio.

Sixty percent of the social science publications were cross-referenced as joint publications with non-social science projects, showing a substantial integration of the work products. Most of these publications were economic studies. Unfortunately, there has been a declining trend in the number and quality of publications during the five-year period, with hardly any journal or high-standing book publication during the last three years.

The Panel suggests that ICARDA should improve its field investigative capacity in the non-economic social sciences by recruiting, training, and using mobile cadre of “farmer-researchers” from women and men in the countryside. They should work on-site in socio-economic field investigations and could take over and conduct research on their own after the projects are completed. ICARDA should also consider scheduling annual, 1-3 day off-station retreats of all ICARDA social scientists, assisted by appropriate advisors who may include other disciplines, to refine unanswered critical research questions. High priority should be placed on developing draft typologies of CWANA farming systems and adoption profiles of farmers. These profiles may serve as a basis for anticipating the technological and socio-economic impact of ICARDA research and determining how representative a proposed “unified research site” is within CWANA.

Possible solutions to the problem of output quality in social science research include recruitment/designation of a lead social scientist, with major responsibility for monitoring and assuring quality of research. This was suggested by the third EPMR, and implied by the CCER, but has not been accepted or implemented by ICARDA. In addition, ICARDA social science work should seek close linkages with centres of excellence, e.g. IFPRI, as has been done so well in the M & M project. The new mentoring approach of ICARDA will not substitute for such linkages.

Regarding social science research, the Panel recommends that ICARDA should: (i) reduce its scope and concentrate on fewer issues - selected in close collaboration with the Centre’s physical and biological scientists and the national programmes - that are central to the operational mandate of the Centre; and (ii) seek to improve the quality of output by among others, (a) judicious recruitment/designation of a lead social scientist, (b) recruitment of high quality support staff, and (c) entering into more co-operative arrangements like those existing with IFPRI.

4.5 Overall Assessment of NRMR at ICARDA

The Panel acknowledges that this EPMR has occurred at a time when the NRMR programme at ICARDA is still in the process of incorporating a broader, more holistic view into its activities. The panel also acknowledges that it takes time for scientists to shift to a new paradigm or, one would hope, in a world class institution, challenge it and build new ones. However the Panel is of the view, that given the fact that aspects of NRMR are not new to ICARDA, or the CGIAR system, it is legitimate to examine the programme, using the elements of the evolving paradigm discussed earlier

The Panel could not obtain a clear definition or description from ICARDA, of what the Centre considers an *Integrated Natural Resource Management System*. Nor could it find a vision of sustainable agro-ecological systems that the Centre is attempting to develop through its research efforts. The Panel believes that ICARDA has not fully adopted the essential integrative and holistic approach to NRM, and came to the conclusion that ICARDA scientists need to develop a clear vision statement agreed with all stakeholders. An example would be something like “NRM at ICARDA aims to produce and test three sustainable and productive land use options for each important ecosystem in CWANA”.

ICARDA clearly understands that development of sustainable NRM practices is only possible on a participatory basis. The involvement of all the stakeholders is very important. However, except in a few projects, this is mainly interpreted to include only farmers. ICARDA’s NRM research must consider that there are other than farmers in the game, its range of stakeholders must be extended.

The Panel found that full scientific integration of the different NRM projects and disciplines has still to be achieved, and could not identify a common focus and strategy of the programme. However, NRM at ICARDA is becoming increasingly system-oriented and participatory, but mostly in applied research. Only a small proportion of its individual research projects could be classified as strategic, and a few as holistic. The success of the Centre in increasing the proportion of holistic or strategic research will depend on its ability to design the increasing number of special projects carefully to include those elements. Success will also depend on the centre’s ability to manage the data collected from different special projects for analysis at headquarters so as to distil strategic research results. As ICARDA may find it increasingly difficult to have all the necessary expertise for NRM among its staff, co-operative arrangements must be worked out, particularly with research institutions that have strong ecologically oriented, non-agrarian disciplines.

The strategy of working in “unified research sites” is commendable, and in line with the evolving CGIAR paradigm. However, the decision to identify “unified research sites” may be premature at this time because ICARDA has not collaboratively articulated clear criteria for such selections with potential stakeholders. As indicated in the socio-economics research section, scientists do not have typologies of types of producers and farming systems that would allow them to assess how representative the selected sites may be; however, the Panel does not believe that selection of sites should wait for new baseline studies. Selection should be wholly operational, based on ICARDA’s accumulated experience and discussion with potential partners. Experience shows that - in the final selection - access, logistical and partnership considerations weight the choice heavily. Baseline studies should continue to be refined, but not at the expense of progress at the unified research sites. Further studies should include incorporation of the wealth of small farm studies made by ICARDA into a GIS format, with a view to laying farming system profiles over the biophysical characteristics of the region.

The Panel is of the view that the thematic grouping of projects in the NRMP is not, in itself, an impediment to integrated research. To strengthen interdisciplinary research at ICARDA the NRMP needs to focus much more on the following issues:

- Careful planning of the implementation of projects in terms of the involvement of mixed disciplines.
- Ensuring that the disciplinary loyalties of individual scientists do not collide with the need for compromises in approaches, objectives and activities that are inherent in multidisciplinary projects.
- Introducing appropriate criteria into the Performance Evaluation process.

Recognising ICARDA's efforts to consolidate its natural resource management research by merging its former projects into a more integrated programme; the Panel recommends that ICARDA, together with appropriate partners, articulate a vision, strategy, and an implementation plan for natural resource management research, drawing on CGIAR and other experiences and centred on Unified Research Sites most appropriate for its emerging poverty alleviation focus.

The Panel suggests that the Centre consider initiating an external review of progress achieved in the NRM programme over the next two or three years.

CHAPTER 5 – RESEARCH SUPPORT

The research programmes at ICARDA are supported by 6 specialist units or groups. These are:

- Genetic Resources Unit (GRU)
- Seed Unit (SU)
- Human Resources Development Unit (HRDU)
- Communications, Documentation, and Information Services (CODIS)
- Computer and Biometrics Service Unit (CBSU)
- Station Operations

In this chapter we review and assess four of these, viz. the Seed Unit, the Station Operations, CBSU, and CODIS. The GRU is considered in Sections 3.2. The HRDU activities are considered in Sections 6.3.

5.1 The Seed Unit

Only a few countries in the CWANA Region (e.g. Morocco, Turkey, Egypt, and Pakistan) can claim well-developed formal seed supply systems complete with seed laws and operating certification and evaluation systems. At the other end of the spectrum are countries with virtually no formal seed supply system and where only a very small amount of seed of the most important crops is produced with limited seed quality control (e.g. Yemen, and Oman). The remaining countries vary in their stages of development. As in most developing countries, formal seed enterprises in CWANA will supply only a small portion of the total required seed of major cereal crops with the remaining requirement coming from farmer seed retention or exchange among farmers (the informal sector).

The reasons for the problems discussed above are many and complex – rigid and bureaucratic seed systems, outmoded production and processing facilities, limited technical and managerial capacities, lack of trained personnel, and absence of a vigorous private seed distribution system. While these constraints are real and serious, it is increasingly clear that much of the weakness in the seed sector is due to factors of policy and management.

CWANA policy makers and professionals are grappling with a number of complex seed-related issues including: privatization, variety ownership and other Intellectual Property (IP) issues, legislation and seed regulatory measures, and conditions for balanced development of formal and informal seed supply systems. Privatization is perhaps the most debated topic in the Region. For the majority of the countries it is no longer a question of whether or not to move to privatization, rather it is a question of when and to what extent. Regional and sub-regional co-operation in the area of seed production is seen as a way of overcoming some of these constraints, thus the recent agreement to launch a Near East and North Africa Seed Consultative Forum (NENA-SCF0), in which ICARDA's Seed Unit is certain to play an active role.

The IARCs have long been aware of the importance of effective national seed sectors to facilitate adoption and spread of improved varieties, and they are engaged in one way or the other with seed-related activities. ICARDA is now, however, the only CGIAR Centre with a dedicated Seed Unit. As such, ICARDA's involvement in seed matters is unique and highly appreciated by the NARS and policy makers in the countries of the Region. This activity is particularly relevant to countries in Central Asia and the Caucasus where the reorganization of seed support is an important component in the restructuring of agriculture.

The ultimate goal of the Seed Unit is to improve seed supply to farmers of the region through strengthening national seed programs. In addition, the Unit provides a service function to the research programs of ICARDA by handling all operations associated with variety management and seed production. It is, however, the activities directed towards national seed systems which increasingly constitute the main thrust of the Unit and where its impact is felt most. These include:

- Training, which is pursued through courses, workshops, M.Sc. scholarships and specially tailored individual courses with a 'train the trainer' approach.
- Networking, which is mostly concerned with collecting and dissemination of information within the region with the Unit acting as a Secretariat. The CWANA Seed Network is the main hub of national and regional activities carried out by the Seed Unit.
- Consultancy service to donor funded projects mainly, but not exclusively, in the outreach and regional programs.

The Unit carries out some problem-solving, development-oriented research, which takes two forms. The first is concerned with traditional applied seed technology research to address specific regional problems. The other addresses broader issues such as the informal sector operations, the economics of seed delivery by formal or informal sectors, and the role of the private sector. These are priority issues both for NARS and other stakeholders. Work on the informal seed sector is also complementary to participatory plant breeding approaches, the product of which would be diffused through local/informal channels. The Unit produces publications including a technical Newsletter, general information publications, and training manuals, but seldom publishes in scientific journals. In addition to the head of the Unit, there are four professional staff - a seed economist, seed systems specialist, seed training scientist and seed production manager.

Overall Assessment: The Unit has adequate human and physical resources and is evolving in its activities and future direction. As ICARDA has moved away from finished varieties, the Unit's primary work on varieties is expected to decrease over time, but as the Centre will have continuing responsibility for its existing materials, it is suggested that the Unit retain some involvement in this regard. The Unit's training program is undergoing some changes due to greater attention to policy issues and socio-economic aspects of the seed industry. The Unit is encouraged to pursue what it terms 'new directions' in training including forging stronger relations with higher education institutes and the development of an M.Sc. course of

international standing. The Unit is pursuing novel features in its 'train the trainer' approach, which is proving to have a high multiplier effect. Traditionally the Unit has concentrated its efforts almost entirely on the mandate cereals and legumes and to a much lesser extent on forage and pasture crops. The Unit is further encouraged to consider devoting more efforts in seed production of the latter including their indigenous species.

ICARDA's early recognition of the importance of seed production and its foresight in putting in place a viable unit to carry out necessary research and development in this field have served the Centre and the Region well. ICARDA's Seed Unit, which in recent times has received substantially increased support in scientific staff resources, has developed into a very well recognized and appreciated enterprise by the NARS as well as being equally important to the germplasm enhancement research of the Centre itself. The Seed Unit is commended for endeavouring to broaden its interests to include more policy and socio-economic issues. Collectively, this technical and policy support to NARS is accelerating the transfer of technology to farmers, which requires special attention in areas of limited resources.

The CCER of Cool-Season Legumes and Seed Production (1996) devoted a good part of its report to the functions and activities of the Seed Unit. The CCER made five major recommendations, one of which calls on ICARDA to retain the seed unit as a permanent organisational entity and that it should focus more efforts on alternate farmer seed supply. The Panel concurs with the intent of this recommendation and agrees that the work of the unit, particularly as it relates to NARS, is an important on-going activity. In this regard, the Panel is of the view that the Seed Unit should place greater emphasis on strengthening the NARS capacity in seed research as well as strengthening the links between national germplasm enhancement programs and seed production and supply sector.

In summary, the Seed Unit is performing important basic functions, particularly those pertaining to strengthening national seed sectors. Ways and means should be found to insulate, to the extent possible, those functions from funding uncertainties. Consideration may, for example, be given to including a seed production component in future relevant regional research and development projects.

5.2 Other Support Units

5.2.1 Station Operations

5.2.1.1 ICARDA Laboratory and Greenhouse Facilities

Some laboratory facilities available at ICARDA have been upgraded and/or extended since 1993 to facilitate the development and application in ICARDA of new technologies. Most of the work has been done since 1997. Space has been extended for biotechnology laboratories, for GIS, for the IPM initiative and for rangeland research. New laboratories have been built for quality assessment and other cereals in the germplasm programme and for molecular characterization by the Genetic Resources Unit. Most of these extensions have been achieved by the renovation of facilities in the Seed Building. A new livestock facility has been added, including

both feeding trial areas and laboratories for animal nutrition, health, feed analysis, milk quality, and for post mortem. There has been a parallel investment in new equipment for these facilities. Finally, the first phase of a new IPGRI Genetic Resources Facility was completed in 1997, and the second phase is currently under construction.

There are no facilities for radioisotope work and no proposals to develop them. Both the Germplasm Enhancement Programme and GRU use non-radioactive DNA probes. There are also no plans to establish containment facilities for genetic engineering research. This will be outsourced until appropriate biosafety regulations and/or legislation have been enacted by the host country, in line with endorsed CGIAR policies.

In terms of laboratory facilities, both the 1996 CCER on Cool Season Legume Projects and the 1997 CCER of Cereal Projects noted the need, in the near future, for additional seed storage facilities for the GRU. This issue is currently being addressed at a system-wide level through the System-wide Genetic Resources Programme. In addition, funds for remodeling and upgrading the old GRU cold store have been identified. This will provide additional storage capacity for 80,000 accessions under medium- and long-term conditions.

ICARDA has 18 growth cabinets each about 1.5 m² which are heavily used but are unreliable in summer. It also has limited glasshouse facilities at Tel Hadya. These are supplemented by polythene tunnels. However, these tunnels lack adequate temperature control and, as noted by the CCER of Cool Season Legume Projects, are of marginal use and not always reliable for growing plants. Unless the greenhouse facilities at ICARDA are upgraded in the near future, this will become a major impediment to the increased use of new biotechnologies in ICARDA's plant research programmes. As the CCER of Cool Season Legumes stressed in 1996 "ICARDA scientists should have available for their use, facilities where plants can be reliably grown in any season". There is a clear need to increase the availability of controlled environment facilities. The Panel therefore suggests that this matter receive the urgent attention of management.

5.2.1.2 Field Facilities

ICARDA operates from its main campus at Tel Hadya (944 ha) and at three other sites in Syria: Breda (76 ha), Bouider (10 ha) and Lattakia (2.5 ha). ICARDA also operates from two sites in Lebanon, Terbol (39 ha) and Kfardane (50 ha) as well as a range of field stations and farm sites in collaboration with NARS partners. These sites represent a variety of agroclimatic conditions, typical of those prevailing in the WANA region. The average annual rainfall at these sites ranges from 226 to 565 mm. The Farm Manager oversees operations at all sites in Syria and also oversees the Farm Operations Unit.

A CCER of Farm Machinery Operations was held in November, 1995 to review the future needs for farm machinery, both for research plots and crop production areas. This review was commissioned because much of the equipment had been acquired many years ago and some was nearing the end of its useful life. This review made 17 recommendations, many concerning replacement equipment needs. ICARDA has responded within the limits of its budget, and purchased 3 new plot

drills, 5 new plot combines, 2 new tractors and a new spray rig since 1995. Further equipment purchases have been planned in 1999.

This review noted that there was occasionally tension between some scientific staff and the farm manager over land allocation and preparation. To resolve this problem, after consultation with all stakeholders, a fixed allocation of all fields to the research programmes was introduced in July 1996, leaving the authority for land management with the senior scientist of any project. A review of land use and rotations by the Land Use Committee is planned for later this year.

5.2.2 Computer and Biometric Services Unit

The Computer and Biometrics Services Unit provides support for ICARDA's research and management information storage, processing and biometrical analyses. It provides support to users of all computer facilities, software packages and hardware maintenance. It assists in the design of experiments and surveys, data analysis and statistical interpretation of results. It provides training support for staff in biometrics and statistical analysis as well as practical training in the use of statistical packages appropriate to the needs of specific clients - staff, trainees, students & NARS research personnel.

The Unit has over the last five years continuously upgraded the hardware, software and services it provides. This has included:

- the establishment and operation of the local area networks;
- standardization of PC applications and provision of technical support to their users;
- provision of the latest experimental and survey designs to researchers, particularly to breeders;
- development of trials management and project management systems;
- automation of data capture in laboratories and the field;
- training of ICARDA staff (1040 in 91 courses) and 331 from NARS.

Current projects include the commissioning of IVDN and internet connection as well as the installation of new Pentium computer servers under Windows NT.

A CCER of Computer Activities was undertaken in February, 1998. Overall the review was positive about the achievements of the CBSU given the difficult environment in which it operates, particularly the financial constraints, limits to the availability of hardware and software and local expertise. Overall the review indicated:

- that the PC hardware and software services were generally satisfactory although response time needs to be improved;

- that in-house software development has generally been unsuccessful and this activity should be made effective or abandoned;
- that the number of statistical packages used by the Centre should be reduced;
- that all hardware and software should be procured centrally to help reduce costs;
- implementation of charging units for staff training to improve its effectiveness and a reduction in number of courses.

ICARDA has generally responded positively to the recommendations of the review and the great majority of them have been implemented.

5.2.3 CODIS: Communications, Documentation, and Information Services Unit

CODIS, the Communication, Documentation and Information Services Unit provides critical information acquisition, storage and dissemination services for the scientific programmes at ICARDA and other researchers worldwide. The Unit is composed of several specialty groups concerned with public awareness, editing, translation, publications distribution, and art preparation, as well as the photolaboratory, the printshop and the Library.

5.2.3.1 Library

Since the last review, the library has focused on becoming a modern, research information centre. Achievements include moving rapidly to a Windows MINISIS platform, abandonment of the card index, establishing a self-learning centre for staff, maintaining copies of all scientist's reprints for distribution, and culling of journal collections. Library staff provide support services, including database searches, document delivery, publications exchange. Unable to access the Internet until July 1999, the library prepared a home page internally on the Intranet and offers access to three towers of 7 CDs each, registering about 220 hits/month.

In fulfilling ICARDA's mandate, it has provided 18 NARSs with training in information management through five annual courses in addition to occasional courses to ICARDA scientists on information management and retrieval. The library actively collaborates with several external organizations: FAO's AGRIS (International Information System for Agricultural Technology and Science) and CARIS (Current Agricultural Research Information System), the Union List of Serials coordinated by ICRISAT, and in the development of the "*Literature Update on Wheat, Barley and Triticale*" in cooperation with CIMMYT, and other IARCs.

In the near future, it faces the challenge of arranging cooperative agreements with the NARSs to develop strong interactive relationships and common technical standards as they come onto the Internet one by one. Within hours of the Center's connection to the WWW, its terminals were accessible. In the future it plans to devote special attention to publishing databases on ICARDA mandated crops, retooling to input into AGRIS and CARIS electronically (as do most CG Centers),

and in reducing acquisition and cataloguing time by accessing publisher information on-line.

The library is well positioned to provide valuable support to scientists and in this respect, particularly in assisting scientists make productive use of the Internet browsers and search capacity. The Panel is pleased with its achievements and plans.

With the need to publicize ICARDA's mandate, mission and achievements to a much larger spectrum of the world community, it must enhance its presence on the web, previously handled by the CG Secretariat by enriching and continuously updating its homepage now that it has Internet access.

5.2.3.2 Communication/Information

ICARDA has been committed to the publication and communication of its research results in easily accessible forms to NARS, other IARC's international organizations media and the general public since its establishment. Since 1993, ICARDA has produced about 1200 publications describing its work. These include specialized reports, donor specific reports, periodic newsletters, workshop proceedings and training manuals. In addition, ICARDA scientists have published well over 350 articles in scientific journals, workshop proceedings, reference books and newsletters.

Since the last review CODIS has faced a severe financial challenge. Its budget allocation fell almost 40% in the past 10 years, from about US\$1.05 million in 1988 to about its US\$0.69 million in 1998. The Unit also suffered severe cuts in staffing. However, in recent years, the Unit has made some staff readjustments in the area of electronic publishing and continues to make efforts to strengthen its editorial team.

In 1995, in the face of the joint impacts of the information revolution and budget constraints, CODIS developed a master plan for strengthening and modernizing the Unit. This plan proposed a two-pronged strategy, first, to set up a strong information facility at ICARDA to meet its own needs and second, to link the Centre to NARS, IARC's and other key groups such as NGO's, Universities, publishers and commercial information producers. Significant elements of this master plan have been implemented over the last 3 years, including:

- computer hardware and software have been upgraded for the production of institutional data bases and for desk top publishing,
- facilities in the printshop have been upgraded to allow in-house production of high quality information materials,
- a multi-media laboratory has been established and a new video, to cover ICARDA's new medium-term plan, was developed and distributed, and
- a multi-media interactive public awareness CD-ROM was developed in-house, duplicated and distributed.

A CCER of ICARDA projects on Human Resource Development and Communication, Documentation and Information Services was undertaken in February, 1997. The CCER was highly satisfied with the work of CODIS and complimented them on the development and implementation of their master plan in a challenging environment. With respect to documentation/information they made three recommendations, which were briefly:

- that ICARDA continue to give high attention to the publication of scientific research results in order to build the image of the institution and to disseminate information vital to NARS and other IARC's;
- that high priority be given to the regular and timely publication of periodically appearing newsletters such as Fabis, Lens, Rachis and Caravan;
- that CODIS editorial staff should be insulated from ad hoc assignments from management to allow these staff members uninterrupted and concentrated work on periodicals with firm deadlines.

ICARDA accepted the first recommendation, and has indicated it has put greater emphasis on the publication of scientific staff in international refereed journals. However, the number of refereed journal articles appears to have continued to decline (65, 66, 49 and 45 in 1995-98 respectively). The possible reasons for this are discussed in Section 7.1 (Quality and Relevance of Science).

ICARDA also accepted the second recommendation, and publication of the in-house journals is now on schedule.

While the Centre accepted the third recommendation as valid, it argued that it was not possible to insulate editorial staff from emergencies, since many were generated externally, such as requests from various stakeholders with very short deadlines. The Panel accepts the Centre's response to this recommendation.

The extension of ICARDA's activities into the Central Asia and Caucasus (CAC) region will pose new challenges for CODIS because it will generate a requirement for a range of additional foreign language publications. The Panel regards this as an important issue, given the emphasis ICARDA is placing on its CAC activities. It therefore suggests that ICARDA needs to seek new resources or reallocate existing resources to cover this need.

Overall, the Panel also supports the CCER conclusion that CODIS has done well to cope simultaneously with declining resources, a major revolution in technology and a difficult operating environment, and commends CODIS staff on their achievements.

CHAPTER 6 – INTERNATIONAL COOPERATION

6.1 Regional Programmes

6.1.1 Introduction

ICARDA's mandate region is large and diverse, covering the countries in West Asia and North Africa and Central Asia and Caucasus countries of the former Soviet Union, as well as developing countries with sub-tropical and temperate dry areas. The Region's NARS vary considerably in their stage of development, capability and needs. Agricultural research is predominantly carried out in governmental institutions and to a lesser extent in university colleges of agriculture. The majority of these are constrained by limitations in human resources, facilities, finances, and managerial skills. Only limited specialized research is performed by the private sector and the role of NGOs in this regard is very limited. It is encouraging, however, to note that a number of CWANA countries have made notable progress in building reasonably effective research capabilities, which place them in a position to assume scientific leadership in regional and sub-regional collaborative research efforts. The newly independent countries of Central Asia and the Caucasus have excellent scientific and research potential, which should be tapped, for the benefit of the Region.

Decentralization of ICARDA's activities through some form of sub-regionalization was seen as the logical strategy for the Centre. This approach has been pursued vigorously by ICARDA with considerable success. What started in 1979 as an IFAD-funded faba bean project involving Egypt and Sudan has developed since into a collaborative research network comprising seven regional programmes involving some forty countries and numerous collaborating partners from within and outside the region. Each Regional Programme has acquired modest, but efficient, physical infrastructure and assembled small management and technical teams. In the last five years, the number of professional staff assigned to the Regional Programmes has increased from 10 to 21.

The role of ICARDA's Regional Programmes, as seen by the Centre, is three-fold. First, to contribute to the sustainability of the research continuum between ICARDA and its NARS partners by ensuring co-ordination of activities, follow-up of implementation and providing feed-back to headquarters. Second, to enhance interaction among countries of the sub-regions through research networks, regional special projects, and to forge partnerships among NARS and with ICARDA. Third, to contribute to mobilization of funds in support of bilateral and regional collaborative research projects.

Since it was last reviewed, the programme has further evolved both in its geographical and programme coverage. Central Asia has now a full-fledged programme serving in addition three countries from the Caucasus, and the Nile Valley Programme was extended to include several Red Sea countries. ICARDA has moved more assuredly into the desert ecosystems of the Arabian Peninsula. In addition, ICARDA, in consultation with relevant countries, is exploring new opportunities in Latin America for collaborative research activities beyond its work on barley.

The outreach activities, including the regional research programmes and networks, are considered and treated as an integral part of the research programme of the Centre. The Centre therefore, accords high priority to harmonization of activities of the expanding outreach programme and headquarters managed research. To this end, various mechanisms, both formal and informal, are used to facilitate better interaction and enhance the continuum of research between Headquarters and Regional Programmes. These include annual national and regional planning and co-ordination meetings, travelling workshops and annual programme steering committee meetings and project development committee meetings. Matters of mutual interest are discussed in an almost daily interaction between the Assistant Director-General for research (ADG-R) and the Director of International Co-operation (D-IC).

6.1.2 The Regional Programmes

The following is a brief description of the seven Regional Programmes and the progress they made in the period 1993-99. In reporting progress, it should be borne in mind that it is, in the first place, a result of the work of the national agricultural research systems through their participation in the regional collaborative research activities within ICARDA's research continuum.

6.1.2.1 Nile Valley and Red Sea Regional Programme (NVRSRP)

The Programme had its beginnings in 1979 in the Nile Valley Faba Bean Project (NVP) serving Egypt and Sudan, which ten years later assumed a regional programme status when Ethiopia joined. It has since evolved into the present Nile Valley and Red Sea Regional Programme (NVRSRP) with the addition of Yemen and Eritrea and a much broadened research and technology development agenda. Currently, the Programme deals with cool-season cereals and legume crops (wheat, barley, faba bean, chickpea, lentil, grasspea, and vetches), and increasingly is moving into work on natural resource management and the development of participatory approaches involving multi-disciplinary and multi-institutional teams, though the latter activities are limited to Egypt. Work on water-use efficiency and water/soil quality and fertilization is being carried out in irrigated areas, while work in rainfed areas focuses on a range of activities including soil moisture and water conservation, water harvesting and crop-livestock integration. ICARDA continues to support research on the management of Yemen's traditional terraced mountain agriculture system. The programme relies almost entirely on special project funding, but increasingly it is attracting funds from national bilateral projects.

As the first outreach initiative by ICARDA, the NVRSRP has long been considered an effective model for cooperation and technology generation and transfer. The enduring achievements of the programme continue to be in the areas of germplasm enhancement and human resources development. Forty-two improved cultivars of wheat, barley, faba bean, lentil, and chickpea were released to farmers by NARS. Between 1994 and 1998, 33 scientists from Egypt, Sudan, Ethiopia, and Yemen conducted their graduate degree research under the joint supervision of ICARDA. Production packages are now in the hand of farmers, the ultimate beneficiaries of the research continuum. Some 774 NARS personnel received non-degree specialized training courses. 116 Visiting Scientists from the region were hosted by ICARDA.

6.1.2.2 North Africa Regional Programme (NARP)

Activities of the Programme are increasingly carried out through a decentralized approach whereby leading NARS in the participating countries (Algeria, Libya, Mauritania, Morocco, and Tunisia) assume greater regional responsibilities. The NARSs of the region are particularly interested in investing in biotechnology to enhance their breeding programmes, conservation of biodiversity, and natural resource management. Capacity building, human resources development and technology transfer continue to be among the enduring contributions of ICARDA in the sub-region. Among the achievements of the Programme are:

- Germplasm improvement where many varieties of wheat, barley, food and forage legumes with high potential yields and resistance to diseases and insects have been released.
- Through the Mashreq/Maghreb Project, a number of technologies have been developed and transferred to farmers in the sub-region (e.g. straw treatment and feed blocks).
- The integration, perhaps for the first time, of policy and institutional aspects into the research agenda of participating countries.
- Through participation in the Ecoregional Programme on On-Farm Water Husbandry, Libya and Morocco have been active in building information, and subsequently taking measures for improvement, on the use of available water resources and indigenous water-harvesting techniques.
- The introduction in Morocco and Tunisia of a farmer participatory approach to barley breeding involving farmers in marginal areas.
- Capacity building and human resources development (25 scientists completed their graduate degree training, MSc and Ph.D., and 500 NARS personnel have received training from ICARDA).

6.1.2.3 Central Asia and the Caucasus Regional Programme (CACRP)

ICARDA has long been aware of the great agricultural potential of this region and the need to strengthen its agricultural research capacity in order to realize that potential. This early perception of the potential and needs of this important region was recognized by the CGIAR in its 1995 Lucerne Declaration. Initially, collaboration with Central Asian countries was part of the mandate of the Highland Regional Programme. As of 1998, a new Regional Programme for Central Asia and Caucasus was initiated, and a Regional Coordinator was appointed and stationed in Tashkent, Uzbekistan. The Programme serves Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Armenia, Azerbaijan and Georgia. In 1998, the CGIAR initiated a Collaborative Programme involving a consortium of nine CGIAR Centres with a start-up fund of US\$ 2 million, which ICARDA administers on behalf of the CGIAR programme. ICARDA's part-time Regional Coordinator spends 75 percent

of his time, as the Head of the Facilitation Unit, facilitating CGIAR activities in the Region. For ICARDA activities, he is assisted by a full-time Deputy Head of the ICARDA-CAC Programme. The Deputy Head of the Programme is from the region.

Within the CGIAR Programme on *Germplasm Conservation, Adaptation, and Enhancement for Diversification and Intensification of Agricultural Production in CAC*, ICARDA is responsible for wheat (with CIMMYT), barley, lentil, chickpea (with ICRISAT) and forage legumes. Research is also being initiated on soil and water management with CGIAR "start-up" funds. ICARDA continues to co-operate with the other CG Centres in the CGIAR Collaborative Programme, in seeking further funding, and in institutional strengthening in the CAC region. Starting in March 1999, IFAD is providing US\$ 1.5 million for a three-year project on Feed/Livestock Integration in the steppes of Central Asia.

6.1.2.4 West Asia Regional Programme (WARP)

The activities of the Programme are very diverse and wide ranging; Durum wheat network (WANADDIN), barley improvement, water harvesting, dryland resource management, *in-situ* biodiversity conservation, production and utilization of multi-purpose shrubs and initiative for collaboration to control natural resource degradation of arid lands in the Middle East. The Programme supports wide ranging collaborative and training activities in Cyprus, Iraq, Jordan, Lebanon, Palestine, Syria and the lowlands of southern Turkey. A major activity of WARP is the Mashreq and Magreb (M&M) Project supported by AFSED and IFAD. The first phase of the Project (1995-1998) had two major components of activity: technology development and transfer, and policy and institutional research. The core of the current phase is adaptive research for the development of integrated crop-livestock production with emphasis on on-farm research. A second phase of the project, commenced in July 1998, endeavours to achieve greater integration of the research through a shift to the community rather than individual farmer level.

The main achievements of the programme can be summarized as follows:

- Improving feed production through on-farm testing of forage legumes in rotation with barley.
- Use of feed blocks as protein supplement, which improve ewes' daily weight gain, fertility and lambing percentage.
- Increasing the economic return of sheep owners in Jordan and Syria through early weaning of lambs.
- Identification of sets of policy and other institutional reforms.
- During 1994-1998, 1328 researchers and technicians from the Mashreq countries received training fully or partly organized by ICARDA. Among them 16 completed Ph.D. degrees and 24 completed MSc. degrees.

The future directions of the research programme will include on-farm water management, use of non-conventional sources of water, rangeland rehabilitation, small ruminant production, conservation of biodiversity, socioeconomics and capacity building.

6.1.2.5 Arabian Peninsula Regional Programme (APRP)

The initial involvement of ICARDA in the Arabian Peninsula in late 1988 was focused on wheat and barley improvement and human resource development, but since 1993 it has broadened its scope considerably. Currently, the Programme has four research thrusts, namely; 1) on farm water use and irrigation management; 2) the abiotic stresses of heat, drought and salinity; 3) rangelands, shrubs, irrigated forages and livestock; 4) protected (confined environment) agriculture. A Regional Office was formally established in the Ministry of Agriculture in Dubai, United Arab Emirates (UAE), and a full-time Regional Coordinator and two senior scientists, one for water management and the other for protected agriculture, were appointed.

The current programme is financed by the Arab Fund for Social and Economic Development (AFSED) and IFAD, with the following participating countries: Bahrain, Kuwait, Qatar, Saudi Arabia, the Sultanate of Oman, the United Arab Emirates and the Republic of Yemen. This phase ends in 1999 and a proposal for a subsequent phase is being developed. In addition to traditional donors, ICARDA is pursuing potential opportunities for local funding. In the short period of its new phase, the programme has made good progress. Its achievements include:

- screening of different forages and shrubs for salinity tolerance;
- studies of on-farm water use and irrigation management;
- agroecological characterization of the seven Arabian Peninsula countries;
- a first-ever assessment of the state-of-the-art of protected agriculture in the Peninsula;
- intensive training courses and workshops to enhance agricultural expertise in the region.

6.1.2.6 Highland Regional Programme (HRP)

Although ICARDA's involvement in the highlands goes back to 1985, the Regional Programme was formally established in 1990 to serve the highland environments of Afghanistan, Iran, Pakistan, Turkey and the Atlas Mountains region of Algeria and Morocco. The highlands of West Asia and North Africa represent some of the most marginal areas where crops are grown, often under severe biotic and abiotic stresses. ICARDA strives to develop technologies that increase the incomes of resource-poor farmers of the sub-region.

Among the achievements of the programme are:

- Strengthening Turkey's crop improvement programmes in cereals and legumes.
- Enhancing the technical skills of research staff and strengthening agricultural research for dryland farming in the high altitude areas of Pakistan.

- Strengthening of agricultural research in the high altitude areas of Iran through a nationally funded project, which supported the posting of a senior scientist, building infrastructure, and training of over 430 researchers, including 50 for M.Sc. and Ph.D. degrees.

6.1.2.7 Latin America Regional Programme (LARP)

The objective of the Latin America Programme for the dry areas is to strengthen collaboration with relevant Latin American countries. ICARDA's current Barley Improvement Programme for Favourable Environments, which operates from CIMMYT in Mexico, focuses on adding resistance to multiple diseases to promising, high-yielding germplasm especially suited for resource-poor farmers. The Programme is in a transitional period at this stage. The Regional Co-ordinator's position has been transferred from CIMMYT-Mexico to CIP-Peru, as the Regional Coordinator/ Barley Breeder in Mexico is to retire in 2000. ICARDA Barley Improvement Programme for favourable conditions will continue to operate from CIMMYT-Mexico through a post-graduate position. The socio-economist, posted in CIP-Peru since February 1999, is currently consulting with the concerned countries, specifically Bolivia, Chile, Ecuador, Mexico and Peru, to initiate collaborative research in the area of natural resources management. In response to demand by national programmes, particularly Peru and Chile, ICARDA is exploring opportunities for collaborative work in water use efficiency, and integration of crop/rangeland/livestock (small ruminant) production in the dry areas. Major achievements of the Programme include:

- Eight national programmes released 10 barley varieties with resistance to widespread fungal diseases.
- Ecuador, China and Vietnam released Fusarium head scab resistant barley varieties.
- Hull-less barley has made great impact in both developing and developed countries where breeders have used germplasm developed through the ICARDA/CIMMYT Latin American Regional Programme.

6.1.3 Assessment and Future Challenges

ICARDA enjoys high standing among its partners and is well respected by national scientists and research managers. Through its collaborative research, networks, training programmes and various coordinating and planning mechanisms, there is now greater intra- and inter-country interaction and co-operation among NARSs of the Region. The achievements of the regional programmes in terms of research results, technology generation and transfer and human resources development are considerable as can be seen from the preceding discussions of individual regional programmes.

The regional programmes have, in particular, given greater impetus to the work of ICARDA in germplasm enhancement and training. More than 190 varieties have been released by the national systems as a result of collaborative regional research. Improved packages are now available to farmers. As regional programmes

gained strength, training activities increasingly became de-centralized, as shown by the increase in number of participants in in-country and regional and sub-regional training courses, from 394 in 1993 to 521 in 1998. This represents over 60% of the total participation in training activities during those years. Also, there was a notable increase in the number of publications from research collaboration between NARS and ICARDA, including 17 articles in refereed journals, giving recognition to national scientists.

Another measure of the Regional Programme success could be seen in its improved ability to generate donor interest and mobilize funds for research activities. The share of funds generated through the regional programmes rose from US\$4m in 1994 to US\$8m in 1998, an increase from 22% to 35% of the total grant revenue of the Centre. Likewise, contributions from donors from the Region increased in the same period from 6% to 14% of the total grant revenue, representing 17.5% and 23.1% of ICARDA's restricted-core funding. Since they joined the CGIAR as members in 1995, Egypt and Iran are contributing annually US\$150,000 and \$125,000, respectively, to the non-restricted core of ICARDA in addition to their contribution for bilateral programmes

The volume of the regional collaborative activities has significantly increased, and ICARDA has been active in enhancing its catalytic role and in introducing greater efficiency and cost-effectiveness to its operations. This has not been problem free and a number of issues need careful consideration.

- (i) **Regional Coverage:** As can be seen from the above, the Regional Programme has over the years developed into an extensive collaborative research network involving all CWANA countries and numerous collaborating partners from within and outside the region. However, there is a concern that growth of the outreach programme might outpace the Centre's ability to provide adequate scientific and logistic support. It is a question of balance and focus, and it is crucial for ICARDA to maintain a credible and viable research programme and a sustainable outreach programme as well as maintaining good balance and synergy between the two.
- (ii) **Devolution / Outsourcing:** The twin policy of devolving some activities to NARS partners and outsourcing others has been widely implemented. Advanced NARS are able and willing to undertake specific activities at sub-regional or regional level (e.g. Tunisia, disease screening; Morocco, screening for Hessian fly; Egypt, developing legislation and protocols for the development and release of genetically modified organisms). Some NARS, however, wish to see more formal arrangements for such outsourcing. While agreeing to ICARDA's pragmatic and flexible approach, the Panel suggests that clearer policy guidelines be developed in consultation with the relevant NARS.
- (iii) **Relations with policy makers:** While ICARDA's work is well appreciated by scientists and research managers, it is less known by policy makers in some countries. To ensure greater understanding of

the work of the centre by policy makers and to solicit their support, ICARDA might consider convening meetings involving policy makers and top research managers to discuss relevant strategic and policy issues. This will be more important for ICARDA in future, as it becomes more involved in policy and socio-economic research and in challenging issues such as *in situ* and on-farm conservation of germplasm and the development and release of GMOs.

- (iv) **Centre-Region Interactions:** ICARDA has developed unique opportunities for interaction and cooperation with and among NARS, as both are highly valued by NARS. The main venue for such interaction could be national and regional planning meetings. As these meetings are increasingly dependent on non-core funding, fewer ICARDA scientists are able to participate. NARS have expressed concern about the long-term sustainability of these activities and expressed the wish that ways and means of ensuring their continuity could be sought, particularly as they are basic to ICARDA's core functions. The Panel believes that dialogue and interaction with NARS are fundamental to ICARDA's mission and a long-standing tradition, and protecting such interactions is important.
- (v) **Interplay between the Headquarters and Regional Programmes:** The above-mentioned national and regional meetings, important in themselves, are equally important to effective interplay between ICARDA headquarters research and the regional programmes. The decline in attendance by scientists in these meetings, due to financial reasons, is leading to less interaction between headquarters and outreach research. The Panel was informed that normally advantage is taken when Regional Coordinators are called to headquarters during the annual Board meeting, offering opportunity for consultations among themselves, and with leaders of research programmes. This arrangement, together with excellent working relations between the Assistant Director General for Research and the Director of International Cooperation mitigates the situation to a great extent, but ICARDA is advised to keep this under review.
- (vi) **ICARDA's Role in the Context of the Regional Programme:** Within the Regional Programme context, ICARDA is seen by the NARS as a research partner, facilitator, service provider and technical back-stopper. The role of ICARDA as a partner differs with NARS capacity, needs, and the ability to make impact. There is general agreement that technical backstopping and related activities have positive effects on the quality of national research, especially in research planning, management and reporting. It is important, however, that expansion of outreach activities does not lead to recruitment of more generalist, technical assistance-type staff rather than scientists.

- (vii) **Information Management:** The information generated in Regional Programmes through the numerous special research and development projects is gathered and analyzed at the Centre level as part of the 19 MTP research projects. However, other information and experience have been accumulated, which should also be retrieved and used effectively inside and outside the Region. The Panel suggests that ICARDA review its approach to total data management from its regional collaborative activities.

In view of the importance of the Regional Programme to ICARDA's interactions with its stakeholders and the Programmes' increasing share of the total financial resources of the Centre, the Panel recommends that ICARDA undertake a strategic review of its outreach activities to examine issues of strategic importance including: regional coverage, devolution/outsourcing, interaction with NARS, interplay between research and outreach, information management and its role in the diverse regions.

6.2 ICARDA's Partnerships

Through its collaborative research, networks, training programmes and various co-ordinating and planning activities, the Centre has a complex set of partnerships, particularly with NARS and ARIs. ICARDA relies greatly on national institutions and scientists in developing and implementing its regional programmes rather than building a large outreach staff and facilities. For example, it increasingly devolves the more applied and adaptive research to its outreach locations and, at the same time, it establishes links with advanced research institutes (ARIs) in both developed and developing countries for the upstream work. ICARDA recognizes the important role of NGOs and the private sector, and it increasingly develops collaborative relations with them. In addition, ICARDA co-operates with sister CGIAR Centres in a variety of ways.

In the following sections, ICARDA's partnership with these stakeholders is discussed briefly.

NARS Relationships

ICARDA is well attuned to the evolving agricultural research and development needs and opportunities in the CWANA Region and maintains responsive partnerships with national research systems. Such partnerships are pursued through inter-disciplinary and multi-institutional approaches at the national level and by developing complementarity in research at regional level. ICARDA's outreach programme is the major umbrella for its partnership and collaborative work. Cohesion and harmonization between the NARS and ICARDA are provided through annual national and regional meetings and networks.

Examples of successful NARS/ICARDA partnerships include devolution of applied and adaptive research into problem-solving networks (e.g. six such networks in the Nile Valley and the Red Sea Regional Programme); decentralization of plant breeding for harsh and marginal environments; and outsourcing activities to mature

NARS (e.g. Hessian fly ‘hot spot’ research to Morocco). ICARDA’s current role in these situations is essentially catalytic through sharing of information and experience, and by offering training and promoting innovation.

In addition to supporting individual NARS, ICARDA has been and continues to be supportive of NARS groupings such as the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA). This regional organization has yet to meet the expectations of the founders, but with the help of its cosponsors - FAO, ICARDA and ISNAR - AARINENA is developing a new strategy with the hope of benefiting from recent developments in regional and international agricultural research.

Relationship with Farmers and their Communities

Since its inception, ICARDA has had close interaction with farmers. Earlier in its history, this was largely through its social science staff using conventional formal and informal survey techniques. The period 1993-99 has seen major innovations in methods and applications increasingly in collaboration with research projects. Two facets are particularly noteworthy; first the experimental perspective adopted by the barley programme in its participatory projects, applying scientific rigour to the evaluation of different approaches; and second, the initiative to work at the community level to broaden stakeholder involvement in interactions with scientists. The approaches being evaluated and the skills developed in ICARDA augur well for the dissemination of the participatory approach, through training and networking, to the NARS in the Region. As a member of the *Systemwide Programme on Participatory Research and Gender Analysis*, ICARDA has much to offer to that initiative.

Donor Relationships

In line with recent trends, a number of ICARDA’s core donors have decided to restrict their funding to specific projects or programmes with increased reporting requirements. This has resulted in a closer interaction and dialogue with donors in the development of proposals for restricted funding or grants. In many cases, this interaction led to donors taking an active interest in the project once it was financed, and some became involved in the Steering Committees of the relevant projects. As could be anticipated, ICARDA is becoming increasingly proactive in developing its relations with donors. Senior Management and scientists often visit donor countries to present seminars on ICARDA research to the donor country’s research community, and discussing funding prospects.

ICARDA has developed innovative approaches for its search for new funding. For example, it has prepared a series of one-page “investment opportunities” for donors who might be interested in supporting on-going or potential ICARDA projects with a strong poverty alleviation thrust (e.g., development of low-toxin/toxin-free grasspea, alleviation of malnutrition and poverty by improving the quantity and quality of barley, exploration of income insurance as a safety net strategy, evaluation of micro-credit, etc).

ARI Relationships

Over the years, ICARDA has developed strong and mutually beneficial ties with Advanced Research Institutions (ARIs), many of them Universities, which provide the Centre with access to advanced techniques and facilities, as well as an additional research work force and expertise from post-graduate students and research fellows. The benefits are not limited to headquarters research but also extend to facilitating tripartite collaboration between ICARDA, ARIs and NARS. ICARDA outsources specific research to ARIs due to staff and/or facilities shortage or when greater efficiency would be realized. Arrangements for such co-operation range from formal - often supported by grants and usually governed by specific agreements and budgets - to informal arrangements involving exchange of information, joint supervision of graduate research, or direct collaboration between individual scientists.

In addition to its co-operation with ARIs in developed countries, ICARDA has developed equally strong ties with “centres of excellence” of its developing country NARS partners. As indicated in the Centre’s Medium-Term Plan 1998-2000, ICARDA is making greater efforts to outsource some of its research requirements with mature NARS. Research areas already identified for outsourcing include germplasm enhancement for host plant resistance to important pests, genetic engineering for transformation to improve legume disease resistance, and knowledge-based expert systems for enhanced technology transfer.

NGO Relationships

ICARDA seeks to strengthen linkages with national and international NGOs operating in the region; however, in WANA, few NGOs operate in agriculture. Still, opportunities for linkages are expanding, particularly in farmer-participatory research, transfer of technologies developed through ICARDA’s co-operative research programme, or where ICARDA’s research links with NGO interests in poverty alleviation, nutrition, health and environmental matters. According to information provided to the Panel, ICARDA co-operates with 18 NGOs in 15 countries.

The Private Sector

Co-operation with the private sector is at both national and regional level. Almost all the regional involvement of the private sector has to do with regional meetings on seed-related matters, especially in the area of privatization and management of small seed enterprises. Some co-operation with the private sector at the national level relates to promoting technologies produced by or through ICARDA. A good example of this is the production of feed blocks where 21 private plants are producing more than 24,000 tons of the blocks. Another example is the World Bank supported private sector project to promote commercial cactus fodder production, which is technically supported by ICARDA’s regional programmes. ICARDA is collaborating with a number of companies in developed countries in biotechnology-related areas, e.g. the use of the stilbene-synthase gene that may improve host plant resistance against *Ascochyta* blight, and development of microsatellites markers in wheat and lentil.

IARC Relationships

ICARDA co-operates with ten IARCs in one or more of the following forms:

- Centre to Centre relationship based on shared mandate. ICARDA shares research responsibility for wheat with CIMMYT and chickpea with ICRISAT.
- Centre to Centre relationship based on mutual research interest (CIAT, IFPRI, ILRI, IWMI, IPGRI and ISNAR).
- Co-operation with a group of centres in a specific research undertaking. An example is the Collaborative Programme for Central Asia and the Caucasus involving eight other CGIAR Centres (ICRISAT, ILRI, IPGRI, IFPRI, CIP, CIMMYT, ISNAR, and IWMI, with ICARDA as a facilitator and focal point).
- Co-operation as part of Systemwide initiatives. ICARDA takes part in 9 Systemwide Ecoregional Initiatives as listed below:
 - (a) Systemwide Genetic Resources Programme (SGRP), Convening Centre: IPGRI.
 - (b) Ecoregional Initiative for WANA: "On-farm Water Husbandry in WANA". Convening Centre: ICARDA.
 - (c) Systemwide Water Resources Management Programme (SWIM), Convening Centre: IWMI.
 - (d) Soil Water and Nutrient Management (SWNM) Initiative. Co-Convenors: CIAT and IBSRAM.
 - (e) Systemwide Livestock Programme (SLP) on Feed Resources: Production and Utilization of Multi-Purpose Fodder Shrubs in West Africa, North Africa and The Sahel project. Convening Centre: ILRI.
 - (f) Systemwide Programme on Integrated Pest Management (SP-IPM). Convening Centre: IITA.
 - (g) Systemwide Programme on Property Rights and Collective Action (SP-CAPRi) Convening Centre: IFPRI.
 - (h) Systemwide Programme on Participatory Research and Gender Analysis for Technology Development (SP-PRGA). Convening Centre: CIAT.
 - (i) Desert Margins Initiative (DMI). Convening Centre: ICRISAT.

As the convening Centre of the Ecoregional Initiative for WANA "On-farm Water Husbandry in WANA" ICARDA initiated and participated in case studies in the areas of supplemental irrigation and water harvesting as well as remote sensing. The case studies were carried out in Egypt, Morocco, Iraq, Jordan and Pakistan during the past two years. The research is organised within the Centre's regular project portfolio by the Water Resources Conservation and Management Project within the Natural Resource Management Programme. The Ecoregional Initiative for WANA itself is still in an early stage of development. Restrictions in funding hindered ICARDA and its partners so far to go beyond the initial stage of the initiative.

ICARDA has joined these initiatives for good and compelling programmatic reasons and it views most of them positively. According to the Centre, the transaction costs are justifiable for the synergy and cross-centre benefits they generate.

Networks

ICARDA uses networks as a mechanism for enhancing co-operation and exchange of technology at national, sub-regional, regional and international level. Most of these networks specialize in problem solving or in exchange of information, germplasm and technology. There are now 26 operational networks, down from 33 in 1993 (Table 6.2). The Panel was informed that nine networks have been terminated – eight have fulfilled their goals and one (Development of Autogamous Faba Bean Sub-regional Network) did not yield tangible results and had to be discontinued. Two new networks were created, *West Asia and North Africa Dryland Durum Improvement Network* (WANADDIN) and *Southern Europe and WANA Durum Wheat Research Network* (SEWANA). Ten of these are structured formally - with special-project type financial support - the rest are financed through core.

The Panel notes that national programmes, based on comparative advantages, expertise and available research facilities, are now assuming leadership of several networks. Agro-ecologies of certain countries, as well as the national needs, are major factors in determining the leadership of certain networks, as is the case in disease epidemics, hot spots for major insect pests and diseases, and specific stress tolerances.

Table 6.2 - Number and Distribution of Networks Operated through ICARDA or with ICARDA's Support

BY ICARDA PROGRAMME / UNIT	Number	
	1993	1999
Germplasm Programme (GP)	6	5
Natural Resource Management Programme (NRMP)	3	2
Communications, Documentation and Information Services (CODIS)	4	4
Genetic Resources Unit (GRU)	3	1
Seed Unit (SU)	1	1
Nile Valley and Red Sea Regional Programme * (NVRSRP)	8	6
Latin America Regional Programme * (LARP) – Informal Networks	6	6
West Asia & North Africa Regional* Programmes (WARP/NARP)	2	1
Total	33	26

* Though coordination is done by Regional Programme or NARSs, technical backstopping is provided either by GP or NRMP.

General Assessment

The Panel was generally impressed by ICARDA's partnership activities and commends the International Co-operation Division for building and maintaining excellent relationships with ICARDA's stakeholder and partners, in both developed and developing countries. ICARDA deserves special commendation for its long-standing tradition of forging excellent and mutually beneficial relations with universities. ICARDA has not been as successful with the NGO community, in part because of the very small number of active NGOs in the agricultural and rural sector in the Region, but recent information presented to the Panel indicates progress in this regard. ICARDA has taken steps to identify areas of collaboration with the private sector, particularly in accelerating the commercial use of technologies developed or identified.

The Panel surveyed the views of NARS by means of a questionnaire sent in early June to about 230 NARS partners (mainly NARIs), of which 86 responded. The results confirm the great appreciation of ICARDA's work in the Region. Information exchange, germplasm exchange, training, networking, and joint research programmes continue to receive high marks from NARS. All these activities/services were rated either as 'excellent' or 'good'; none was rated 'fair' or 'poor'. Both country and individual responses were unanimous in stating that ICARDA's research priorities fit national agricultural policies. The Panel commends ICARDA for its endeavour to interact with farmers and farmers' communities and the contribution it is making to the development of innovative participatory approaches, initially in the germplasm programme with barley, and later more widely, including the newly formed NRM programme.

ICARDA enjoys excellent and cordial relations with its host country, Syria. This was confirmed to the Panel during meetings with the Minister of Planning and the Minister of Agriculture and Agrarian Reform. The success of the joint programme between Syria and ICARDA was particularly praised, and continued support to ICARDA from Syria was reaffirmed. Both Ministers stressed the need for ICARDA to continue providing its most needed services to the countries of the Region. Traditionally, ICARDA has maintained close relationship with the Arab Centre for Studies of Arid Zones and Dry lands (ACSAD) hosted in Syria. The co-operation between the two Centres includes joint workshops, conferences and training; exchange of germplasm; plant pathology backstopping; formulation of research programme and participation in networks (e.g. WANADDIN). ACSAD confirmed to the Panel that it views its collaboration as mutually beneficial.

ICARDA collaborates with relevant IARCs in a variety of ways, including providing host facilities to some Centres and acting as a focal point and facilitator for some CGIAR initiatives in CAC countries. ICARDA appears to have satisfactory collaborative relationships, on a Centre to Centre basis, with its sister institutes. Nevertheless, these relationships vary significantly among the various Centres and are evolving, in some cases relatively rapidly, over time. For example, ICARDA has developed an excellent working relationship with IPGRI in the areas of germplasm conservation and documentation and this relationship continues to develop and prosper. ICARDA has also developed a strong collaborative programme with IFPRI and a number of NARS which has opened up policy research in ICARDA (see

Section 4.4.4). It has a long-standing working relationship with CIMMYT in wheat improvement and many of the difficulties encountered in the past have been overcome (see Section 3.1.5). Some tensions still exist, but do not appear to be impairing the conduct of the wheat breeding programmes. ICARDA has a good working relationship with ILRI Systemwide Livestock Programme, in relation to forage shrubs, but the two Centres have been unable to date to achieve a working relationship in animal health in the CWANA region. Finally ICARDA has had difficulty in maintaining a working relationship with ICRISAT in the area of chickpea improvement because of funding difficulties over the last four years.

In addition to the specific issues affecting ICARDA's interaction with other Centres, two broader issues emerged from IARC responses to the TAC Secretariat request for comment. The first was the potential of Centres, including but not restricted to ICARDA, to act as 'gatekeepers', by adopting the stance that all research by other CGIAR Centres, on their mandate crops or regions should be done with or through them as the lead agency. This 'gatekeeper' role has been raised with respect to ICARDA in terms of research in the CWANA region. The Panel has no evidence that ICARDA can or does restrict CGIAR Centres' involvement in the CWANA Region. The Panel, nevertheless, realizes that this matter can create tension among Centres and it urges Boards and Management of Centres to resolve any conflict in a satisfactory manner.

The second issue was the value of regional mandates for crops where another Centre has a global mandate. Centres with a global mandate argue that it is an unfair 'restraint of trade' for them to have to work with other Centres with a regional mandate when they are free to choose to operate with all other CG Centres or third parties where regional mandates do not exist. The Panel was not convinced that regional mandates were a hindrance to productive research relationships or had outlived their usefulness. Indeed, the Panel's assessment is that research performance is enhanced where regional mandates exist, simply because the competitive element between Centres ensures that greater effort goes into regional problems. The Panel therefore supports the efficacy of regional mandates.

The Panel commends ICARDA for its significant involvement in the CAC and its active participation in formulating proposals for relevant CGIAR initiatives. ICARDA has been given the task of focal point/facilitator of the CGIAR Collaborative Programme for Central Asia and the Caucuses involving nine Centres. During the Panel's visit to Central Asia, it was able to witness the efficient manner by which the Programme Facilitator and his staff were acting on behalf of the CGIAR as well as the respect they command from the relevant national authorities.

6.3 NARS Training

Background

ICARDA has a long standing, regional reputation as an institution that links research and training. The objective of its training programme is to transfer knowledge, methodologies, and information from the laboratory, the research stations and farmers' fields to NARS researchers. Since its founding in 1977, ICARDA has trained more than 9000 NARS agricultural scientists from more than 90 countries.

The subsequent close relationship between ICARDA's "alumni" and its scientists significantly strengthens regional scientific co-operation

The Centre decentralized its training activities to take advantage of in-country donor opportunities, linking it to a mix of special project research and bilateral country level funding. Each year they tailor the annual NARS requests into course offerings, designed to fit ICARDA's limited resources and capacity, by combining requests for in-country training and offering regional and sub-regional courses. In the past, training and professional development were organized through long-term courses (4-18 weeks) at Tel Hadya, short-term specialist courses, training workshops, individual non-degree training and other arrangements. ICARDA gradually de-emphasized long-term group training at headquarters and closed it down in 1997. It retains a cadre of degree and non-degree trainees (see Table 6.3), the former affiliated to both ICARDA and a home or overseas university. There has been a significant increase in short-term courses (1-5 weeks) and over sixty percent of this training is now conducted in close collaboration with NARS outside the Headquarters.

ICARDA's updated mandate includes increased attention to poverty alleviation, especially among rural women. Collecting reliable information on women in CWANA agriculture will demand technically trained women. ICARDA reported an increased request from donors and NARS for gender training.

The proportion of women attending ICARDA training has varied between 12 and 18% since 1993. The Centre encouraged women trainees by organizing 5 courses for researchers on gender analysis and by a note in letters to the NARS management promoting applications from women. Some Board members believed that logistical obstacles were limiting the participation of women in training programmes, especially the limited availability of housing appropriate for women. This was addressed through a leasing arrangement to provide housing dedicated to accommodate women trainees. However, these mechanisms have not had a noticeable impact on the attendance of women.

Table 6.3 - NARS Researchers Trained by ICARDA, 1993-1998

	1993	1994	1995	1996	1997	1998	93-98
Long-term group	14	12	10	11	9	0	56
HQ short-term group	111	102	84	146	140	171	754
Non-HQ short-term group	394	294	465	369	504	521	2547
Individual non-degree	83	81	90	84	98	106	542
Individual degree	57	62	68	58	65	67	377
Total	659	551	717	668	816	865	4276

Despite budget cuts and a heavy trimming in the training staff at the centre, the enrolment has increased and 4276 people were trained in the period 1993-98. Three-quarters of the short-course enrolment was in-country, although the fastest growth occurred in short course training at headquarters. Special funding is now covering approximately 60% of the operational costs of the increasing demand for short-courses, in which enrolment has increased 30% since 1994.

Budgetary stress has encouraged innovations in training methods. Since 1991, the Seed Unit has been refining a variation on the train-the-trainer model which might be called the “train-the-trainer with a shadow” approach. Under this model, seven courses, with 75 trainers, were taught. Forty-nine of these second generation trainers, sometimes working in teams, conducted 32 follow up courses with 417 students in 7 topics over the following years. ICARDA instructors backstopped their trainee’s subsequent courses in their home countries and provided them with updated teaching material. The result was a multiplier effect of 8.5 (in terms of participant trained per follow-up course). This model not only reduces training costs, but links ICARDA scientists more closely to NARS counterparts and to decentralized training in NARS. It encourages rapid dissemination of information from Headquarters to the NARS and, through the trainers, to other scientists.

A 1991 follow-up study of the alumni of the 1984-1987 period found that ICARDA training was successfully targeted, and its graduates have attained increasing job responsibility. An update of this study was delayed due to the untimely death of the researcher. ICARDA has been working to complete this follow-up study.

Future Strategies

To maintain high quality in instructor ability, trainees, and course materials with reduced staffing is a continuing challenge. NARS vary in scientific capacity; for example Egypt has over 6,000 Ph.Ds, Yemen only 52, and the HRDU must cope with considerable diversity of trainee needs, technical capacity, and linguistic abilities.

ICARDA intends to continue its multilateral strategy, emphasizing continuous dialogue and consultation with the NARS. Greater emphasis will be placed on alternative training approaches, such as distance learning and audio-conferencing in collaboration with advanced research and training institutions. Emphasis will also be placed on expanding participatory techniques like the ‘train-the-trainer-with a shadow’ and the ‘learning by doing’ approaches. Lower level training (research technician) training will be reduced and resources shifted to advanced, long-term training in new technologies, such as biotechnology, genetic engineering, and GIS.

To reduce administrative cost and time, the HRDU has prepared its training policies for publication on the Intranet and Internet. Requests often include information on local arrangements, as well as on Syria, and these have been referenced on the site. Plans are to update continually this and other pertinent information. Web site pages will be updated to show changes in courses offered, allowing the NARS and regional coordinators to keep current.

The HRDU continues to encourage more cost sharing agreements with NARS and has focused on long-term, collaborative agreements such as those with the UNDP, FAO, GAP Project in Turkey, CIHEAM, and ICTG. ICARDA tries to ensure that externally funded research projects include a training component.

The 1997 CCER

The 1997 CCER recommended that a carefully reasoned training plan, including timelines and milestones and consistent with ICARDA's resources, be developed. The Unit already uses timelines and milestones in its operations.

The CCER also recommended that NARS be informed that a minimum number of slots are being made available to women only, and therefore encourage the NARS to seek out qualified women to nominate. ICARDA did not accept the recommendation, which it believed contradicted social customs in the region. At the same time, the course invitation letters to NARS often request a single nominee, making it difficult to reserve that single slot for women. The Centre has continued to encourage qualified female participants to make use of ICARDA training opportunities. However, some selection criteria, such as years of experience in agricultural research, may inadvertently set de facto barriers, that limit training opportunities for junior professional women. Since such barriers vary from country to country, the NARS might be encouraged to participate in identifying the administrative and outreach methods to overcome them.

The Panel commends ICARDA's response to the decline in funding for training. The cadre of individual degree students at the Centre represents a particularly useful resource in research and research related activities for the Centre. ICARDA has taken creative action on the challenges discussed by the CCER and has successfully avoided weakening training in a time of dwindling resources. The Panel commends ICARDA for seeking innovative ways to sustain the flow of technological and methodological information to NARS scientists and in seeking out long-term agreements and tailoring courses to the needs of NARS. As noted, the diversity in NARS capacity across the region poses problems for the planning of training, but offers the opportunity to use trainers from advanced NARS. Reducing training staff while expanding enrollment and decentralizing courses inevitably raises the issue of maintaining quality. The Panel recognizes that the quality of training is difficult to measure, and the changes are perhaps too recent for any trend to emerge. The Panel suggests that, over the next year, the HRDU should start to compare trainee evaluations of similar courses held before and after the changes as one way to monitor any changes in quality.

Being a good scientist does not always correlate with being a quality instructor. At times strong reactions have appeared when critical evaluations were returned to instructors. The practice was stopped and course evaluations are now given to the scientist's Programme Leader/Unit Head to be considered in the annual staff performance evaluations. ICARDA may wish to reconsider whether this practice is desirable. ICARDA is encouraged to continue to innovate by organizing regular workshop on professional presentation for ICARDA scientists' to ensure they have a good command of innovative teaching methods and technologies.

ICARDA's increased involvement with donor-driven demand for training is leading it into areas in which it may not have core competence and where it may have to draw upon external resources. This should be carefully handled to ensure that high quality training is achieved.

ICARDA's success in raising finance in the regions for training raises a further concern. The increasing reliance on special project and country based bilateral financing may threaten the region-wide nature of its training mandate. NARS requests for training are becoming more difficult to finance from core. Donors and their projects may increasingly monopolize the time of ICARDA trainers, presenting a potential problem for those NARS without strong donor support. ICARDA has already moved to address this problem, both by formalizing umbrella-training agreements with partners, and by negotiating with donors to allow Centre-designated NARS trainees to attend courses being sponsored by special project funds. The Panel commends the Centre for these developments, but cautions that ICARDA needs to keep its own skills and capacity firmly in view in fulfilling its training mandate.

The Panel understands the complexities of training women in the region and shares the Centre's frustration in the failure of its past efforts to increase the participation of women. The issue is discussed further in Section 7.3.

CHAPTER 7 – CROSSCUTTING THEMES

7.1 Quality and Relevance of Science

One of the more difficult tasks faced by the Panel was the assessment of the quality and relevance of the science at ICARDA. First, the assessment of the quality and relevance of science is difficult in any circumstance, because there are few widely agreed criteria or processes. At ICARDA such an assessment is doubly difficult because of its wide range of scientific activities, from strategic to applied, which are carried out in many places in a multiplicity of collaborative arrangements and partnerships. The Panel asked, what should be expected from strategic or applied research in dry areas and how can its scientific quality and relevance be assessed?

In answer to this question, the Panel chose a two-stage procedure. First, it examined the quality assurance procedures that ICARDA had in place for four individual components of the research process:

- research relevance
- research inputs
- research execution
- research outputs

and second, from this information, sought to develop an overview of the relevance and quality of science in the Centre.

7.1.1 Quality of the Individual Components of the Research Process

7.1.1.1 Research Relevance

The relevance of research is difficult to assess quantitatively but determined principally by the quality of strategic planning and topic selection processes. For ICARDA these have been described and reviewed in Section 8.2.3. From this review, the Panel concluded that the planning processes were thorough, inclusive of ICARDA stakeholders, and systematic, resulting in broad acceptance by the staff of the relevance of ICARDA's research agenda. This is not to say that the Panel does not have specific concerns about research relevance in some areas (see selected sections of Chapters 3 and 4). Rather, that in the main, the Panel was satisfied with the Centre's planning process (see Section 8.2.3) and its efforts to refocus or terminate research programmes that have had limited impact.

7.1.1.2 Research Inputs

The main inputs into ICARDA's Research Programmes are staff and infrastructure.

In terms of assuring staff quality, an important first step is the hiring of well qualified people. ICARDA has, in recent years, developed a set of open and transparent processes in the employment of new scientific and technical staff. As a result, the overall quality of staff is generally high; 77 of the current scientific and

administrative staff hold Ph.D.s and a further 33 have M.Sc. degrees or their equivalent. Nevertheless, the Panel has concerns about the appearance of significant gaps in expertise in others; specific suggestions are made in relation to these issues in Chapters 3 and 4.

A second important step is the retention of good staff and the maintenance of staff morale. ICARDA in the past has been criticized for its lack of adequate performance appraisal procedures. However, in the last two years, to ensure that high quality scientists continue to provide high quality inputs into the research programmes, the centre established a new annual performance appraisal system, which is still being fine-tuned.

An important third step to ensuring quality staff is the provision of training courses so that individuals at all levels can upgrade their skills in a supportive, life-long learning environment. While ICARDA has provided a limited number of courses for staff, particularly in computing, biometrics, research management and biotechnology, the provision of training for staff is not a strength of the Centre. Indeed, it is now understood that scientists are not routinely offered opportunities to attend conferences or to acquire new skills in overseas laboratories. The Panel, while accepting the financial constraints on the Centre, believes this practice is shortsighted and has the potential in the medium term to hamper the capacity of ICARDA's staff to adapt to the rapid changes in the major fields in which they operate: genetics and plant breeding, natural resource management and the social sciences.

In terms of physical resources the Centre also has well-defined processes for the allocation of space, experimental facilities, land and the purchase of equipment. These processes seek to ensure that new and existing staff have the capacity to meet their agreed outputs in the MTP. The major research support services were described and reviewed in Chapter 5. The Panel found that the overall quality of the facilities and equipment is also satisfactory, although a number of specific deficiencies were noted (see Section 5.2).

7.1.1.3 Research Execution

Programme Leaders and Project Managers have primary responsibility for the quality of ongoing research in their portfolios on a day-to-day basis, which they undertake through regular monitoring of relevant projects and staff. This monitoring is supplemented by a formal annual review process managed by the ADG-R (see Section 8.2.3) as well as by annual staff evaluations and project reports, particularly to donors. Individual reviews are also supplemented by periodic external peer reviews including CCERs (see Section 7.2). Comparing the present planning processes with those used in the past, the Panel was generally satisfied with the measures the Centre has now put in place to ensure the quality of its ongoing research. The Panel recognises that high quality inputs will not necessarily guarantee high quality outputs and impact, but the improved planning process is a critical step in the right direction. Nevertheless, the Panel was concerned that the Centre still does not have a computerised project management system in place and functioning well (see Section 8.2.3.4).

7.1.1.4 Research Output

ICARDA has a number of processes in place to ensure the quality of research outputs. At the programme and project level these include CCERs, adoption and impact studies, and feedback from NARS, ARI's and mentors.

Publications are one important output from ICARDA. The quality of papers produced by ICARDA scientists is monitored by a structured, internal refereeing process. Formal approval for papers to be submitted for publication is given by the ADG-R on the basis of this internal assessment. There are also well developed mechanisms within the Centre to record and assess publication outputs.

Another important output is useful products derived from ICARDA's research. These include a broad spectrum of products including improved cultivars, soil and plant test kits, computer packages and water management methodologies, legume seed harvesting equipment and on-farm technologies and processes. In the past these products have received less recognition than publications. However, this is now changing, and the Centre now has a more formal processes for cataloguing and recognizing such products. However, the formal processes to assess their relevance and impact are ad hoc, relatively arbitrary and not yet strongly linked to reward systems.

7.1.2 Panel Assessment of the Relevance and Quality of Research

Several criteria can be used to assess and assure scientific quality¹⁴:

- *Publication record*, including the quality of journals in which a work is published. Traditionally, in institutes that work in pure and strategic research, particular emphasis has been given to refereed international journals. However, in an institute such as ICARDA with a relatively high emphasis on strategic and applied research linked to outreach, other sorts of publications such as reference books, Training Manuals and Conference Proceedings can be of importance in assessing quality and relevance of output.
- *Citation analysis*, which may be regarded as an objective way to determine how important or useful a publication is considered by other scientists.
- *Output of useful products*, these may be finished products used directly by farmers or farm advisors, such as improved varieties, test kits or new machinery. Alternatively, they may be intermediate products such as gene probes, genetic stocks or research methodologies that are used by other scientists, particularly in NARS.
- *Relevance*, does the research align well with the mission and plans of the Centre and its stakeholders?

¹⁴ Sindermann (1985)

- *Peer review*, widely regarded as an essential part of any scientific enterprise, and a check on ideas and the value of research.
- In the case of institutes with a training function, *the number and quality of graduating students*.

In assessing the quality of science at ICARDA, the Panel put particular emphasis on 5 criteria:

- Publications, in refereed international journals because of the widespread use of this measure.
- Other publications, especially book chapters, conference proceedings, reference books and training manuals, because of their importance not only internationally but in regional programmes.
- Other outputs, including both finished and intermediate products because of their importance in adoption and impact, which are seen by the CGIAR as key performance criteria of a Centre's research.
- Number of higher degree students (Ph.D./M.Sc.) completing degrees at ICARDA, a measure of the Centre's contribution to the human scientific capital of the region.
- Adoption and impact, assessed in quantitative studies.

Publications

The publication output of the Centre in terms of journal articles and other publications for the years 1994-98 inclusive, is summarized below.

Table 7.1.2.1 – Number of journal and other articles published by ICARDA Scientists (1994 – 98)

YEAR	1994	1995	1996	1997	1998
Journal Articles	86	65	66	49	45
Other Publications	121	124	181	168	138

These figures suggest there has been a decline in refereed journals since the last review. Even if we accept the possibility that 1994 was an abnormally high year and that all of the 1998 publications may not have been recorded, the downward trend is still of concern, as it suggests a decline in first rate science application at ICARDA over time. This is of particular concern, given that the total P/RA level staff declined by only 3 over the same period (from 84 to 81). At the same time, there appears to have been an increase, at least initially, in other less formal publications from the Centre, but this is also now trending down.

The Panel's observations indicate that several factors have contributed to this decline. These include: (i) the rapid growth in restricted funds and the greater demands placed on staff time to prepare project proposals, Medium Term plans and reports to the Centre, Donors and the CGIAR, (ii) the greater proportion of staff in regional/outreach programmes (10 in 1993, 21 in 1998) where it is difficult to pursue research and where other activities (e.g. coordination, technical back-stopping and training) utilise a greater proportion of staff time than at headquarters, and (iii) a lack of a consistent positive attitude towards publication in internationally refereed journals by some senior staff and management. It can be argued that the reduction in number of refereed publications represents a reduction in the quantity of science being done at ICARDA rather than a reduction in the quality (see Section 7.2.1). However, even if this argument is accepted, a fall in refereed journal articles by about 50% over a five year period when the total ICARDA revenues increased by about 40%, suggests a significant shift of resources into activities other than research. This is a worrying trend, not only for ICARDA but the CGIAR as a whole, given its focus on the application of leading edge science in the alleviation of poverty. In particular, it suggests that ICARDA's research programmes (as well as those in other Centres) may be in danger of losing critical scientific abilities, visibility and credibility, in some key areas.

A further analysis of the ICARDA publication data for internationally refereed journals is shown below. In this case, the data are broken down by the major MTP research themes and show the mean number of publications/scientist year for each group.

Table 7.1.2.2 – Average Number of Journal Articles (JA) and Other Publications (OP) Per Scientist at ICARDA (1994-98) by Research Theme*

YEAR	Publication	1994	1995	1996	1997	1998
Germplasm Enhancement	JA	3.2	2.4	2.6	2.5	2.1
	OP	3.9	4.5	4.9	7.0	5.0
Production Systems	JA	2.2	1.7	1.8	1.6	0.9
	OP	3.6	3.5	3.0	5.7	2.4
Natural Resource Management	JA	0.6	0.6	0.4	0.5	0.5
	OP	1.6	0.6	1.0	1.4	1.2
Social Sciences	JA	0.8	0.5	0.4	0.3	0.2
	OP	3.7	3.7	2.8	3.3	2.3

*Base data provided to the Panel, 24 April 1999

What this table emphasizes is that science quality as measured by publications in refereed journals varies markedly amongst the major ICARDA research themes. The germplasm enhancement group clearly has a strong record of achievement and would be equal to many equivalent groups in ARI's in developed countries and the

better groups in other Centres. The other groups compare less well. In the case of the social sciences and natural resources management, it should be noted that a number of new staff have been appointed in recent years, and there may not have been time to produce significant outputs at this level. Nevertheless the figures are concerning. These data also reinforce the point that publication rate/scientist year has decreased in all thematic groups.

The data for other publications are more consistent across groups, suggesting that scientists in Production Systems, Natural Resource Management and Social Sciences put relatively more of their effort into less formal publications. There is also less of a decline across years for other publications compared to journal publications.

Useful Products

As noted earlier, the Centre also produces a wide range of other useful outputs, both finished and intermediate, in addition to publications. For ICARDA's thematic research groups these include:

Germplasm Enhancement: Released varieties, new sources of genes, molecular probes, improved breeding procedures.

Production Systems Management: Elisa kits, IPM packages, simulation models, decision support systems, technologies for rangeland rehabilitation.

Natural Resource Management: Methodologies for water capture, storage and use, methodologies for erosion-hazard assessment, ex situ and in situ conservation of genetic resources, models of crop productivity.

Socioeconomics and Policy: Decision tools, diagnostic surveys, adoption studies, impact assessment, policy evaluation tools.

Some of these, such as the numbers of cultivars released and numbers of germplasm samples conserved, are easy to quantify, but others are not. In those cases where a quantitative analysis was possible, the data suggest that there has been a trend towards reduced outputs over the last 5 years. One example is the number of improved cultivars released by the Germplasm Enhancement Programme (over all crops and species) with NARS partners, which are given below:

Table 7.1.2.3 – Number of Cultivars of All Crop and Forage Species Released Using ICARDA's Germplasm (1994-98)

YEAR	1994	1995	1996	1997	1998
Cultivars Released	50	56	24	35	34

While the numbers released are still impressive (on average about 1.7 varieties released per scientist per year), there is a downward trend over the last five years. This apparent downward trend may simply indicate that it is now harder to develop new cultivars that are significantly better than previous releases from ICARDA

germplasm. Alternatively, it may represent a shift in emphasis in ICARDA's germplasm programme to more intermediate products. It should be of concern to Management.

Student Numbers

The number of theses published by students undertaking higher degrees at ICARDA, are given in Table. 7.1.2.4 for the years 1994-98 for the major MTP research themes. Completions provide a truer measure of contributions to the trained human resource base than current enrolments.

The data overall indicate that ICARDA has maintained a consistent record of achievement in postgraduate student training. The Panel commends ICARDA for its continuing commitment to postgraduate research training.

Adoption and Impact

ICARDA has increased its emphasis on formal quantitative studies of the adoption and impact of outputs, particularly improved cultivars, since 1993. Over the last 5 years social scientists have conducted over 80 diagnostic, adoption and impact studies. However, only one of these was a quantitative impact study. Further, such studies do not seem to be used except in the most *ad hoc* way in the performance assessment of the scientists who developed the technology, as distinct from the social scientist who studied its impact. A full discussion of this issue is given in Section 7.4 and Section 4.4.

Table 7.1.2.4 –Number of Theses completed by Higher Degree Students Undertaking Research Projects at ICARDA (1994-98 and total)

Programme	1994	1995	1996	1997	1998	Total
Germplasm Enhancement	9	11	14	6	6	46
Production Systems	5	5	5	9	5	29
Natural Resource Management	10	5	6	10	7	38
Social Sciences	5	0	1	1	2	9
Other	2	3	1	3	0	9
Total	31	24	27	29	20	131

Box 7.1: Socio-Cultural And Economic Research—Quality and Relevance of Science

In an addendum to the general TOR for the EPMP, the Panel was asked by TAC to undertake in-depth analysis of the extent and quality of ICARDA’s research on socio-cultural and economic issues, focussing particularly on the “quality and relevance of science.” The findings of the Panel are detailed in the socio-economic and poverty alleviation sections of this report (Chapters 4.4 and 7.1 respectively) and can be summarised as follows:

- Examination of the social science studies for the perspective on beneficiaries shows a trend from working on all farms to focussing on resource-poor farmers; from a focus on agricultural production only, towards more emphasis on poverty alleviation; and from household analysis towards gender-disaggregated analysis of beneficiaries.
- While there have been a number of individual studies that should have led to the production of typologies, characteristics, and needs of the ultimate users, ICARDA social scientists have yet to define types of producers, households or communities for CWANA, apart from standard production-defined, typological distinctions (irrigated/rainfed, large/small, crop-livestock, etc). Nor have the more than 80 studies been synthesised into clear producer/adopter/impact profiles for the region.
- Social science impact is evident in programme identification, adoption studies, impact on centre programme direction and planning, policy analyses, and ability to assure an awareness of CGIAR mandated programme directions in the social sciences. Despite their diverse and sustained contribution, ICARDA social scientists have yet to develop an internationally recognised and defined focus. The human and cultural ecology aspects of anthropology have not yet been integrated into the natural resources research work, despite more than 10 years of anthropology input in the Centre. The desire of production scientists for simple typologies for use in sampling frames is unmet.
- During the period under review, the quantity and quality of research output have not been commensurate with the number of social scientists engaged in research. With a few exceptions, analytical tools have been basic, standard and non-innovative. While publications per scientist in refereed journals dropped from 3.2 per scientist in 1993 to 2.1 in 1998 in germplasm enhancement, that for social scientists dropped from 0.8 to 0.2.
- ICARDA social scientists as a group have made a major contribution to the institutionalisation of farmer participatory research in ICARDA, and throughout the region. There is much integration of the social science and biological science activities in the Centre. This is confirmed by the fact that 60% of the social science publications were cross-referenced as joint publications with non-social science projects, showing a substantial integration of the work products. The anthropologist has played a major role in this respect (participatory barley breeding).

Overall Assessment

The overall conclusions of the Panel from this analysis are:

- i. research performance is uneven. Some programmes are excellent with high outputs of quality publications as well as other products; other groups have performed less well both in terms of publications and other outputs;
- ii. research performance and science quality, to the extent that they be measured by articles in internationally refereed journals and numbers of released cultivars, has declined on a per scientist basis over the last five years.

To improve research quality and relevance, and to help develop a more prominent place for the conduct of multidisciplinary research at ICARDA, the Panel recommends that the Management promote quality and multidisciplinary research through recognition, rewards, and other incentives, and by assuring that appropriate criteria are covered in its Performance Evaluation process.

7.1.3 Assessing the Quality of Science in Regional Programmes

ICARDA now has 21 staff in Regional Programmes and Country Offices, up from 10 in 1993. These staff undertake a wide spectrum of activities, including strategic and applied research.

Despite the fact that ICARDA now has about 25% of its staff in the regional programmes, the Centre appears to have given little attention to (i) defining appropriate performance measures for such staff, in particular establishing a set of expected quantitative and qualitative outputs, and (ii) establishing quality assurance procedures for regional staff and their activities.

It is important for the Centre to do this. Otherwise its performance and that of its regional staff are likely to be misjudged using traditional criteria (publications, cultivars, etc.), when in fact they are performing well in terms of their expected functions.

In view of the substantial and increasing numbers of ICARDA staff involved in regional programmes, the Panel suggests that ICARDA establish for such staff:

- i. appropriate performance criteria and expected outputs;
- ii. mechanisms and procedures to assure quality of science and performance.

7.2 CCERs –Quantity and Quality

Centre Commissioned External Reviews (CCERs) represent a relatively new approach to the review process in the CGIAR system. An outline of this approach and its relative merits are discussed in the paper: *“Improving the Quality and*

Consistency of the CGIAR's External Centre Reviews – prepared by the CGIAR and TAC Secretariats for ICW 95.

CCERs serve two purposes. They are a management tool that allows (i) a Centre's Board and Management to obtain external expert advice on the ongoing activities of the Centre, and (ii) provide input into the EPMR process. ICARDA has used the potential of CCERs well to review its programmes at critical times of change to facilitate planning that allowed it to reposition itself in a changing world.

ICARDA commissioned a total of 8 CCERs in the five-year period 1994-1998 inclusive. These were distributed amongst the Programmes and Units as indicated on page 105.

As can be seen, the CCERs covered both the research programmes, all 6 research support Units including the Station Operations (machinery) and Management (finance & administration). This is an excellent coverage, and provided background material on a broad range of the Centre's activities for the EPMR.

The CCERs commissioned by ICARDA differed significantly in a number of respects. All were led by distinguished, internationally recognized specialists in their fields. In turn, these were supported by one (Review of CBSU) to five (Review of Cereal Germplasm) additional team members, in line with the complexity of the TORs of the review. Review periods varied from 2 to 9 days, but in only one case did the review team suggest the time was too short to allow detailed assessments to be made.

Use of CCERs in the EPMR process

The CCER reports commissioned by ICARDA each highlighted challenges, opportunities or recommendations for strengthening or redirecting programme activities or indicating suggested changes in support services and management. The Board and Management then took these suggestions and recommendations and considered them, in most cases adopting all or part of them, and then implemented the relevant changes.

The Panel's comments on each of the CCERs, how they were used by the Centre, and the utility of their recommendations are included in the sections of this report dealing with the particular programmes, unit or activities. In most cases the Panel did not repeat the individual recommendations of the CCERs as they had already been commented on, and in most cases acted upon, by the Centre Board and Management.

The Centre provided copies of each of the CCER reports to the EPMR and in its Synthesis 1993-1999 document listed the Centre's responses to each of the recommendations and/or suggestions to the review. This was valuable in allowing the Panel to assess both the initial response of ICARDA to the reviews and whether their actual response had rectified the problems or challenges the CCERs sought to address.

One issue which emerged during this process was the level of detail which should be included from the CCERs in the final EPMR Report to avoid apparent gaps in coverage. The question raised was: If the Panel approved a CCER process and its recommendations, is it sufficient to say this in the report or is it necessary to summarise the CCER findings and to reproduce its recommendations? In this report the Panel decided to list all the CCER recommendations with the Centre responses in an Annex. It was felt this approach would allow the interested reader to assess both the breadth and depth of the CCER recommendations, as well as the appropriateness of the Centre's response, while avoiding unnecessary repetition in the body of the report.

DATE CCER	COVERAGE								
	M	GE	NRM	GRU	SU	HRDU	CODIS	CBSU	SO
June, 1994 (Production Systems)			X*						
February, 1995 (Natural Resources)			X**						
November, 1995 (Farm Machinery)									X
March, 1996 (Legumes)		X		X	X				
February, 1997 (Cereals)		X		X					
February, 1997						X	X		
January, 1998 (Finance & Administration)	X								
February, 1998								X	

* Project housed in PFLP

** Project housed in FRMP

M = Management

NRM = Natural Resource Management Programme

SU = Seed Unit

CODIS = Communication, Documentation and
Information Services

PFLP = Pasture, Forage and Livestock Programme

GE = Germplasm Enhancement Programme

GRU = Genetic Resources Unit

HRDU = Human Resources Development Unit

CBSU = Computer and Biometric Services Unit

SO = Station Operations

FRMP = Farm Resource Management Programme

Assessment

Overall, the CCERs provided a very useful platform on which the EPMR Panel could build, and provided critical assessments of the quality and effectiveness of much of the Centre's activities. They enabled the Panel to focus more on strategic (rather than detailed) assessments of research programmes.

For the purpose of the EPMR, the quality of the CCER reports varied significantly. The report of the first two reviews of the projects under the former PFLP and FRMP were relatively short, and limited themselves to considerations on broad changes in research directions and allocations. Further, the first in June 1994, failed to give a clear set of recommendations. The CCERs of the GE programme were more detailed, comprehensive and focussed on project assessments. The Panel gained the impression that the quality of the reports improved over time, suggesting that the Centre learned from the process and became more expert at commissioning the

reviews and developing effective TORs. One common deficiency of the CCER Reports of the research programmes was the lack of explicit comment on science quality. Three of the four reports did not comment explicitly at all, the other provided only qualitative comments based almost exclusively on the publication records of the scientists concerned. Clearly, if the CCERs are meant to provide clear and objective assessments of science quality for the EPMR, then this aspect of their conduct requires attention

In summary, the CCER reports provided helpful input into the EPMR process. First, most of the Centre's activities were reviewed. The major exception here was the Regional Programmes, and this is taken up in Section 4.1, although some individual projects have been externally reviewed by donors. Second, from late 1995 on, the CCER reports were comprehensive, and provided a detailed analysis of the problems facing particular groups in the Centre, and suggested courses of action. Understandably, the EPMR did not always agree with the CCER recommendations or the Centre's response. The Panel suggests that in commissioning future CCERs the TORs specify attention to science quality and the need for clearly expressed recommendations.

7.3 ICARDA's Focus on Poverty and Gender

7.3.1 Background

As indicated in Chapter 1, poverty is pervasive in the dry areas of the world, with wide variations within and between countries in CWANA, and is most prevalent in rural areas.

From its beginning, ICARDA was to “*raise the standard of living and promote the social, economic, and nutritional well-being*” of peoples in developing countries. Its 1989 Strategic Plan also points to implications of the shift to drier areas as an “*increased focus on the poorer, smaller producers for whom farming is a high risk enterprise.*” In an early recognition of the need to focus on poverty alleviation, and a concern for gender issues, the plan emphasised that; “*within the farm family, ICARDA's work will primarily affect those who provide labour for crop and livestock production. In the [C]WANA area, women shoulder a major share of the work on the farm, which becomes particularly demanding in those cases where young males are attracted to more remunerative [off-farm] work....*”¹⁵

7.3.2 Current Focus and Achievements

Prior to 1996, ICARDA focused on increasing productivity and natural resource management to improve the well-being of the poor. Although it had not identified a particular subgroup of the poor within the region on which to focus, research emphasis in marginal resource areas often meant that ICARDA was conducting research on issues linked to poverty alleviation.

¹⁵ Sustainable Agriculture for the Dry Lands: ICARDA's Strategy. ICARDA Aleppo, Syria. 1989.

The 1996/97 strategic planning exercise, leading to the 1998-2000 MTP, captured considerable interest and initiated a crosscutting Centre focus on poverty alleviation. Methodologically, this can be seen in more poverty-focused economic synthesis, policy research and a widening use of a participatory framework. Like the farming systems research framework, the poverty alleviation focus is challenging ICARDA's social scientists methodologically. They are turning their attention to ways to examine more closely on-the-ground links between agricultural research, agricultural policy, and their impact on incomes among the poor.

In its 1998-2000 MTP, ICARDA approaches poverty alleviation through four research thrusts each of which has been assessed by the Panel in the respective chapters dealing with the research programme:

- Increasing quantity and stability of production resulting in improved incomes (Chapter 3.1 - *Germplasm enhancement*)
- Enhancing the quality and quantity of natural resources employed in production which is sustainable over time (Chapter 4.3 - *Production systems, and 4.2 - Natural resource management*)
- Increasing the diversification of production and products that increase marketability and reduces risk of economic loss (Chapter 4.4 *Socio-economic research*)
- Improving the quality of production and added value to products at the farm and community level to improve returns to producers and improve market position (Chapter 4.4 *Socio-economic research*)

ICARDA has also intensified its focus on beneficiaries since the last EPMR. The user perspective has been partly incorporated into ICARDA's priority setting framework. It has also been introduced into the research programmes by including a concern for quality and acceptability of the final products in germplasm enhancement, by bringing farmers on-station to help in selection of new varieties, and by taking early germplasm to farmers' fields. Preliminary results from participatory barley breeding experiments are confirming that plant breeding can be organised to include farmers as major actors in the selection, testing, and multiplication of new cultivars. The user perspective, including indigenous knowledge of ecological processes and resource management, is incorporated in NRMR in Egypt, Syria, and Yemen, and is planned at research sites in Central Asia and the Caucasus.

Examination of the social science studies for the perspective of beneficiaries shows a trend from working on all farms to focussing on resource-poor farmers; from a focus on agricultural production only, towards more emphasis on poverty alleviation; and from household analysis towards gender dis-aggregated analysis of beneficiaries.

The CGIAR aim is for the IARCs to focus on poverty alleviation, with an emphasis on beneficiaries, especially rural women. Prior to 1993, three CGIAR Gender Programme consultants examined ICARDA's research portfolio for links

between production characteristics and gender¹⁶. They identified major institutional constraints to an integrated focus on gender:

- a lack of socio-economic capacity, particularly at field assistant level,
- incomplete understanding of how gender issues might contribute to the efficiency and equity of agricultural research, and
- a deficiency in training in gender sensitive quantitative methods.

During the review period, ICARDA decided not to form a distinct gender analysis unit, or to hire a gender specialist. Instead it has sought to weave gender into the existing research programme. An international staff research associate whose responsibilities include incorporation of gender analysis in ICARDA research activities has been recently appointed in the NRMP. With the assistance of her fellow social scientists and advisors, she is adapting gender analysis methods to the circumstances of the CWANA Region. ICARDA has begun to collect basic information on gender, and has increased work on gender issues in lentil/barley and livestock/barley systems. Products include a comprehensive literature review of women in agriculture in CWANA and a directory of researchers on women in agriculture.

Demand for training in gender analysis is high in the region, especially among NARS partners. ICARDA has conducted five courses on gender analysis and women in agriculture, (71 women participants) held in Egypt, Jordan, Morocco, and Syria. No training or awareness workshops have been held for ICARDA scientists, although the CGIAR Gender Programme Consultants recommended these.

7.3.3 Future Strategy and Plans

The Panel was informed that in the near future, the Centre hopes to:

- Incorporate poverty-weighted criteria in its selection of Unified Research Sites.
- Undertake synthesis studies, to determine the behavioural attributes of poverty that may influence the technology needs, adoption patterns or demands on the management of natural resources used in agricultural production.
- Assure that its future co-operative research with NARS, and its own socio-economic studies are routinely desegregated and analysed by farm size, farm type, resource endowment, and gender.

The community-based studies in the Mashreq-Maghreb Project will incorporate gender analysis. The Netherlands is supporting a MS-level person to work on impact assessment of ICARDA's research, particularly with respect to environment, poverty and gender. A linkage grant from USAID is supporting a study in child nutrition status among households with different types of food systems and different income levels. Another MS study will focus on Syrian women. A staff member who has

¹⁶ H. Sims Feldstein, J. Leesburg, and L. El Fattal. Gender Analysis in Agricultural Research at ICARDA: A portfolio review and strategy for future. November 19, 1992.

focused on female labour work groups in Syria will be completing her PhD. The Panel encourages ICARDA to continue these types of student research projects.

7.3.4 Assessment and Future Challenges

The Panel found that ICARDA had increased its focus on poverty alleviation among beneficiaries, especially rural women, in line with the CGIAR's new priorities. ICARDA research on gender related issues is embryonic, but expanding. Measured against the CGIAR Gender consultants' recommendations and suggested strategy, ICARDA has moved forward. The Panel encourages ICARDA to use tripartite criteria (poverty alleviation, food security, NARS needs) routinely for aligning its research priorities.

ICARDA does not yet have a formal strategy to ensure that gender becomes a routine part of its research programme. A Gender Research Committee was formed with terms of reference to liaise with the CGIAR Gender Programme and advise on gender-related research issues. Introduction of Centre personnel issues have confounded its discussions, but now a gender strategy is emerging. The Panel believes that a Gender Research Committee with a clear focus on gender in agricultural research would accelerate this trend. Personnel issues related to gender employment should be handled by a different mechanism.

ICARDA has justified requests for donor support on its ability to alleviate poverty. Seldom, however, is the research product evaluated in terms of whether or not poverty alleviation actually happened. The Panel strongly encourages ICARDA to assess critically or at least test the association of poverty and resource-limited farming, which grows out of an agroecological, - rather than a socio-economic - characterisation of farming. The empirical evidence on the links between poverty and land degradation is mixed.¹⁷ The Centre should adopt more of the multidimensional indicators of poverty that are commonly used in international poverty research. These generally refer to material deprivation, including consumption-based poverty measures.

The Centre is encouraged to undertake other poverty alleviation investigations that may include:

- Empirical testing of the assumption that underlies so much of CGIAR and ICARDA research – that increases in productivity lead to increases in farmer income and reduction in poverty.
- Examination of the place of non-farm income on natural resource management conservation and other agricultural decisions, within the context of socio-cultural transformations (especially, the demographic shift toward a more elderly rural population and the changing roles for women).
- Determination of ways to increase the productive capacity of community organisation, co-operatives, and other forms of agrarian social arrangements that are commonly used in managing farming resources.

¹⁷ See review by S. J. Malik. Rural Poverty and Land Degradation: A reality check for the CGIAR. August 1998.

The Panel believes that research relevance will be enhanced by wider initiatives to understand women's roles in the agriculture of the region. The Panel suggests ICARDA has the opportunity to help the region by preparing, in conjunction with the NARS, an outreach strategy to increase the proportion of women being trained in agricultural research. Such a strategy would best be based on an analysis of scientific areas in which trained women have a comparative advantage, and here help might be obtained from the CGIAR Gender Programme. The role could extend to encouraging NARS towards better understanding of the agricultural activities of women across the region to enhance relevance in both training and research. Regarding training, the Panel suggests ICARDA should seek partners to facilitate its efforts in this area.

The Panel endorses the decision of ICARDA not to set up a separate gender analysis unit, but to weave gender into the existing research programme. However, the Panel suggests that ICARDA should recruit/designate a senior scientist who would have part-time responsibility for ensuring that gender analysis is integrated into the Centre's research programmes, and is of the quality required in an international centre.

The livelihood strategies of the poor include actions and trade-offs that reduce risk, increase or protect their resource endowments, facilitate information dissemination, widen their choices, expand capabilities, in addition to strategies that increase yields. More social, economic and agroecological information is needed to synthesize and focus ICARDA's limited resources on poverty alleviation.

Recognizing that ICARDA has conducted a wide range of studies offering partial insights into poverty, the Panel recommends that ICARDA determine, with its partners, the rural livelihood strategies of the poor in its region to clarify what research options, investments, policies, and technologies are most likely to benefit them. Special emphasis should be given to highly vulnerable segments of the population.

Once available, ICARDA should use this knowledge to evaluate under what circumstances continued or new investments are likely to benefit the poor.

7.4 Towards a Centre Strategy on Impact Assessment

The 1993 EPMR recommended [2.5, page 42] 'ICARDA should conduct impact studies of its major technologies so that, by the time of the next ER, clear, quantified data are available'. Over the 5 year period 1993-98, while the Centre, through its social science group, has implemented and reported on many adoption studies, it has only completed a limited number of impact studies, and only one which quantifies the economic returns to research.

Full impact studies examine the improvements in income and productivity from an intervention, and may estimate its effects on employment and other wider economic variables. Studies may also estimate the impact on natural resources and possible trade-offs between changes in productivity and in the environment. They may be done at several levels (farming system, region, agro-ecology, country). Full impact studies absorb time, skills and a high level of funds, mainly due to the need to

collect reliable, detailed data, usually at the level of the household. Given their cost and the time lag required for the spread of innovations, such studies are usually done where there is evidence of some farmer adoption.

7.4.1 Stakeholders in Impact Assessment and Study Objectives

Donors, the CGIAR, the Centre and the NARS all have a stake in the assessment of the performance of their activities. Donors want to understand the outcomes from their investments, both to satisfy their domestic constituencies, and to validate their processes for project selection. The CGIAR uses similar information to reinforce its case to donors as an avenue for effective investment. The Centres use such information for evaluation of their programmes and for promotional purposes. Full impact assessments have no value for year to year, or even medium term, center planning. The lag period – from Centre output, through adaptive research in the NARS, farmer adoption and enough dissemination to justify a study – ranges from 5 to 20 years. Though few do so as yet, NARS can use the same type of information for convincing policy makers to support agricultural research, as well as to evaluate their relationships with other partners, including the IARCs.

7.4.1 Formulating an ICARDA Strategy for Impact Assessment

In an ideal world, every project would be assessed by a full impact study. In the case of ICARDA, the implication of such a strategy would be studies of each project in each of the countries to which it was targeted. Hypothetically, for example, one might suggest 19 projects each that are relevant to 10 countries; further, assuming useful output after 5 or 6 years, this would imply some 35 studies a year, a level of coverage using resources well beyond ICARDA's means and that would absorb more than the Centre's existing social science capacity. The Centre needs a strategy to compromise on such an ideal.

It helps in thinking about a compromise to distinguish between intermediate and final research products. Again ideally, as an international centre ICARDA would produce intermediate products (genes, germplasm, new understanding of soil, water, crop and human processes) which require further processing to final products (varieties, field practices, new methodologies), usually through adaptive research in the NARS or other institutions. Although ICARDA has little control over this downstream process, many of its efforts in capacity building and collaboration seek to improve it. Their impact can be evaluated by examining downstream performance. The Seed Unit offers an example. The performance of some of its projects can be measured by the trend in the rate of turnover of varieties in farmers' fields, or, as an easily obtained proxy for this - the increasing rate of expansion in seed sales of new varieties.

7.4.2 Appropriate Measures of Performance

Donor, CGIAR and Centre interests in performance, and their promotional needs can at least partially be met by measures of performance much cheaper to monitor than full impact studies.

Intermediate products can be identified and counted as a measure of output, and the number of NARS, NGO's or companies adopting them, or taking them up for further development, as intermediate beneficiaries. Such a measure serves to highlight the diversity of the Centre's clients and products. Some estimate of potential impact can be offered by relating the expected improvement in performance, in economic, or environmental measures, of such products (suitably discounted for full field performance when the only measure of improvement is from experiments) to the target area envisioned for the intervention.

For final products a number of cheaper measures, while not recording full economic or environmental impact, have a value for both Centre planning and for promotional purposes.

- Surveys counting farmer adoption and farmer estimates of the changing acreage under adoption can be combined with diagnostic studies to evaluate sub-groups which have not adopted the technology, in order to re-shape it to fit their needs. These are particularly useful for national programs implementing adaptive research programmes and running such surveys routinely.
- Trends in sales of improved seed at both local and national levels.
- Trends in area and yield statistics, at local and at national levels.

7.4.3 Full Impact Assessment

The output from full impact studies will be for promotional purposes and to provide insights into the development process. Research projects at ICARDA, for full impact assessment will inevitably be self-selecting. They will be those projects which have been disseminating outputs for some time, which have had some adoption as intermediate products by NARS, NGO and/or commercial partners, and which, as final products, show adoption by farmers. Such self-selection, while immediately laying the study open to criticism of bias, is the most practical, cost effective way forward.

A useful aim is to be able to show returns, direct and indirect, to the single project under assessment, and to consider these against the costs of the project itself, the total programme of which it is a part, and the total investment in ICARDA. Reporting should acknowledge the self-selection bias, but also note that not all research activities lay such golden eggs. This 'dry well' phenomenon, so far ignored in agriculture research, is well established in manufacturing. Studies have shown that in manufacturing companies, some 80% of R & D activities never come to market. Clearly the ones that do offer very high returns, even to total company investment on R & D, not merely the investment in the successful product, would be considered to have most successful impact. The 'dry well' phenomenon might be an area of interest to the Impact Assessment and Evaluation Group (IAEG) of the CGIAR.

Given the current donor climate, a limited, carefully chosen selection of full impact studies are probably worthwhile for ICARDA. The Panel endorses the recommendation of the last EPMR that "ICARDA should conduct impact studies of its major technologies so that, by the time of the next external review clear,

quantified data are available'. Perhaps a realistic target is one each year. This can be supplemented by a range of other, less costly, performance measures on intermediate products, and on final products being adopted by farmers in the region. Studies on final adoption by farmers might best be done in collaboration with, or even outsourced to, the NARS, and in such cases ICARDA can help them target the results to national policy makers. Such a strategy keeps the resource commitment under control, and provides a flow of new promotional material to keep stakeholders enthusiastic. Perhaps the IAEG could help Centres, including ICARDA, to formulate cost effective impact strategies.

7.5 Is ICARDA Overstretched?

ICARDA faced a number of challenges and changes during the review period and increased demands have been made of the Centre. The question is not whether ICARDA has been stretched, for it clearly has, but whether it has been stretched too thinly to maintain the quality and integrity of its strategic research programmes. Both external and internal factors are examined in this section.

Fall in Core Funding

The most significant external factor influencing the Centre has been the precipitous drop in unrestricted core funds, from about 80% in 1993 to 30% in 1998. This drastic trend was managed by attracting project funding to support an ever-increasing share of the Centre's total budget. As is detailed in Section 8.3 this has created heavy demands on Management and scientists, both for interaction with donor representatives and for the preparation of project proposals, and has significantly increased individual workloads.

The fact that ICARDA has successfully turned to sources of funding within the region, together with the geographical expansion in the operational mandate, brought a number of ramifications:

- There has been an increase in scientific staff positions in the region - from 10 in 1993 to 21 in 1999, and a decrease in the number of scientists at headquarters¹⁸.
- Regionally deployed staff can spend a greater proportion of their work time on project administration, technical backstopping, training, liaison and representation, allowing less time for research.
- The research pursued under regional sources of funding, particularly that supported by donor development programmes, is often adaptive or applied research and often location specific.
- Training has increasingly been deployed to the regions.

¹⁸ According to the Centre, of the 21 scientists in the region, 6 are primarily responsible for project administration and NARS liaison, and 15 are full time scientists implementing components of the agreed MTP.

A second external factor has been the need for the Centre, like others, to respond to new initiatives which emerged from the CGIAR, TAC, and the donor community. All these initiatives clearly added to the workload of scientists and Management at ICARDA. Expansion of the CGIAR to include Eastern and Central Asia led to ICARDA having responsibility to facilitate the efforts of other IARCs working in the Central Asia Region. The extension of ICARDA's geographical mandate required further regional staff both scientific and administrative.

The Lucerne Declaration called for a peer, rather than a mentor/client relationship with NARS, with implications for new ways of working both in the regions and in international cooperation. Both facets added to the workload of scientists and managers at the Centre.

The CGIAR and TAC promoted the importance of NRM research and led the development of an ecoregional approach. This stimulated ICARDA to expand its skill mix in NRM associated disciplines. The CGIAR and TAC also promoted system wide initiatives on strategic issues in NRM requiring the co-operation of several centres, to improve intercentre coordination and cost effectiveness. ICARDA joined several of these initiatives and is the convenor of the one on On-Farm-Water Management. [see Section 6.2]. These two have made extra demands on Management and staff.

TAC and the CGIAR Secretariat made changes to the IARC planning and review process. They asked the IARCs to implement Center Commissioned External Reviews (CCERs) to complement the external review process. The eight CCERs mounted by ICARDA during the period brought in more than two scientist years of external reviewers. The Panel estimates that approximately six ICARDA scientist years may have been required to deal with these CCERs. The CGIAR and TAC also asked for rolling Medium Term Plans (MTPs) for programmes and budgets and promoted the practice of project based management with the IARCs.

7.5.3. Internal Factors

In 1996 ICARDA revised its Strategic Plan with several implications for the organisation and management of the Centre. The planning process included a review of the term, Dry Areas, and its geographical implications which widened the Centre's activity beyond the WANA region. TAC agreed to that widening and to other adjustments in the operational mandate when it approved ICARDA's MTP 1998-2000.

A new Director General recruited a new management team and major downsizing was begun, in part because of planned programme changes but also in response to the funding crisis. A re-engineering of the Centre included restructuring at HQ and the greater decentralization of research and training to its seven regional programmes. Despite downsizing, research was increased in some areas. These activities and changes demanded time from the staff and managers, increased workload, and, by their nature, heightened uncertainty about both career development and future job continuity. Some Management actions also had repercussions on scientists time management.

7.5.4. Assessment

The Panel concludes that, while it is not yet critical, there is evidence that the Centre is in danger of being overstretched.

The reduction of staff at headquarters threatens critical mass in several areas of the core strategic research programme. The Panel identified pathology, genetic resources, resource economics and, looking ahead to future needs, biotechnology, as affected areas.

Dependence on special project funding has brought shorter term contracts for scientists and greater uncertainty about continuity of funding, career development and future career paths. The same uncertainty also threatens the continuity of long term research programmes.

The quality of science appears to have suffered in some areas. Section 7.1 details the downward trend in the number of refereed publications and germplasm releases over the Review period.

The Panel believes that, unless corrective action is taken, ICARDA could begin to lose effectiveness if the pace of externally generated demands on the Centre were to continue. Its concern at the erosion of strategic research capacity at headquarters is demonstrated in Section 3.1.3.4 with the recommendation on the recruitment of a fungal pathologist. A number of comments from regional partners suggest that ICARDA is already perceived to have lowered its level of support from Headquarters, despite the increase in the number of regional based scientists. The Panel has dealt with this aspect in Section 6.1.3 in recommending a strategic review of regional programmes. The Panel seeks to deal with staff issues in Section 8.2.4.2. and by the related question of the effects of the quality of science by its recommendation in Section 7.1.2.

Beyond this there is need for greater focus. The Panel suggests three ways forward. First, the use of the new CGIAR poverty alleviation emphasis to terminate lower priority projects and to wind up work in locations which do not meet this test. The Panel has addressed this in its assessment of the NRM Programme in Section 7.3. Second, work with the donor community to increase the research component in country specific development funding made available to ICARDA - reinforcing the idea that it is an international centre and its outputs need to be useful across country boundaries. Third, ICARDA might seek greater research output from supporting NARS with strong programmes relevant to its mandate. For example, high value is being obtained from the modest support given to strong individual scientists in Central Asia.

Finally, the Panel recognizes that while ICARDA has been significantly affected by the decline in core funding, the Centre's situation is not unique. The Panel believes that the changing funding pattern and its implications for the work of the IARCs need to be explored fully on a system-wide basis. Further, it fears such funding could bring about a significant change in the nature of the research programmes of the IARCs, that strategic research of a global nature may be foregone in favor of adaptive research or technical assistance, and that contradictory poles of

activities may be emerging as centres struggle to stay viable as important, unique, international entities.

The Panel recommends that TAC undertake a comprehensive analysis of the impact of the continuing decline in unrestricted core funds on the Centres' research activities and their outputs and impact, as well as on their interactions with national agricultural research systems and advanced research institutions.

CHAPTER 8 – MANAGEMENT

8.1 Governance and Leadership

8.1.1 Board of Trustees

Stewardship of ICARDA's mandate and mission is vested in its Board of Trustees (BOT), currently consisting of 16 members. Of these: 2 are nominated by the Government of Syria (the host-country), and 1 by the Government of Lebanon (a country where a principal station of ICARDA is located); 3 by the CGIAR; and 9 by Board members themselves. The DG is an *ex-officio* member. All trustees, except for the host-country nominees and the DG, are appointed to a term of 3 years, limited to 2 consecutive terms. The rules of procedure specify that the BOT meet at least annually. Table 1 shows the gender, nationality, areas of specialization, terms of office, and current position on the Standing Committees of the members.

8.1.2 Board Structure and Functions

In order to perform its functions the Board has 4 Standing Committees - Executive, Programme, Nominations, and Audit. These committees meet when the BOT meets and at other times as necessary. The functions of the 4 Standing Committees are, briefly:

- Executive Committee - to act for the Board in the interim between Board meetings in accordance with Board directives; to serve the Board in an advisory role in matters relating to budget and finance.
- Programme Committee - to consider and make recommendations on ICARDA's programmes; to advise the DG and the Board generally on ICARDA's programmes; to monitor and review the implementation of the research programmes.
- Nominations Committee - to monitor and review the composition of the Board; identify persons and maintain a file of potential candidates for Board position; propose suitable candidates for election; present the case for re-election of Board members; nominate, in consultation with the Chairperson, candidates for the Standing Committees.
- Audit Committee - to provide assistance to the Board in fulfilling its fiduciary responsibilities relating to accounting, investment, internal controls and financial reporting; ensure that accounts and financial statements are properly audited by External Auditors; consider Internal and External Auditors' reports prior to presenting them to the Board; communicate sensitive issues to the Board and its Executive Committee for consideration and action; recommend annually to the Board, the appointment of the Centre's External Auditors.

In 1996, the Programme Committee instituted “monitoring sub-committees” drawn from Board members, to monitor, through interaction with the functional units (research and research support) at the Centre, the quality of their outputs and plans for the future.

Assessment

The current Board has a reasonable blend of scientific and general administrative expertise, and an appropriate geographical spread (and balance) of countries served by ICARDA as well as of donor countries. Two members are due to complete their terms at the Board’s annual meeting in August 1999. One successor has already been nominated and is going through a process of induction as observer, prior to joining the Board formally. The Panel found that the Nominations Committee is well aware of the need to maintain a balance on the Board in expertise, geographical representation, and gender. The Board has developed a set of criteria, which is used for succession planning against a horizon of at least two years. The Panel notes that gender balance in the BOT continues to be weak; the Panel was given to understand that it is this particular issue that is holding up succession of the second retiree. While the table might also imply a weakness on Finance *per se*, the Panel learnt that several current members have wide experience in this field through their positions as heads of institutions. The Panel recognizes that composing a truly representative Board is not easy, and finds that the process in place for addressing the problem of balance is sound.

The Panel finds that the recommendations by the 1993 EPMP on: i) mechanisms for oversight; ii) assignment of responsibility for reviewing and assessing the full range of administrative and management systems; and iii) a BOT endorsed process for nominating the Chair and Vice-Chair, have been fully addressed. Oversight has been addressed through Board “monitoring sub-committees” set up for in-depth interaction with the various functional units (research, research support), the introduction of quarterly operating reports from the DG to all Board members, and through the Board’s heavy involvement in the preparation of ICARDA’s strategy in 1996/97. On administrative and management systems responsibility, the Board has enlarged the responsibilities of the Audit Committee; and the issue on a process for nominations for the Chair and Vice-Chair, assigned to the Nominations Committee.

The Panel has two suggestions on these specific items: First, on oversight - with the growth of regional programmes, the Board may wish to re-examine the extent of the regional programmes in the light of the views of some members of the Board that the Centre might be spreading itself too thin. Additionally, it might consider instituting a “monitoring sub-committee”, specifically for periodic, in-depth reviews on programme effectiveness, and its effect on ICARDA’s research output. The Panel is aware that members undertake regional visits individually and that the Board meets at one of the regional programme sites on alternate years. The Panel considers that this is not the same as a formal monitoring process. Second, on administrative oversight and a process for nominations - the Panel suggests that the enlarged responsibilities given to the two committees (Audit, Nominations) should now be formalized by including them in the Board Handbook.

The Panel had an opportunity to attend the Board and the Standing Committee meetings, interview Board members individually, and peruse minutes of meetings. It found that Board members are aware of their responsibilities and accountabilities (as covered comprehensively in an ICARDA Handbook and the set of CGIAR Guidelines). The procedure of introducing a new member to the Board in an observer capacity, at one meeting prior to formal appointment, and election to the Programme Committee on joining the Board, is seen by members as a speedy route to full participation. (This is in addition to a formal orientation programme including visits to programmes in the regions). The Panel commends the Board for institutionalizing the orientation process.

In the period 1994 –1998, the Board has also been pro-active in commissioning an extensive range of CCERs, that covered research, training and support services [details in chapter 5]. These included one in 1998, specifically for Finance and Administration. This again is a reflection of the Board's desire for a thorough understanding of the Centre. On the question of whether an annual meeting is sufficient for oversight of this Centre, the Board has taken the following approach: The EC meets, formally, in the interim between annual meetings, but acts only as directed by the full Board; the EC shares its deliberations with all members; frequent contacts between the Board Chair and the DG, and the Chair's practice of keeping all members informed. The Panel agrees that this is a pragmatic solution to keeping the Board involved between the formal, annual meetings.

The Panel learnt that a sub-committee of the Board, chaired by the Board Chair, conducted periodic performance reviews of the DG, fed back review results to the entire Board for endorsement before discussing the review with the DG. Members of the Panel were present when the Board unanimously endorsed the most recent review results. The Panel is pleased to note that a formal, scheduled process is in place and is being used effectively.

During the period covered in this review the Board Chair initiated self-assessment of the Board as a formal, structured process. As this approach was not accepted by several of the members, the Chair introduced an open-ended, consultative process which members accepted and is now in use. The Panel found this to be a pragmatic interim measure. However, it is of the opinion that, now that the purpose and the usefulness of such assessments has been accepted, the time may be right for re-introducing a formal, structured process taking into account CG Guidelines on the subject.

Overall, the Panel finds that under the present Chair, whose term will expire in August 1999, a cohesive team has evolved that operates in a collegial manner. The Panel commends the Board Chair, Chairs of the Standing Committees and members, for their actions cited earlier, and is confident that the various measures now in place give the Board a good grip on its stewardship responsibilities. Minutes show that members contribute constructively to the governance of ICARDA and are active participants at meetings. The Panel also noted that there is a good understanding between the Board and the Management of ICARDA on their respective responsibilities and roles. The Panel commends the Board for its strong contribution to the strengthening of the Centre over the past few years.

TABLE 1: INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS (ICARDA) - BOARD PROFILE

NAME	BOARD COMMITTEES	GENDER	NATIONALITY	DISCIPLINE	NOMINATED BY	TERM START	DATES END ¹
Ahoomahesh, Ali	M-PC	M	Iran	Plant Protection	Board	05/01/94	05/05/00
Alaoui, Assia Bensalah	M-PC	F	Morocco	Law	CGIAR	04/01/94	05/05/00
Bronnimann, Alfred	C-BOT, C-EC	M	Switzerland	Plant Pathology	Board	04/01/93	08/16/99
Coffman, William	C-PC, M-PC	M	United States	Plant Breeding	Board	05/10/93	08/16/99
Davies, John, OBE	C-AC, M-EC, M-PC	M	United Kingdom	Entomology	Board	04/01/94	03/31/00
de Nuce de Lamothe, Michel	M-AC, M-PC	M	France	Agronomy	Board	04/19/97	04/18/00
Dudal, Raoul	M-PC	M	Belgium	Soil Science	Board	04/25/95	04/24/01
El-Beltagy, Adel	M-EC, M-PC	M	Egypt	Biology	Ex-Officio	02/01/95	01/31/05
El-Zabri, Ismail	M-NC, M-PC	M	Jordan	Agricultural Economics	Board	04/19/98	04/18/00
Hamze, Mouin	C-NC, M-EC	M	Lebanon	Plant Physiology	Member Go	05/29/91	05/05/00
Havener, Robert	M-NC, M-PC	M	United States	Agricultural Science	Board	04/19/98	04/18/01
Ismail, Toufik	M-AC, M-EC	M	Syrian Arab Republic	Economics	Member Go	01/28/93	05/01/01
Kobori, Iwao	M-EC, V-BOT	M	Japan	Administration	Board	07/16/96	07/15/99
Monti, Luigi	M-EC, M-NC, M-PC	M	Italy	Plant Breeding	Board	04/25/95	04/24/01
Sharafeldin, Mamdouh	M-PC	M	Egypt	Animal Science	Board	04/18/98	04/17/00
Some, George	M-PC	M	Syrian Arab Republic	Irrigation Management	Member Go	04/28/91	05/01/00
Franck-Oberaspach, Peter	M-PC, O	M	Germany	Plant Breeding	CGIAR	08/17/99	08/13/02
BOARD MEMBERS WHO HAVE RETIRED FROM 1993 TO AUGUST 1, 1999							
Casas, Joseph		M	France	Economist	CGIAR	1993	1998
Istanbulluoglu, Ersin		M	Turkey	Animal Science	Board	1993	1998
Noolan, Julie (Virgo)		F	USA/Australia	Management	CGIAR	1993	1998
El-Badawy, Mervat		F	Egypt	Economics	Board	1992	1997
Yoshida, Tomio		M	Japan	Soil Science	Board	1994	1996
Faraj, Hoceine		M	Morocco	Agronomy	CGIAR	1988	1994
Halse, Norman		M	Australia	Animal Science	Board	1988	1994
Ouellette, Gerard		M	Canada	Soil Science	Board	1988	1994
Porceddu, Enrico		M	Italy	Genetics	Board	1987	1994
von Urrf, Winfred		M	Germany	Economics - Agricultural Policy	Board	1988	1994
Rabbinge, Roelof		M	Holland	Ecology	Board	1987	1993
Riley, Ralph, Sir		M	United Kingdom	Cytogenetics	Board	1989	1993
NOTES	Board Committees - Acronyms			Nominated by			
	C - Chair	BOT - Board of Trustees		Member Go -		Nominated by the Host Government In their Official Capacity	
	V - Vice Chair	AC - Audit Committee		Ex-Officio			
	M - Member	EC - Executive Committee					
	O - Observer	NC - Nomination Committee					
		PC - Program Committee					

¹ The term ends at the end of the regular meeting of the Board in that year.

8.2 Organization and Management

8.2.1 Institutional

Structure

ICARDA's present organizational structure is one result of the comprehensive revision of Centre strategy undertaken in 1996. It also addressed a recommendation made by the 1993 EPMR, that an organizational study be undertaken to "... *include a carefully reasoned work programme for the Deputy Director General-Research that enables the incumbent to focus on research leadership and oversight*". The product of this exercise is shown in Figure 1. The principal differences between this structure and the previous one which was operational till end 1996 are: i) Responsibility for all research and research support units are vested in the re-designated post of Assistant Director General-Research (ADG-R); ii) Responsibility for all Regional Programmes is with the re-designated Director-International Cooperation (D-IC), in parallel with the ADG-R; iii) The creation of the post of Assistant to the Director General, equivalent to an ADG-At Large (ADG-AL). The opportunity was also taken to strip a layer off the organization to make it more horizontal and balanced than previously. The post of Director Finance and Administration is currently under recruitment, and in the interim, the ADG-AL has been given this responsibility. The Board approved this structure in February 1997.

Management

Two main management committees - Executive, Management - are forums where management decisions are taken. The Executive Committee, composed of the DG, ADG-AL, ADG-R, the D-IC and (currently) the Acting Director of Finance, meet weekly on issues requiring a senior management perspective. The Management Committee, which combines Executive Committee members with all Research Programme Leaders, Unit Heads and the Internal Auditor, meets monthly, to address administrative and financial issues related to research and training. There is a hierarchy of other activity-specific committees, chaired by a member of the management team, which assist the two management committees.

Assessment

The Panel finds that the structure is suited to ICARDA's current mandate, and its modalities of working with partners, donors and the CG system. Job descriptions for all management positions are clear and well defined. Equally, the division of responsibilities between the ADGs and the Directors on the management team, are unambiguous; and the workload appears to be balanced. The requirement that the ADG-R focus wholly on research is also met. The D-IC now takes total responsibility for implementation of regional programmes which includes staff support to the DG on donor relations. The creation of the post of the ADG-AL is sensible for two reasons: i) With the DG having to spend some 40% of his time on donor relations, the ADG-AL backstops the DG in his absence, and ii) because the DG takes responsibility for liaising with the CG system, inter-centre initiatives, and dealing with external agencies, means that the ADG-R and the D-IC can concentrate on their respective research programme responsibilities. The nature of ICARDA's programmes and

funding (a large portfolio of regional programmes; some 70% of funding from multiple donor sources) obviously requires close coordination and almost daily contact between the DG and members of the management team, and especially, between the team members themselves. The Panel is satisfied that the formal (institutionalized committees) and the informal daily interactions, work smoothly. Organizations are only as good as the incumbents in the various positions. The Panel is pleased to note that the DG has assembled a highly competent team, who work in harmony. In turn, the management team is backed by an efficient and knowledgeable secretarial team. The post of Director-Finance and Administration, has unfortunately, been vacant since July 1998. This puts an additional load on the ADG-AL, limiting the time available for managerial supervision of the units in Finance and Administration.

On taking up appointment the DG showed decisive leadership in many areas, amongst which: swift action taken to tighten operational practices which were found to be slack; measures taken to improve the cost-effectiveness of support systems; the successful drive for funds which offset the steep decline in core funds. Additionally, with the backing of the Board, he has taken initiatives on strategic planning, donor relations (Section 8.2.2), Board interface, and used CCERs as a mechanism for review on selected areas of research and administrative functions. He has also taken steps to discourage the cliques that had formed amongst the internationally recruited staff. The Panel finds that the DG in particular, and the management team as a whole, have shown strong leadership in a period when much of the Centre's attention has had to be devoted to finding alternate funding sources, and to re-engineering the organization. The Panel, however, wishes to draw attention to the fallout from these actions of which the Management may be unaware. Based on interactions with staff, both by questionnaire and interviews, the Panel finds a general perception:

- that some staff feel they are unable to express views openly to Management.
- that some Management decisions in reacting to short-term events, are disproportionately disruptive of staff work schedules

Moreover, the Panel found that morale among some staff is not what it should be for a Centre with a challenging portfolio of opportunities. Management, understanding the totality of Human Resource concerns of staff and addressing them as suggested in Section 8.2.4, should resolve this issue.

8.2.2 Donor Relations

Organization and Management

Responsibility for donor relations rests on the DG. Staff support for this activity is provided by the rest of the EC members, with D-IC in a focal point role, supported in turn by the Project Officer, Programme Leaders and the Regional Coordinators. With the large shift on funding sources that has taken place since 1994, where some 70% of ICARDA's current funding is through one or another form of restricted fund (types and modalities covered in Section 8.2.3.1), this is a key activity for the Centre. A process has evolved where currently, annual campaigns can be planned and mounted in a systematic manner. It is based on a historic trend analysis

of donor contributions, prepared by the D-IC, where the previous years' pattern allows a profile to be made of each donor. These are compared with responses received during contacts made by Senior Management and the DG with donors, in order to identify what measures bore fruit. A campaign, proposed by the D-IC and endorsed by the Management Executive Committee, is then mounted. The campaign includes, among other initiatives, the dispatch of information material (targeted to donors' specific interests), visits to the donor by the DG, Board members, Senior Management and/or scientists as appropriate, contact with ambassadors based in Syria, and embassies of donors in the CWANA countries. A multi-media presentation at the Centres week is a further channel for donor relations. The Centre has also stepped up its public awareness efforts in order to reach a wider audience than the traditional donor agencies. The Panel learnt that the DG and the D-IC devote approximately 40% and 50% of their time respectively, to donor relations.

Assessment

The Panel finds that ICARDA has developed a professional process for donor relations. The steps outlined earlier are time consuming not only for Senior Management, but to a lesser extent, also for other scientific staff who are called upon from time to time for information or presentations to donors. A good indicator of its efforts to maintain close ties with the diplomatic community in Syria, is that, the Centre's *Presentation Day* has been included in the annual calendar of diplomatic events. All these initiatives have certainly borne fruit as ICARDA has been able to raise its total funding by some 30% in the period 1994-1998, while core funds declined steeply in the same period. The Panel commends the Centre on its donor relations activity and trusts that Management will keep a prudent balance between efforts devoted to fund-raising *vis-à-vis* the research agenda and its management.

8.2.3 Research Management

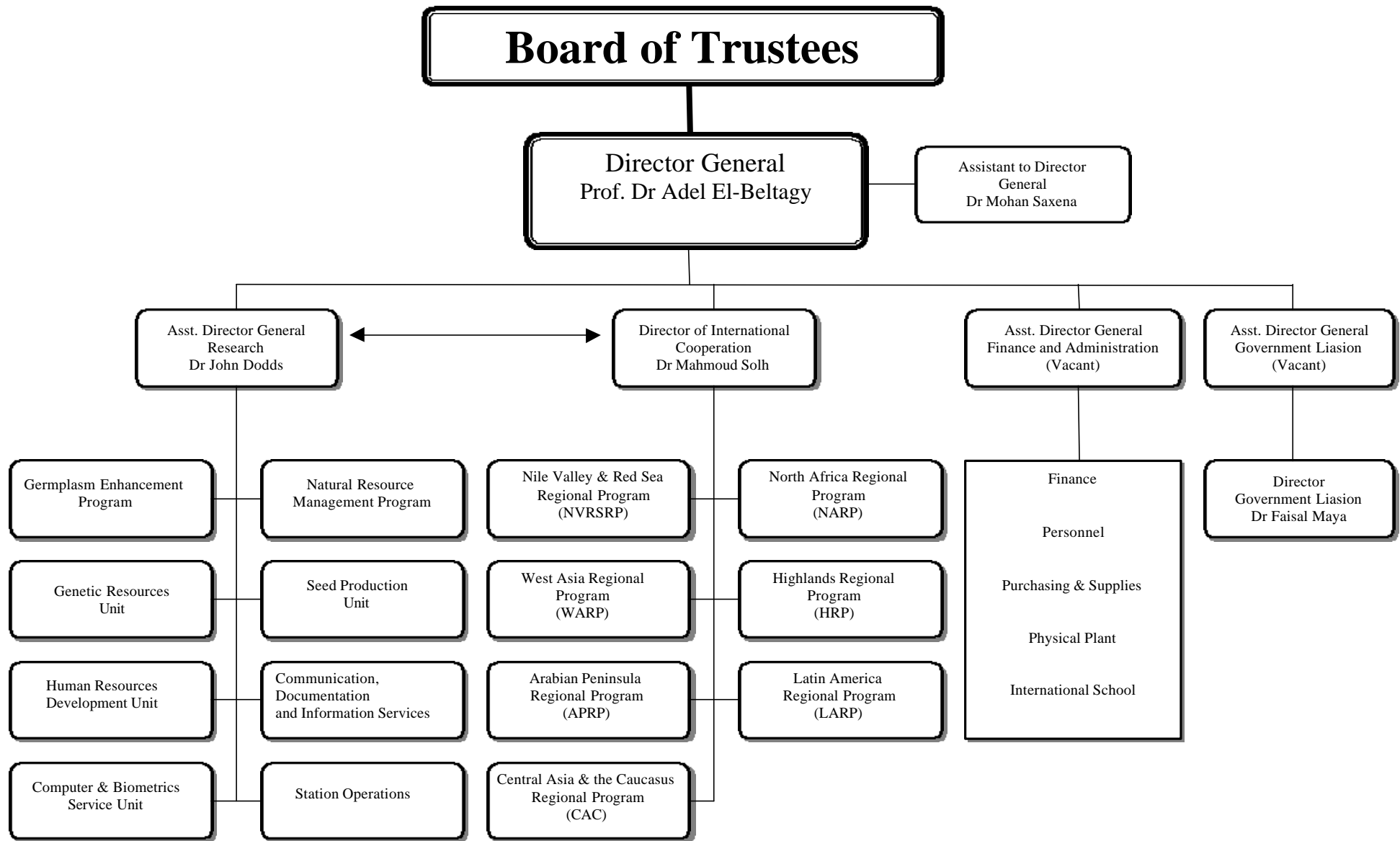
8.2.3.1 Introduction

Research management at ICARDA is complex. It begins with the mandate, which encompasses a diverse region of more than 40 countries in the most water-scarce region of the world, and deals with:

- Global mandate crops – barley, lentils and faba bean.
- Regional (CWANA) crop responsibilities in partnership with sister centres – wheat (with CIMMYT) and kabuli chickpea (with ICRISAT).
- Natural resource management research in dry areas – soil, water, biodiversity, rangelands and small ruminants.

The research is carried out through 19 multidisciplinary projects by scientists in Germplasm Enhancement Programme, Natural Resource Management Programme, a Genetic Resources Unit, and a Seed Production Unit, with assistance from the four other research support units, Figure 1. It is carried out at ICARDA sites in Syria and Lebanon, and in the regional programmes, in a decentralized continuum involving numerous partnerships (covered in Section 6.2).

Figure 1: ICARDA Organizational Chart



This complexity is further compounded because of the multiple sources of funding that have to be tapped to fulfill its mandate. Declines in core funding have caused all IARCs to become more opportunistic and flexible in managing their research agenda. In the case of ICARDA, from a ratio of unrestricted core to *restricted* of 80:20 in 1994, in 1999 it is now 30:70. Within the *restricted* category there are, again, 4 streams:

- *Restricted* core funds for CGIAR themes.
- *Restricted* core support to MTP projects.
- *Restricted* grants (special projects) with fixed terms and itemized budgets.
- *Restricted* funds from tripartite cooperation (NARS/ICARDA/Donor).*
(*A source encouraged by the World Bank)

Thus, projects may be financed with a combination of unrestricted core funds, plus *restricted* funds, often from more than one source. The multiplicity of funding sources, many of them quite specific and short-term, means that a constant search must be made to obtain funds to secure and sustain high-priority research. Such funding also brings special reporting requirements that place extra burdens on research management and scientists. These many factors require that Research Management at ICARDA must be agile, vigilant and well-informed about the programme, its progress and possible needs for adjustment, but above all, adept in melding core and non-core funds to secure and sustain high quality staff and have effective research processes to achieve longer-term objectives.

8.2.3.2 Management

The principles followed for managing research at ICARDA include:

- Focusing research on ‘needs driven’ problems and opportunities identified in cooperation with NARS.
 - Integrated approaches to problem solving and priority setting.
 - Partnerships of all types, and enhancement of NARS capabilities at national and regional levels.
 - Maintaining an enabling environment for dialogue and interdisciplinary discussion.
 - The concept of ‘A Centre Without Walls’.
 - A research continuum, irrespective of geographical location.
 - An ability to revise staffing patterns to reflect changing research trends in a rapidly changing research environment.

To implement and monitor the research agenda, a project based management scheme is used. ICARDA’s ADG-R describes the research management system as follows: “... *the 19 MTP projects cover the entire research of the Centre. The management of the system is shared cooperatively by the ADG-R and the D-IC; where the ADG-R is wholly responsible for the review and quality of the science performed,*

while the D-IC is responsible for quality and timeliness of reporting to donors and the coordination/facilitation of regional Programmes, including enhancing NARSs and Donors relationships. This process is highly dialog oriented and involves discussions and feedback from Programme Leaders, Research Project Managers, and Regional Coordinators”.

Accordingly, under the leadership of the ADG-R, research responsibility is delegated down the line to the two Programme Leaders (PLs) who are accountable to the ADG-R for their respective thematic programmes, and further down the line, to the 19 Research Project Managers (RPMs) who are accountable to the PLs for the 19 MTP projects. Similarly, the ADG-R’s responsibility for the other 6 Units is delegated to the heads of these Units, one of whom is also a Programme Leader.

Regional Programmes (Section 6.1) represent the collaborative research, training, technology transfer and other activities undertaken with NARS partners. They provide a continuum of research from ICARDA to NARS partners and are an integral part of the research mandate of the Centre. The D-IC is responsible for coordinating (with the ADG-R) and facilitating their implementation, consisting of some 80 restricted projects. The D-IC’s responsibility is delegated to Regional Programme Coordinators (RPCs), outposted in the respective regional offices, who are accountable to the D-IC. In addition there is a Project Officer at the Centre, reporting to the D-IC, who provides project management support for the restricted projects. The D-IC also provides staff support to the DG on all donor and partner-country business. These include identifying donor interests *vis-à-vis* potential funding, preparation of special projects for funding by donors or partner-countries (from bilateral loans/grants), progress reporting to donors and/or governments, and preparation and administration of contracts entered into with such funding entities.

To summarize, the two arms of ICARDA’s research activities are complementary, and require close coordination between the ADG-R and the D-IC. However, management responsibilities are clearly delineated as described in Section 8.2.1.

8.2.3.3 Planning and Review Process

Planning

The Panel found that ICARDA used a systematic process, run through several iterations, to generate a well-documented strategy in 1996/97. It involved three steps: strategy development, research prioritization and project prioritization. Development of the strategy was based on a comprehensive array of inputs which included, among others: formal inputs from the NARS, the Board, CGIAR and TAC directives on priorities and strategies, global concerns, and changes in the mandate and geographical spread.

In determining its research priorities, ICARDA used a procedure which integrated its mandate, mission and strategic goals, concerns of the NARS partners, ICARDA’s comparative advantage and expected research outputs. By identifying research needs associated with its mission, broad programmatic themes were developed within which individual projects were formulated with detailed objectives,

outputs and resource needs. The process was structured to ensure that there was wide participation within the Centre, complemented by consultation at national and regional levels with the objective of obtaining ownership at all levels of the research portfolio.

For priority-setting among projects ICARDA adopted a modified *Delphi* approach, which identified a hierarchy of criteria that represented measures of contribution to institutional goals and strategic goals, modified at a second pass by a further set of factors¹⁹. Senior scientists scored ICARDA's existing projects using three measures for each of five criteria: i) productivity enhancements, ii) relevance to the poor, iii) resource conservation, management and use efficiency, iv) internationality, and v) strengthening NARS. The process, conducted over a period of 15 months in 1996/1997, required heavy investment in time by management, staff and the Board and resulted in the 1998–2000 Medium Term Plan.

Review

The annual review is a formalized review of progress on all projects. It is prepared by programme leaders and unit heads under the direction of the ADG-R, and is a comprehensive review that is documented and incorporated into ICARDA's annual corporate report after endorsement by the Programme Committee of the Board. In addition to this annual review there are project-specific reviews on most *restricted* projects, and other *ad-hoc* reviews, including CCERs. This is mainly due to the fact that each *restricted* project specifies its own frequency and format for reporting. For defining projects in the work plan for the year 2000, ICARDA will be using the *logframe* methodology and format. This standardized format will include the goal, purpose, deliverables, verifiable indicators and milestones. A consultant has been selected to conduct a course at the Centre to familiarize all users with the *logframe* format.

8.2.3.4 Assessment

Organization

The current organizational structure is the product of the 1996/97 strategic planning exercise, taking into account observations made by the 1993 EPMR. While conceding that the structure then "*has been reasonably effective...*" the 1993 EPMR noted that cross programme integration could be improved, and offered various alternative models. The revisions to the structure and the rationale for them have been covered in Section 8.2.1. The concern on cross-programme research integration within research was addressed by consolidating four programmes into the two, broad, current programmatic themes. Simultaneously, the project-based management, which institutionalized the delegation of responsibility and accountability for projects, was also established. Thus, the research programme for 1998 was planned on a project basis consisting of the 19 projects defined in the MTP (1998 – 2000).

The Panel commends the Centre for the clear division of responsibility that has been made between research, and research *coordination* with partners. That is

¹⁹ E.Bailey, A. Aw-Hassan and R. Tutwiler. 1997. Project formulation and in-house priority assessment at ICARDA. 23 January, 1997. ICARDA, Aleppo, Syria.

probably the most important reason for the absence of managerial overlap which often leads to friction and high internal transaction costs. Nevertheless, the cooperative nature of the roles of the ADG-R and the D-IC requires a dialog-based management process, where priority and resource allocation, while clearly the responsibility of the ADG-R, is done jointly with the D-IC at the planning stage, or whenever mid-course corrections have to be made. The Panel is pleased to note that structurally, the managerial organization fits ICARDA's *modus operandi*, and seeks to group scientists in multi-disciplinary teams rather than by scientific disciplinary themes. Management's view is that given the nature of its mandate, projects have to become more holistic. The Panel addressed progress in this regard in Chapters 3 and 5.

Management

Financing the research agenda is a complicated exercise because of the factors outlined earlier. It requires:

- Forward estimates of the funding pattern (core, restricted).
- Prioritization against the anticipated total funds.
- Segmentation of MTP Projects into sub-projects (congruent with donor restrictions).
- Iterations to balance projected income with estimated expenses.

This process involves ADG-R and D-IC staffs, and Finance, for the preparation of the annual Work Plan, budget and the rolling MTP. Another activity is the task of entering into contracts for most of the *restricted* projects, and administering them by meeting reporting requirements. The short-term nature of much of the funding means that in addition to ongoing projects, ICARDA has to identify and keep alive a forward list of "projects in the pipeline" in order to prepare for subsequent years. This activity involves the Project Officer, the D-IC, ADG-R and staff down to scientists, who have to be imaginative in finding ways of slicing longer-term themes into discreet, limited-term projects. On the Finance side, budgeting, expenditure control and reporting entail extensive bookkeeping.

Having examined the activities described and interviewed key players in the organization, the Panel can only conclude that the structure and processes are practical. The proof lies in the fact that up to now ICARDA has been able to attract funding from donors that more than compensates for the decline in core funds. There is the question, of course, as to what extent this has diminished programme integrity, longer-term research, and is diverting scientists' time from research. The Panel has addressed this in Chapter 7.

The intensive and frequent interactions required to plan, budget and implement the research agenda require a whole set of internal transactions. The Panel finds that, despite the cooperative environment that exists, the absence of a purpose-built MIS system that will appropriately link the various existing independent ("islands of information") databases, will reduce transaction time, increase productivity and reduce staff frustration. Since the end of 1997, an internally developed Project Management and Data Registry (PMS) system has been available

online. It has the capability only of recording project definitions and reporting progress. However, it has the potential for being developed into a comprehensive MIS tool for project management. The Panel found that so far only some 30% of the scientists have loaded the system and use it, despite the fact that computing staff has offered courses on it. The CCER on Computer activities carried out in February 1998, noted, with respect to internally developed systems, "*that the relationship between end-user and developers must be strengthened*". The Panel agrees, and this may well be the reason that even the data registry system is not yet fully utilized. The newly commissioned Oracle Financial system offers the opportunity to create purpose-built reports which will link appropriate financial, purchasing and progress information suited to ICARDA's project-based management system. The desirability of a time management module, linked to the system, should also be examined. This is best done bottom-up i.e., based on a thorough understanding of user needs, if need be, with the use of a consultant knowledgeable on the Oracle system.

Realizing that the complexities of managing research at ICARDA require many interactions between project managers and other units, and that staff productivity will be greatly enhanced if a computerized management information system (MIS) is available, the Panel recommends that ICARDA implement a purpose-built MIS system for project management, if necessary acquiring the services of a consultant with experience on the recently-commissioned financial package, so that a user-oriented system is put in place.

Planning and Review Process

Basically, the Panel found that the process for planning was systematic, thorough, participatory, and that the steps were logical.

The review process described earlier appears to be adequate. The definition of projects using the *logframe* format for the MTP projects for the year 2000 will provide consistency across projects on deliverables, milestones and verifiable indicators. The Panel is satisfied with the review process, particularly because the Centre has institutionalized the procedure of presenting the findings of the annual review and justifying them to the Programme Committee.

8.2.4 Human Resources Management

8.2.4.1 Staff Profile

Currently, ICARDA has a total of 412 staff, down from 591 in 1993; a necessary reduction in light of the decline in unrestricted core funding. Despite the staffing cuts, management has ensured that the number of scientists has remained almost constant - 93 at present, compared with 95 in 1993. Other staffing data of interest, such as the gender and geographic balance, are summarized in Box 8.2.4.1.

The disciplinary composition of the scientific staff has changed somewhat, with a reduction (by 9) in the Germplasm Enhancement and NRM Programmes, and an increase in the Seed Unit and Regional Programmes (by 9), reflecting the changing needs of the research programmes undertaken by ICARDA. There has been an increase in the number of Ph.D.s on ICARDA's staff and a reduction in the number of

M.Sc.s. As noted in the research-related chapters, the adequate staffing of various programmes--particularly with respect to the disciplinary mix and “critical mass” of scientists in different programmes (e.g., the shortage of pathologists working in the GE and IPM programmes, ref. Sections 3.1 and 4.2)--was of concern to the Panel. The Panel’s specific suggestions/recommendations on the staffing of research projects are given elsewhere in the report.

Box 8.2.4.1 - Staff Profile – Highlights

Gender - Since 1993, female staff at ICARDA have increased from 19 to 22%; mainly due to an increase in General Services from 21 to 26%. At the P-level, the share of female staff has remained constant at 7% (4 female staff members), which is rather low in comparison with other CGIAR-supported Centres (average 16% in 1997).

Diversity - In 1993, P-level staff at ICARDA came from 24 countries; they now represent 29 countries. Overall, 41 nationalities are represented in ICARDA’s staff (up from 37 in 1993), which appears to be a reasonable geographical spread.

Post-Graduate Qualifications - The number of scientific and administrative staff holding Ph.D. degrees rose from 67 in 1993 to 77 in 1999. The number of staff holding M.Sc. degrees has fallen from 45 to 33. This demonstrates the recruitment of more highly qualified staff.

Research: Research Support - No significant change since 1993 in the ratio of senior (P-level) research scientists to research support staff (RA/PDF/NPOs). The ratio is almost 1:1 now.

8.2.4.2 Assessment

The 1993 EPMP had recommended the recruitment of a human resources professional to head the Personnel unit and had listed a number of areas that required strengthening. These included human resources planning (linking staffing plans to the evolving strategy and MTP), skill/career development, leadership/succession planning, performance appraisal, and compensation/rewards. ICARDA has only partially responded to this recommendation, and these issues of human resources management need more attention than they have received thus far.

A Personnel Officer was recruited at P-level in 1997, but left after one year for personal reasons. The current head of the Personnel unit, an experienced and well-qualified Personnel Officer, again at P-level, joined in June 1998. ICARDA redesigned the staff performance evaluation system in 1997, and is fine-tuning it at present on the basis of last year’s experience. These are promising steps. However, discussions with staff at headquarters and in regional programmes, as well as responses to the staff questionnaire survey conducted by the Panel, indicate that greater attention to the following HR issues with a direct bearing on the productivity and job-satisfaction of staff would be very worthwhile:

Professional Development

ICARDA has provided professional development opportunities in selected areas such as biotechnology, gender issue and computing. Since the benefits of professional development accrue to the institution as well as to the individual staff member, and staff feel that this is not adequately addressed in the annual performance review, it would be appropriate for ICARDA to strengthen this area. The Panel suggests that greater use be made of short-term sabbaticals for P-level staff to give staff members a much-valued opportunity for professional renewal and career advancement. This would provide large benefits to the Centre as well, particularly if the staff member continues to serve ICARDA for several years thereafter.

Review of Job Descriptions and Grading

Because of rapid changes in technology and the external labor market, and staff reductions in many programmes and units (thereby consolidating job responsibilities), it is understandable that some staff members perceive a mis-match between their job description and salary grade. The need for reviewing this alignment, on a case-by-case basis, is accepted by the Personnel Department. The last job equivalence study was done 7 years ago. The Panel was not able to examine this issue in depth, and cannot be certain of how widespread within ICARDA this concern might be. However, it would be prudent for Management to give greater attention to staff concerns regarding the matching of job responsibility and compensation, so that both the reality and perception of internal equity are maintained.

Transparency of Policy Implementation

There is a perception among some staff that certain personnel policies, particularly those pertaining to discipline and grievances, are not adhered to uniformly. It appears to the Panel that in such sensitive matters as discipline, “justice must not only be done, but seen to be done”. Further, there seems to be a general need for improving regular communication between Management and staff on human resources issues, and this need is exacerbated whenever new revised personnel policies and practices are introduced. We suggest therefore that an updated personnel policy manual be prepared and distributed to staff (as recommended by the 1993 EPMR); and this be supplemented by periodic briefings of staff by Management and the Personnel Department head to clarify changes in personnel policies/practices as they occur.

Performance Evaluation

The performance evaluation system introduced in 1997 seems to be an improvement over previous years; but some staff are concerned about the lack of a relationship between performance ratings and rewards. The Panel believes that as a matter of principle such linkages are good management practice. Now that the new system has been in use for two years, it would be useful to “fine-tune” it as appropriate and re-establish the link between performance evaluation, promotion, merit increases and professional development.

Work Load

In discussions with the Panel and in response to the staff survey, many staff have expressed concern regarding a heavy workload, and the common practice of devoting many extra hours and weekends to institutional activities. Some of this work is undoubtedly the result of ICARDA taking on new projects and research-related activities, as well as the increasing information requests from CGIAR members, Committees, and the TAC and CGIAR Secretariats. The Panel has not had the opportunity to examine this issue comprehensively, but there is obvious merit in conserving the scarce time of scientists. It offers two suggestions: i) buffer the scientists from “non-mainline” activities as far as possible; and ii) improve the efficiency of routine administrative/reporting tasks through a purpose-built MIS system that routinely provides easily-accessible data. We recognize also that the difficulty of balancing work and family is not unique to ICARDA, and that corrective measures will require the collaboration of all supervisors and staff at ICARDA. We therefore suggest simply that management and staff recognize the productivity-enhancing benefits of properly addressing the workload issue (and the adverse consequences of not doing so), and join hands in finding a solution that best meets the Centre’s needs.

Conclusion

The Panel recognizes that the recruitment of a Personnel Officer and the re-design of the personal evaluation system are steps in the right direction for addressing some of the staff issues identified by the Panel. However, it strongly suggests that a task force be appointed to address all staff issues, in particular: professional development; job-descriptions and grading; transparency of policies and consistency in their implementation; performance evaluation; workload. Such a task force should include representatives drawn from appropriate categories of staff.

8.3 Finance and Administration

8.3.1 Finance

8.3.1.1 Analysis of Trends

ICARDA’s financial position was found by the 1993 EPMR to be “*sound with a high degree of liquidity*”. At that time, the Centre had an unrestricted core funding of 80%, provided principally by two donors (USAID and IBRD), and a healthy reserve of \$10.5m in its capital and operating funds. This funding source declined rapidly thereafter, a scenario thought likely in the 1993 EPMR. Table 8.3.1.1a (overleaf) is an analysis of funding and expenditure in the period 1994 –1998 and it shows that:

- Core (unrestricted) revenue decreased from \$12.3 m to \$7.4m
- Restricted plus special projects revenues increased from \$3m to \$14.9m
- Total Revenue increased from \$18.5m to \$25.1m*
(*Including a one-time grant from CGIAR of \$ 1.6m in 1998 discussed later)
- ICARDA ran deficits in 1994, 1996 and 1997. (The deficit in 1997 is discussed under Assessment)

**Table 8.3.1.1a: Revenue and Expenses
Trends - 1994 -1998
Rounded off to US\$ Million**

TYPE	1994	1995	1996	1997	1998
<i>REVENUE</i>					
Unrestricted Core	12.3	11.8	9.9	8.1	7.4
CGIAR Grant (One-time)					1.6
Other Income	3.2	3.7	1.5	0.5	1.2
Sub – Total	15.5	15.5	11.4	8.6	10.2
Restricted	3.0	7.5	11.0	14.7	14.9
Total Revenue	18.5	23.0	22.4	23.3	25.1
<i>EXPENSES</i>					
Unrestricted Core*	16.1	15.3	12.6	13.2	8.8
Restricted	2.9	7.3	10.8	14.4	14.7
Total Expenses	19.0	22.6	23.4	27.6	23.5
Surplus (Deficit)	(0.5)	0.4	(1.0)	(4.3)	1.6

*Expenses are net of indirect costs recovered from core restricted projects
(Source: audited accounts)

ICARDA's percentage of unrestricted (core) funding is now low, 30%, compared with the average for all Centres of 43%²⁰.

Table 8.3.1.1b analyses expenditure broken down under the headings research and administration. This table highlights the fact that in the period when unrestricted core funds declined, ICARDA has reduced administrative costs from 20% of total expenditure to 14%, thereby ensuring that a greater proportion of its revenues was directed to research (from 80 to 86%).

**Table 8.3.1.1b: Total Expenditure Trends
Rounded off to US\$ Million**

Heads	1994	1995	1996	1997	1998
Research	15.2	18.8	20.0	23.9	20.3
Administration*	3.8	3.8	3.4	3.7	3.2
Total	19.0	22.6	23.4	27.6	23.5
Percentage Analysis					
Research	80%	83%	86%	87%	86%
Administration*	20%	17%	14%	13%	14%
Total	100 %	100 %	100 %	100 %	100 %

Source: Audited accounts

(*Administration expenses include: Management, BOT, Finance, Personnel, Purchasing, Damascus and Beirut offices, workshops, building maintenance, security, Housing Unit and site maintenance)

²⁰ Source: CGIAR Financial Report – 1997, page 18.

8.3.1.2 Strategy

In line with the MTP 1998-2000, ICARDA proposed a research agenda for 1999 requiring \$28.5m. However, the Panel learnt that assured funding is estimated at \$ 25m. The research agenda has, therefore, been scaled down. In so doing, ICARDA has been guided by its strategy of continuing its increased emphasis on natural resource management. Thus, proposed spending reductions have come mainly from crop improvement and related projects. Other measures for prudent financial management are in place to offset any further decrease in funding.

The MTP 2000-2002 projects a funding pattern of \$26.3m for year 2000 to fund the TAC-endorsed agenda. This assumes that the donor community will continue to fund ICARDA at the levels required to fund the research agenda, based on a detailed analysis, by donor, and their particular interests in ICARDA's research agenda. Once again, in the event of a modest funding shortfall, ICARDA has stated that it has mechanisms to absorb the shock in the year of occurrence, which include postponing activities, deferring recruitment, postponing capital purchases, and making staffing adjustments in low priority areas. A larger and continuing shortfall is to be dealt with through a slimming of its portfolio of projects without jeopardizing the integrity of the research programme.

8.3.1.3 Assessment

The Panel confined itself to the broad picture on finances. It has examined the External auditor's reports and finds that in such aspects as financial controls, ratios for funds management, and internal reporting mechanisms, ICARDA is well positioned. It has amply demonstrated that the challenge of funding has been adequately met. An equal challenge to ICARDA is the uncertainty inherent in short-term funding, which requires reliable forward estimates. ICARDA has been largely successful in having had to make only modest withdrawals on its operating fund to meet year-end deficits in 1994 and 1996. The large deficit of \$4.3m in 1997 (Table 8.3.1.1a) was the result of a coincidence of circumstances related to assumptions made for "other income", principally: exchange rates; and a one-time depreciation windfall adjustment (as a result in a change on the useful life of buildings). This deficit was worsened by receipt of funds later than anticipated from major donors, thus reducing interest income. The Audit Committee of the Board, in consultation with the External Auditors, found that the windfall adjustment would not have met the guidelines of the Generally Accepted Accounting Practices standard. Management and the Board had, therefore, to close the year with a deficit of \$4.3m. The withdrawal from operating funds to meet this deficit resulted in a negative balance in operating funds which was compensated by a one-time CGIAR grant in 1998 of \$1.6m, supported by donors (Table 8.3.1.1a). The operating fund has a positive balance of \$0.6m at the start of 1999.

ICARDA's capital fund has increased from \$5m in 1994 to \$7m in 1998, a healthy level where annual capital expenses have been in the order of \$2m over the period. Using the recent CGIAR guideline, which allows combined reporting of capital funds and operating funds, the Centre now has a cushion of 109 days of average daily expenditure (including capital expenditure).

In terms of financial procedures and practices, the External Auditors have provided a list of items in their Management Letter accompanying the audited accounts. The Panel wishes to draw Management's attention to these, which are relatively minor in themselves, and mainly relate to tightening procedures and practice. The Panel suggests that Management set deadlines for those items that have not been fully addressed. On Y2K compliance the Auditors stated that the implementation timetable might not allow compliance trials and test runs to be completed in time, and therefore, suggested that a contingency backup plan should be in place. The Panel is aware that Management has such a plan and is satisfied that it is a practical option. The Panel suggests that it would be wise to include in this plan, backup contingency measures to meet possible failures in systems external to ICARDA, e.g., power system, telecommunications, fuel supplies, and banking.

The CCER conducted in January 1998 has proved very useful to the Panel. There were 10 recommendations related specifically to financial procedures and systems with which the Panel is wholly in agreement. The Panel is pleased to note that management has already taken positive action on 9 of these. Commitment reporting, however, has not yet been taken up, partially because the CGIAR guidelines do not require this. From a project management point of view, the Panel is of the opinion that commitments are an essential part of project control and should be made part of the MIS for project management described in Section 8.2.3.

The Panel found that the service provided by Finance to other units was service-oriented, "*cooperative and helpful*", and that bookkeeping activities have kept pace with the increase in the sources of funding and financial reporting to donors. The Panel has also seen examples of current financial reports submitted to ICARDA's management and the Board and found them informative, and an improvement over past reports. Among other monitoring activities, the Panel understands that management's Investment Committee meets weekly to review investments and bank balances. (External Auditors have confirmed that balances are held "*with financial institutions of international repute*"). Budgeted income versus actual expenditure are monitored monthly by the EC, supplemented by an analysis of expenditure by project, prepared by the Internal Auditor. The financials, however, do not contain a forward cash-flow estimate to year-end, a feature that would prevent awkward surprises. Such an addition will require monthly updates on income and at least an exception report from project managers on their outlook on year-end under/over expenditures. Overall, the Panel is satisfied that good management practices are followed for prudent management of finances and commends ICARDA's Management for this.

8.3.1.4 External Auditors

On the recommendations of the Board Audit Committee the Board has re-appointed Messrs. KPMG for 1999, first appointed in 1993. The CGIAR guidelines, on the advisability of periodically reviewing and replacing auditors, if need be, had been dealt with by the Board in 1993, and a Board policy is on record. Members of the Panel were present at a meeting of the Board Audit Committee, when the audited accounts for 1998 and the audit plan for 1999, were discussed. Judging from this meeting, and a private meeting with the auditors to review their approach to auditing, the Panel is pleased to confirm that ICARDA's external audit is in the hands of

competent professionals at KPMG. The Panel found that the External Auditors and the Internal Auditor aim to make complementary workplans, a move that should avoid gaps and overlaps in audit.

8.3.1.5 Internal Audit

The Internal Audit function has made remarkable progress since the 1993 EPMR, which noted the limited attention paid to operational audits at the Centre. Reporting directly to the DG, Internal audit is not the conventional “*vouch and verify*” activity. Audits at the Centre now cover a wide range of operational activities - organizational, administrative, and environmental - with productivity and safety enhancement objectives as appropriate. The CCER in January 1998 noted that “*ICARDA has in place an almost textbook example of a well functioning, highly professional Internal Audit function*”. Having reviewed an impressive list of audits, at the Centre and at Regional offices, the Panel fully endorses the CCER’s conclusion. The Centre’s audits, based on a workplan agreed with the DG and the Board Audit Committee, have also been followed up systematically and monitored for progress on the implementation of recommendations. The workplan showed that audit proposals anticipate management issues. ICARDA is probably the only Centre to have won international awards for the scope and quality of its internal audit. The Panel commends the Centre for making skillful use of its qualified, highly professional auditor.

8.3.2 Administration and General Services

8.3.2.1 General

The units covered under this head are: i) Purchasing and Supplies, ii) Engineering Services, iii) Facilities Management, iv) Canteen, v) Medical, vi) The International School of Aleppo, vii) Damascus Office. From 1995 on, Management has mounted a broad campaign for revitalizing these units aimed at achieving user-satisfaction, cost control/reduction/elimination. Some examples:

- *Engineering Services* - synchronized operation of the standby generators has resulted in fuel savings costs of 35 – 50%; and use of surplus building material and technical staff in the construction of the new buildings (for IPGRI) have provided cost recoveries.
- *Purchasing and Supplies* – stock value has been reduced from \$800,000 in 1994 to \$490,000 at end-year 1998 through increasing use of local sources. At present the unit is working towards finding a balance between lowered stocks and longer response time to user requests.
- *Facilities Management* – the carpentry shop is now self-financing.
- *The International School* - is self financing its operating costs. This co-educational facility for kindergarten through Grade 12 children, serving some 280 children from 37 countries, is accredited to US and European educational associations and offers the International Baccalaureate Program as well as the International Certificate of General Education. Its

facilities have been improved, as have the terms of employment of teachers.

- *Medical facilities* – the clinic at ICARDA offers seven days on site coverage during working hours. The doctors regularly monitor and maintain records on staff working with pesticides, and perform regular analyses on ICARDA's water quality. Policies and procedures are available for dealing with medical emergencies.

Expenditures across the units covered by General Services have been reduced by 35% since 1995. This has been done through a concerted drive for efficiency - through the mechanism of monthly meetings of all administrative unit heads, monthly reports to the ADG-AL, and systematic monitoring. Charges directly attributable to staff employed on, or services rendered to restricted and special projects, are increasingly being recovered from them.

8.3.2.2 Assessment

The Panel commends management for seeking continually to improve cost-effectiveness of General Services, including searching for opportunities to outsource such activities to cost-competitive, high quality sources. The Panel notes particularly that the International School, which is a key requirement for attracting high quality international staff, has reached a standard comparable to such schools in other parts of the world.

CHAPTER 9 - OVERALL ASSESSMENT AND FUTURE DIRECTIONS²¹

ICARDA's Preparations for the Review

The Panel was impressed by the quality of ICARDA's preparations. Notable was its *Synthesis 1993-1999* document which presented a summary overview of the work and evolution of the Centre during 1993-1999.

The Panel was also impressed with the Board's attention to Centre-Commissioned External Reviews (CCERs) during 1993-1999. Eight such reviews were conducted and were used by the Board and Management during the Centre's period of rapid evolution from 1995-99. The eight CCERs represent a total of more than two scientist years of time devoted by the CCER panels to their analyses of essentially all of ICARDA's programme activities and its management and financial systems.

The CCERs proved useful to the Panel in understanding the work of the Centre before its restructuring in 1998 and in the Panel's assessments of its programmes and management. Indeed, the ICARDA review might have been the first time CCERs were used in a fashion like that envisioned by TAC as a way forward in conducting reviews, and their availability changed the nature of the EPMR and its report. The Panel commends the ICARDA Board and Management for giving such an important place to CCERs and for their serious response to CCER recommendations and suggestions.

The Need for ICARDA

For more than 20 years, ICARDA has worked on problems of crops and natural resources of critical importance to the poor in West Asia and North Africa (WANA), including major staple crops, food and forage legumes, and matters pertaining to water, land and genetic resources.

Poverty is pervasive in the dry areas – over 80% of the population currently live in countries with an average of \$1.10 per day, and more than 70% are in rural areas where they largely depend on agriculture for their main source of income²². Improving the lives of these impoverished people means enlarging their choices by expanding their capabilities and protecting their natural endowments. Increased agricultural productivity is one of the key means to increase incomes of the rural poor and purchasing power of the urban poor, and to widen the choices of the poor in these areas, both of which may be increased by developing relevant policies and institutional arrangements.

²¹ The reader should take note that the Panel has purposely used two terms in this chapter, WANA (West Asia and North Africa) and CWANA (Central and West Asia and North Africa). This distinction is used because ICARDA has now included Central Asia in its operational mandate, but many past statistics refer only to WANA *per se* and do not include Central Asia.

²² Rodríguez, A. and Thomas, N. 1998. Mapping rural poverty and natural resource constraints in dry areas. ICARDA Social Science Paper No. 6. ICARDA, Aleppo, Syria.

The Panel was struck by the enormity of water problems faced in WANA, which international authorities have identified, in terms of *per capita* supplies, as the most water-scarce region of the world. That scarcity can only increase as population growth and urbanization continue. The Centre is keenly aware that water scarcity also exists in other dry areas of the world where its research products could be useful. The Panel believes water will always be the single most important factor to consider in the Centre's work in crop improvement and natural resource management.

ICARDA lies in the center of origin for major cereal and other crops, including grain and forage legumes. Its recognized work in genetic resources conservation and use in Central and West Asia and North Africa attests to the wisdom of placing an international centre of excellence in this region. Today, ICARDA holds in trust one-fifth of the plant genetic resources held by the CGIAR, a trust that represents a significant long-term responsibility for the Centre.

From its beginning ICARDA has studied the natural resources of WANA as well as the way these are managed in the farming systems of the region. More recently, poverty and natural resource management questions have arisen which need attention, and these are being addressed using new tools and techniques, following guidance from the CGIAR.

The Centre enjoys the respect of more than 40 countries in its mandate region, and increasingly is asked to take on new responsibilities by the countries and others. The Centre has worked closely with National Agricultural Research Systems (NARS) to identify key problems and constraints that limit agricultural productivity and/or viability, and that also affect the management of natural resources. That work is now maturing and evolving as ICARDA seeks further decentralization of its research.

ICARDA has tailored its modes of operation to the CWANA region and its cultures and problems, and has developed ways to finance various regional collaborative efforts. Over the years, the Centre has gained tremendous experience and knowledge, and has established a unique position in the region as a research partner, facilitator, mentor, and even as a scientific lifeline for scientists working in isolation.

The Panel concluded that ICARDA has made major efforts to achieve the objectives of its founders, and that the need for ICARDA is just as great now, if not greater, than in 1977.

ICARDA During 1993-1999 – A Time of Transformation

The review period spanned a time of major transformation of the Centre, involving a number of events and developments. Following the 1993 EPMR, new Board leadership began to implement recommendations of the review. A new Director General was appointed in 1995 and a new Management team was recruited. A revision of the 1989 Strategic Plan started in 1996 to position the Centre for preparing its 1998-2000 Medium Term Plan. A steady decline in unrestricted core funds that began in 1993 resulted in a drop from 80% to 30% in 1998.

The new Strategic Plan foresaw the need to restructure and reorganize the Centre to meet external and internal needs. These included: adoption of the eco-regional research paradigm, expanded partnerships with NARS and Advanced Research Institutes (ARIs), and the CGIAR decision to move to project-based management. ICARDA was able to deal with the afore-mentioned developments and to keep the institution moving forward, despite its continuing problem of declining core funds. These efforts were remarkably successful, as ICARDA saw its total budget increase by some USD 6 million over 1994-98 while core funding was going down.

By 1998, the new strategies and priorities laid out in the 1997 Strategic Plan and manifested in the 1998-2000 MTP were being implemented. In 1998, a reduction in staff was carried out in response to short-term financial exigencies, while other staff reductions were made for reasons of efficiency or as a result of the restructuring of the Centre (see Chapter 8).

The new model of research collaboration with NARS and other partners fits in well with ICARDA's strategy to decentralize – to the extent possible – research in the regions. The Panel believes this approach is sound, and could be a way to extend the power of agricultural science to more than 30 countries in the CWANA region.

In the meantime, ICARDA was seeking restricted core or special project funding to augment its reduced unrestricted core funding. While necessary, seeking special funds can place increased stress on scientists due to workload and time pressures. The Panel believes that some staff concerns regarding top-down administration and decision-making related to such matters, as well as to the pace of evolution at the Centre.

Germplasm enhancement has been a major component of ICARDA's research programme since its establishment. The five years since the last EPMP have seen radical changes in the Germplasm Enhancement Programme's (GEP) organization, funding and philosophical basis. Changes include substantial reduction in size (from 27 scientists to 20), and a significant shift of resources away from plant breeding to biotechnology, principally molecular marker and rapid generation turnover technologies. Also, decentralized breeding programmes have been developed with NARS to produce locally adapted cultivars using elite segregating ICARDA germplasm, and increased emphasis has been placed on participatory approaches to breeding.

Germplasm Enhancement has been successful in part due to its capable and enthusiastic staff. More than 240 ICARDA-derived varieties of cereals, food and forage legumes have been released since 1993, many with combinations of resistances to biotic and abiotic stresses. The group has published over 500 articles since 1993, of which 186 were papers in refereed international journals. Despite the success of ICARDA's work scientifically, its impact in the field in some cases has been disappointing, due in part to the generally poor infrastructure in the region for seed production and distribution. ICARDA has taken steps to overcome the problem and is now the only CGIAR centre with a dedicated Seed Unit. The Seed Unit's goal is to improve seed supplies to farmers through strengthening national seed programmes of the region through training, networking and an emphasis on policy development.

ICARDA's Genetic Resources Programme has been exceptionally successful. It has modern facilities that are well planned and run. It has established a unique world class collection that is not only a needed and critical global resource, but is responsive to the needs of users, both internal and external, including providing training in conservation and documentation of plant genetic resources.

Over the 1993-1999 period ICARDA was able, through research efforts of its Natural Resource Management Programme (NRMP), to contribute to filling knowledge gaps in the specific fields of the disciplines involved and to produce information and improved technologies for the land users of its mandate region.

Despite the above contributions, ICARDA has not yet clearly articulated its approach to natural resource management research. Furthermore, the Centre needs to broaden its vision of sustainable agro-ecological systems. The Panel considers that only a small proportion of the individual research projects in the NRM Programme could be classified as strategic in nature, and few as holistic. Also, the projects are still trying to cover too wide a range of questions. ICARDA faces the difficult challenge of taking a holistic approach, while continuing to focus and prioritise.

The Panel considers it important that ICARDA should seek to offer its stakeholders a variety of future resource management options that include management of range and small ruminants.

During the period under review, ICARDA's social scientists shifted emphasis from evaluating technological innovations to emphasising the institutionalisation of farmer participation in the Centre's research. They engaged in over 180 studies, shifting toward whole farm analysis, desk rather than field studies, increased concerns with policy questions, and more emphasis on resource-poor farmers. However, output levels of social scientists have been modest, and there is a poor record of refereed journal publications.

While the re-engineering of the Centre was going on, ICARDA was finding new ways to enhance its partnerships with NARS. In this regard, the Centre had to deal with a variety of factors (geography, technology capability, human resource availability) of NARS to address the relevance and diffusion of its research and research products to NARS, including measures to help strengthen them. In this regard, the Panel questioned whether growth in the outreach programme might outpace the Centre's ability to provide adequate scientific and logistic support. For these reasons the Panel recommended that ICARDA undertake a strategic review of its outreach activities.

The Panel commends the staff and leadership of the Centre for bringing about the transformation at ICARDA, under difficult conditions. In addition, the Panel commends the Director General, the Management team and the Board for their roles in the transformation that has taken place. The Panel considers this transformation to be profound and important, and recognises the hard work and vision required to bring the Centre to its present position.

ICARDA Beyond 2000

The Panel believes that ICARDA is poised for a take-off into 2000 and beyond. The last five years have been busy ones, but their fruits are a much-improved institution with most of its house in order, as most of the big decisions and changes have been made.

The Panel concludes that the time has come at ICARDA to begin a period of 'dynamic consolidation'. Consolidation does not mean maintaining the *status quo*, or a static centre. Rather the idea would be to focus on matters such as balancing research resources against demand, fine-tuning the research agenda, and finding a balance between headquarters and outreach. Other issues that need consideration include; dealing with matters of critical mass and core competence in specific fields, finding new methodologies to carry out multidisciplinary research, improving management information systems, finding ways to avoid 'stretching too thinly', and dealing with staff concerns. Further examples can be found in relevant chapters of the report.

As noted in Chapter 2, ICARDA's mandate is broad and complex, covering both global and regional germplasm responsibilities, which include: in the dry areas, responsibilities for certain activities in small ruminants, water management and rangelands; and in the CWANA region, responsibilities for natural resources research. The Panel recognized the need for the broad mandate of ICARDA, and endorses the importance of the areas of work that are implied. It also recognized that NARS and other stakeholders, the Board, Management and staff were involved in the strategic planning effort. The Panel commends the Management and Board for the planning effort and for their work in defining a new operational mandate.

In its analysis, the Panel questioned whether ICARDA was becoming stretched too thinly, as demands continue to grow for its involvement in a number of areas. There are signs that stretching may be occurring: e.g., new demands from the regions (e.g., Latin America, Central Asia), some shifts in core staff from headquarters to the regions, and possible critical mass concerns in some research areas. The Panel concluded that there is a danger of ICARDA becoming over-stretched, and addresses this in three recommendations.

In the light of the financial situation faced by the international agricultural research centres (IARCs) today, the Panel is aware of the need for a Centre to keep some options available in its research agenda for special project funding, and that a broad mandate allows this. However, the Panel was concerned that the availability of special funding for regional activities may tend to draw key staff resources from headquarters at a time when core support to ensure critical mass for strategic research programmes has been reduced. Therefore, the Panel, realising this problem was not unique to ICARDA, made a general recommendation that TAC should examine the problem of heavy reliance of the IARCs on restricted funding and its effects on science quality and important longer-term research.

ICARDA enters the new millenium with world class research and research-related capacity in genetic resources conservation and use, and in genetic enhancement of barley, grain legumes and durum wheat. It has in place a regional program structure that allows a continuum of research from headquarters to NARS, including NARS/NARS relationships, and it has learned how to conduct research in its mandate region in a decentralized manner

In natural resource management (NRM), the challenge for the Centre is to develop and implement its paradigm for multidisciplinary NRM research, including developing methodologies to achieve this. The Centre has assembled capacity in some of the 'tools' needed for such research, including GIS and modeling, to aid in moving ahead in this area. It also is developing an innovative strategic research concept, Anticipatory Long-Term Research, which the Panel commends for future elaboration as a way to help deal with long-range sustainability issues. Unified research sites are also being selected to improve ICARDA's capacity to identify agroecological problems of production systems and natural resource management. In the social sciences, the challenge is to focus on fewer problems, seek out improved models for stakeholder participation, and link the livelihood strategies of the poor with the biophysical research activities.

ICARDA has come through a period of transformation under conditions that would have daunted most institutions. Without wishing it, the Centre has learned to live and work in a situation where unrestricted core funding has dropped severely, and in fact to a level below the average in the CGIAR. Despite that, it has re-engineered itself and is well positioned to deal with 21st century problems. To sustain that position will require means of funding that will assure a core capacity at headquarters with the vision, knowledge and ability to muster scientific power to solve important societal problems.

The Panel would like to present its vision for ICARDA, based on its overview and analysis of the Centre. This vision is not meant to be prescriptive, but illustrative of what the Panel believes is possible for a center of excellence in the most water-scarce region in the world. The Panel believes the Centre should strive to attain the following core competencies or comparative advantages:

During the next five years, which should be considered the period of dynamic consolidation, ICARDA would:

- Develop and test its natural resource management paradigm and related methodologies, and see its research internationally recognised,
- Have a biotechnology-based genetic enhancement effort in place,
- Continue to enhance the productivity of its partnerships, particularly with NARS,
- Have developed and be using improved internal management systems for finance, human resources and research management,

- Be known as a scientific center of excellence serving as the regional node for a consortium of international efforts, both CGIAR and non-CGIAR, that focus on the CWANA region and the dry areas.

To sum up, ICARDA has undergone an impressive transformation in its programmes and strategy. A dedicated staff and an effective Management team are in place. A supportive, committed Board practices its oversight responsibilities with due diligence in the reviewing and approving of the Centre's priorities and strategies. Donors who wish to see their resources used to help the poor are urged to support ICARDA in its research efforts in the harsh, water-scarce environments of the dry areas. ICARDA is worthy of their support.

ACKNOWLEDGEMENTS

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Dr. Adel El Beltagy, Director General, Dr. Mohan Saxena, Assistant to the Director General, Dr. John Dodds, Assistant Director General Research, and Dr Mahmoud Solh, Director of International Cooperation, cooperated fully with the Panel as well as with the TAC and CGIAR Secretariats in the organization and implementation of the review process. They deserve our special thanks for ensuring that we were provided with a good working environment and effective secretarial and technical support. We also thank Dr. and Mrs. El Beltagy for their kind hospitality.

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APPENDIX I

COMPOSITION OF THE PANEL AND BIOGRAPHICAL INFORMATION

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¹ Participated only during the first phase of the review.

Name: PLUCKNETT, Donald L. (USA)

Position: President and Principal Scientist, Agricultural Research and Development International (ARDI), Annandale, Virginia, USA

Expertise: Tropical crop and pasture management, tropical soil management, natural resource management, weed control, genetic resources, research management

Education: B. Sc. General Agriculture, Vocational Education, University of Nebraska (1953); M.Sc. Agronomy (Weed Science), University of Nebraska (1957); Ph.D. Tropical Soil Science, University of Hawaii (1961)

Experience: University of Hawaii, from 1958 to 1980. 1958-60: Junior Soil Scientist; 1961-65: Assistant Professor of Agronomy; 1965-70: Associate Professor of Agronomy; 1970-80: Professor of Agronomy and Soil Science; 1965: Ford Foundation consultant and Senior Agricultural Advisor, Aswan Agricultural Development Centre, Egypt; 1968: Visiting Professor, University of Queensland, Brisbane, Australia; 1968-69: Visiting Scientist, International Rice Research Institute (IRRI), Philippines; 1971: Senior Fellow, East-West Food Institute, Hawaii; 1973-1976: Chief, Soil and Water Management Division, USAID, Washington, DC; 1978-79: Deputy Director, Board on Food and Agricultural Development, Technical Assistance Bureau, USAID, Washington, DC; 1979-1980: Chief, Agriculture and Rural Development Division, Bureau for Asia, USAID, Washington, DC; 1980-1993: Senior Scientific Advisor, CGIAR, The World Bank, Washington, DC. Since 1993: President, ARDI, Annandale, VA, USA.

Panel member of the Farming Systems Stripe Review 1977-78; Panel member of the first Quinquennial Reviews of IITA (1977) and CIAT (1977); CGIAR Resource Person in the Reviews of CIAT (1984), CIMMYT (1982 and 1987), CIP (1983 and 1989), IBPGR (1985), ICARDA (1985), IITA (1983), ILCA (1981), ILRAD (1980 and 1986), IRRI (1982, 1987, and 1992), and WARDA (1986). Consultant to CIP Review (1995). Panel member of EPMR panels of ICRISAT (1997) and IRRI (1998). Panel Secretary to ILRI EPMR (1999). Fellow, Linnean Society of London, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, American Association for the Advancement of Science. Member of several scientific societies and author of 12 books (editor of 8 books) and author of more than 200 scientific publications.

Name: DOWNING, Theodore E. (USA)

Position: Research Professor of Social Development, Arizona Research Laboratories Interdisciplinary Division, University of Arizona, Tucson, USA.

Expertise: Social development, agrarian systems, research management, ethnographic methods, evaluation research, irrigation's impact on society

Education: Ph.D. (Social Anthropology), Stanford University (1973)

Experience: University of Arizona (1971-present), multiple positions, beginning as Asst. Professor of Hydrology and Water Resource Administration through Research Professor of Social Development, Arizona Research Laboratories: Interdisciplinary Division (1995 -). Saudi Arabia: King Abdulaziz University, Research Director and Associate Professor of Meteorology and Arid Land Studies (July 1982-Jan. 1983). England, University of Oxford, Visiting Scholar Institute of Social Anthropology (Jan – Nov 1983). Mexican National Science Foundation, Scientific Agricultural Research Team Director (Sept. 1977 - June 1979). President. International Society for Applied Anthropology, 1985-87. President, American Association of University Professors, Conference of the State of Arizona. 1988-90. Vice-President, 1990-95. Founder and

Chair, Scholars for Mexican Rural Development Network (1991-President), Founder and Director, The Policy Kiosk (web based non-partisan policy facilitator), Fulbright Academic Program Specialist, 1984. Consultant to The World Bank, The International Finance Corporation, Inter-American Development Bank, AGRA Earth and Environment (Canada), Mexican government. Completed 14 major interdisciplinary research projects. Directed research teams ranging from 3 to 25 scientists. Publications include 11 books authored or edited, numerous public lectures and over 45 articles. Editor, *Culture and Agriculture*, 1981-84, Editorial Boards of the journals *Agriculture and Human Values* and *Human Organization*.

Name: MARSHALL, Don (Australia)

Position: Professor of Plant Breeding and Director, Plant Breeding Institute, The University of Sydney, NSW Australia

Expertise: Genetics and Plant Breeding

Education: B.Sc. Agr. Agronomy, University of Sydney (1963). Ph.D., Genetics, University of California, Davis (1968)

Experience: Postdoctoral Fellow in Genetics, University of California, Davis (1968-69); Research Scientist and Leader Genetic Resources Section, CSIRO, Division of Plant Industry (1970-81). Director, University of Sydney, Wheat Research Centre, Narrabri (1981-86). Professor of Agronomy, University of Adelaide (1986-91). Since 1991: present position.

Member of South Australian Wheat & Barley Research Committees; Member Australian Green Legumes Research Council; Founding Director of the Australian Grains Research & Development Corporation; Director at Sunprime Seeds; Member of Board of Trustees of IPGRI. Member of Board of Trustees of ICRISAT; Panel Member, CCER, Wheat Germplasm Improvement Sub-Programme, CIMMYT; Panel Member, Fourth EPMR, CIMMYT. Fellow of the Australian Academy of Technological Sciences and Engineering; Member of several scientific societies; author of numerous publications.

Name: PAUL, Louis R.K. (Netherlands of Indian origin)

Position: Independent Consultant

Expertise: Strategic planning and research management

Education: Bachelor of Engineering-Mechanical (Honors), University of Madras (1952); Business Studies (Programme for Senior Executives), Sloan School, MIT (1983).

Experience: 1952-1991: positions of increasing responsibility with Royal Dutch Shell, including Field Mechanical Engineer (1955-1968), Strategic Planning Analyst (1973-76), Head, Planning and Economics, Refining Function (1976-83), Marketing Policy Adviser (1983-87), Head, Planning and Coordination, Research (1987-1991). In his last position his responsibilities covered Shell's research programmes across a world-wide network of international research centres, with a research outlay of US\$ 800 million and a scientific pool of 7,000 staff; key achievements included the introduction of rigorous research priority reporting coupled to business-impact review of research results. Long-term assignments in Bombay, Trinidad and a Shell's Head Officer in London and The Hague; trouble-shooting and other work-related visits to many other parts of the world.

Member, Advisory Committee on Management of Technology, Commonwealth Secretariat (London). Founder-Member of an English-speaking Rotary Club in The Hague, etc. Consultant to the EC on Research Management. Consultant to the Advisory Council for S&T (Netherlands). Panel Member of the 4th CIP EPMR (1995) and of the 5th IRRI EPMR (1998).

Name: SPENCER, Dunstan (Sierra Leone)

Position: Managing Director & Principal Scientist of “Dunstan Spencer & Associates”, Freetown, Sierra Leone

Expertise: Professionally qualified agricultural economist, with graduate level training in animal science, and undergraduate level training in agronomy. Expert in Women in development, environmental assessment, impact evaluations, and poverty alleviation issues.

Education: B.Sc. General Agriculture, with Honors, London University (1966); M.Sc. Major: Agricultural Economics – Minor: Animal Science, University of Illinois, USA (1969); Ph.D. Agricultural Economics (1973)

Experience: 1966-77: From Research Assistant to Senior Lecturer, Njala University, College, University of Sierra Leone; 1975-77: Visiting Associate Professor, Department of Agricultural Economics, Michigan State University, USA; 1977-79: Senior Agricultural Economist, West Africa Rice Development Association (WARDA), Monrovia, Liberia; 1980-84: Director, Development Department, WARDA, Monrovia, Liberia; 1984-86: Principal Economist, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Sahelian Centre, Niamey, Niger; 1986-93: Director, Resource and Crop Management Division, International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria; Since 1994: Independent Consultant, Managing Director of a small consulting firm. 1994: Leader of a three-man team engaged by Winrock International to evaluate the African Rural Social Sciences Research Network; 1995: Leader of a three-man team engaged by the World Bank to evaluate the SPAAR Frameworks for Action research projects in 6 African countries; 1996: Leader of a five-man team of consultant engaged by the World Bank to prepare the Village Infrastructure Project (VIP), for the Ministry of Agriculture and Forestry, Ghana; 1997: Consultant to IFAD/World Bank, Field Team Leader of a 7-person team of international consultants, and a 12-person team of national counterparts, on the re-design and appraisal of the IFAD-funded Roots & Tubers Investment project in Ghana; 1998: Leader of Mid-Term Review of ICIPE. Member of several scientific societies; author of numerous publications.

Name: WOLFF, Peter (Germany)

Position: Independent Consultant

Expertise: Irrigation, drainage, land development, natural resource management

Education: S.g.L. General Agriculture, Agricultural College, Witzenhausen, Germany (1956-57); Ing. Agr. Trop., German College of Tropical and Subtropical Agriculture, Witzenhausen, Germany (1958); Dipl. Landw Kulkurtechnik (Irrigation, Drainage, Land Improvement and Land Development), Technical University Berlin, Germany (1960-63); Ph.D. (Agriculture), Technical University of Berlin, Germany (1966).

Experience: (1951-56) Farm Manager at Bad Hersfeld, Germany; (1959-60) Field Assistant at Kimberley Research Station, Northern Australia; (1963-66) Research

Assistant at Technical University of Berlin, Institute for Irrigation, Drainage, Land Development and Pasture Research; (1967-68) Head of the Section East of the Overseas Department of the German Potash Industry, Hannover; (1968-98) Professor for Irrigation, Drainage and Soil Conservation at the Faculty of International Agriculture of the University of Kassel, Germany and Head of the Department of Rural Engineering and Natural Resource Management; (1991-97) German Liaison Scientist to the International Irrigation Management Institute (IWMI), Colombo, Sri Lanka; (1994-98) Director of the Centre for International Rural Development, University of Kassel-Witzenhausen; (1995-96) Member of the Hessian State Commission of Agricultural Science. Since 1968, Consultant Land and Water Management, Natural Resource Management. Since 1998 member of the Steering Committee of the European Forum for ARD. Lecturer: University of Baghdad and Mosul: Modern Irrigation Methods (1976), Justus-Liebig-Universität Giessen: Irrigation and Drainage of Agricultural Lands (1980), Technical University of Berlin: Hydrology and Watershed Management (1987), Georg-August-Universität Göttingen: Irrigation in the Tropics and Subtropics (1989-98).

Member of several scientific societies and author of numerous publications.

Name: ZEHNI, Mohamed (Libya)

Position: Independent Consultant

Expertise: Agriculture Development, agricultural research management, and natural research management

Education: B.Sc. Agriculture, University of Alexandria, Egypt (1957); M.Sc. Horticulture, University of California, USA (1963); Ph.D. Plant Physiology, University of Cambridge, UK (1970).

Experience: Consultancies with FAO, TAC/CGIAR, IAEA, FAO/RNE, IPM Global Facility (1997-99); Director, FAO Plant Production and Protection Division (1995-97); Director, FAO Research and Technology Development Division (1984-94); Ambassador / Permanent Representative of Libya to the Rome-based UN Organizations (FAO, IFAD, WFP and World Food Council) (1978-84); Chairman / Director-General of the Agricultural Research Centre (ARC), Libya (1972-78); Director-General, Plant Production Department, Ministry of Agriculture, Libya (1970-72); Member of: IBPGR's Quinquennial Review Panel (1980); Second Review of the CGIAR (1981), FAO Programme Committee (1980-84), IFAD Board of Directors (1980-83), Technical Advisory Committee (TAC) of the Consultative Group for International Agriculture Research, CGIAR (1980-84) and Ex-officio member of the Board of Trustees, IPGRI (1995-97).

TERMS OF REFERENCE
FOR EXTERNAL PROGRAMME AND MANAGEMENT REVIEWS
OF CGIAR CENTRES

BACKGROUND

Context

1. The Consultative Group on International Agricultural Research (CGIAR) is an informal association of over 50 members that supports a network of 16 international research centres in agriculture, forestry and fisheries. The CGIAR aims, through its support to the Centres, to contribute to promoting sustainable agriculture for food security in developing countries. Because the Centres constitute the core of the CGIAR, the effectiveness of each Centre is crucial to the continued success of the CGIAR (as a System).

2. Each Centre is an autonomous institution operating within the mandate assigned to it by the CGIAR, and is governed by a legally constituted Board that has full fiduciary responsibility for managing the Centre. To ensure accountability in an essentially decentralized system, each Centre is expected to be responsive to the CGIAR, which provides financial support for its work.

3. The CGIAR has established a tradition of External Programme and Management Reviews (EPMRs) to provide a mechanism of transparency and accountability to the Members and other stakeholders of the CGIAR System. EPMRs are the joint responsibility of TAC and the CGIAR Secretariat, and are conducted for each Centre approximately every five years. As each Centre is autonomous, EPMRs provide a measure of central oversight and serve as an essential component of the CGIAR's accountability system.

Integrated System of Reviews of Each Centre

4. Besides the EPMRs, Centre Commissioned External Reviews (CCERs) are undertaken at each Centre. These CCERs are commissioned by the Centre Boards to periodically assess the quality and effectiveness of particular aspects of a Centre's work. The terms of reference (TORs) for each CCER are determined by the Centre, based on broad principles endorsed by the CGIAR at ICW95 (ref. document entitled *Improving the Quality and Consistency of CGIAR's External Centre Reviews*, dated October 24, 1995).

5. EPMRs complement the CCERs by providing a CGIAR-commissioned and comprehensive external assessment of the Centre’s programme and management, especially its future directions and the quality and relevance of its research. The TORs for the EPMRs (which update the “standard TORs” endorsed by the CGIAR at MTM95) are provided below. Guidelines for undertaking the reviews are issued separately.

TERMS OF REFERENCE

Objectives and Scope

6. EPMRs seek to inform CGIAR members that their investment is sound, or recommend measures to make it so. Members of the CGIAR and other stakeholders can be informed whether the Centre is doing its work effectively and efficiently. EPMRs are both retrospective and prospective; and help ensure the Centres’ excellence, relevance and continued viability, and the CGIAR System’s coherence. Each review is expected to be strategic in orientation and as comprehensive as the situation warrants.

7. The broad objectives of EPMRs are to: a) provide CGIAR members with an independent and rigorous assessment of the institutional health and contribution of a Centre they are supporting; and b) to provide the Centre and its collaborators with assessment information that complements or validates their own evaluation efforts, including the CCERs.

8. The EPMR panel is specifically charged to assess the following:
- a. The Centre 's mission, strategy and priorities in the context of the CGIAR's priorities and strategies;
 - b. The quality and relevance of the science undertaken, including the effectiveness and potential impact of the Centre's completed and ongoing research;
 - c. The effectiveness and efficiency of management, including the mechanisms and processes for ensuring quality; and
 - d. The accomplishments and impact of the Centre’s research and related activities.
9. The topics expected to be covered by the EPMRs are listed below.

TOPICS TO BE COVERED

A. Mission, Strategy and Priorities

- The continuing appropriateness of the Centre's mission in light of important changes in the Centre and its external environment since the previous external review.
- The policies, strategies, and priorities of the Centre, their coherence with the CGIAR's goals (of poverty alleviation, natural resources management, and sustainable food security), and relevance to beneficiaries, especially rural women.
- The appropriateness of the roles of relevant partners in the formulation and implementation of the Centre's strategy and priorities, considering alternative sources of supply and the benefits of partnerships with others.

B. Quality and Relevance

- The quality and relevance of the science practised at the Centre.
- The effectiveness of the Centre's processes for planning, priority setting, quality management (e.g., CCERs, peer reviews and other quality and relevance assurance mechanisms), and impact assessment.

C. Effectiveness and Efficiency of Management

- The performance of the Centre's Board in governing the Centre, the effectiveness of leadership throughout the Centre, and the suitability of the organization's culture to its mission.
- The adequacy of the Centre's organizational structure and the mechanisms in place to manage, coordinate and ensure the excellence of the research programmes and related activities.
- The adequacy of resources (financial, human, physical and information) available and the effectiveness and efficiency of their management.
- The effectiveness of the Centre's relationships with relevant research partners and other stakeholders of the CGIAR System.

D. Accomplishments and Impact

- Recent achievements of the Centre in research and other areas.
- The effectiveness of the Centre's programmes in terms of their impact and contribution to the achievement of the mission and goals of the CGIAR.

Addendum to the General TOR for EPMR Review for the ICARDA Panel

Given the socio-economic diversity of farming systems and agro-pastoral communities within the ecological areas that are under ICARDA's mandate, the EPMR should devote in-depth analysis to the extent and quality of ICARDA's research on socio-cultural and economic issues. This pertains particularly to the "quality and relevance of science" part of the EPMR and should include:

- Quality of social research on the typology, characteristics, and needs of the ultimate area producers' communities; socio-economic constraints, adaptive response strategies.
- How is ICARDA's social and economic research integrated/linked with its biological, agronomic and breeding research projects? Which linkage model (integrated? parallel?) proves to be more effective? Extend to which characteristics of area crop-livestock systems or agro-forestry systems are reflected in the technical research projects?
- Contribution of ICARDA's anthropologists to promoting participatory research methods in ICARDA's research/experimental work.
- Role and performance of the Centre's nucleus of social scientists in bringing into ICARDA the state-of-the-art knowledge generated internationally outside the Centre in this domain?
- Farm management and policy implications of the socio-economic and policy research done at the Centre.

APPENDIX III

Recommendations of the 1993 External Program and Management Review Panel, and the 1999 Panel Comments on ICARDA's Response

Research	Panel Comment
<p>Recommendation 2.1</p> <p>ICARDA, as an ecoregional center for the dry sub-tropics, should be given encouragement to work in restricted research domains in irrigated agriculture for which it has expertise. However, the work should be financed with special-project funds (with a component to cover headquarters-related overhead) and carried out by special-project-supported staff, so as not to detract from ICARDA's primary research emphases.</p>	<p>The recommendation has been fully implemented. As expressed in the MTP 1998-2000 approved by TAC focused research in irrigated agriculture is being conducted in Egypt, Sudan and Yemen. In Egypt, a special grant from the EU supports ICARDA's work with national scientists. The grant includes provision for three National Professional Officers (NPOs) employed by ICARDA and stationed in Cairo. In the Arabian Peninsula, a grant from AFESD has enabled the appointment of scientists to work with national programs on water use efficiency and protected agriculture in irrigated systems.</p>
<p>Recommendation 2.2</p> <p>The proposed move of the wheat pathologist to Ankara will further weaken the capacity for close support work in cereal pathology at Tel Hadya. ICARDA should, as an absolute minimum, fill the position of wheat pathologist at headquarters by a post-doctoral appointee.</p>	<p>The recommendation has been implemented as fully as possible in the changing circumstances of funding decline and programme restructuring. ICARDA posted a Regional Coordinator in Turkey with expertise in pathology. He assisted in building capacity and the development of the required mist-irrigation facilities for the Central Research Institute for Field Crops, Ankara. He has now moved on to be Regional Coordinator in the CAC region. A position of Cereal Pathologist was created and filled at HQ in August 1998 and ICARDA HQ is backstopping the Turkish pathology programme. However, a further shortage of funds in 1999 has led to the loss of the pathology position for legumes. This leaves ICARDA with one pathologist at HQ. The Panel addresses the issue further in section 3.1 of the report.</p>

<p>Recommendation 2.3 Work on transgenic material should be deferred until there is bio-safety legislation in place in the host country.</p>	<p>The recommendation has been fully implemented. Biosafety legislation is still not in place in Syria. ICARDA is taking a twin-track approach to genetic transformation: 1. The Center is working actively for biosafety legislation in the region, including Syria. 2. The Centre is cooperating with ARIs where there is expertise and appropriate legislation.</p>
<p>Recommendation 2.4 In view of the ongoing debate within the Center and the many different attitudes that exist among its main partners the NARS/ICARDA should give immediate attention to the development of a comprehensive rangelands research strategy, in which the Center's role would clearly be identified.</p>	<p>The recommendation has not been implemented. A comprehensive ICARDA rangelands strategy document has been drafted and is undergoing review, yet it remains unpublished 5 years after the 1993 EPR recommendation. The Panel feels such a delay bruises the credibility of the Centre, new initiatives are being planned and implemented without a contextual document to provide coherence. The Panel urges ICARDA to issue its rangelands strategy to all stakeholders as soon as possible.</p>
<p>Recommendation 2.5 ICARDA should conduct impact studies of its major technologies so that, by the time of the next ER, clear quantified data are available.</p>	<p>The recommendation has been only partially implemented, one impact study has been completed since 1993 together with a variety of adoption studies. ICARDA notes [Synthesis Document] that adoption and impact studies are integral to all of ICARDA's research projects, and that the social science projects have a special responsibility to coordinate and facilitate these studies, increasingly conducted with NARS partners. The Panel addresses the issue in section 7.9 of the report</p>

<p>Recommendation 3.1 Research staff in Morocco should be moved to a more effective regional location for interaction with national and regional research personnel.</p>	<p>The recommendation has been fully implemented. In outpostting its staff, ICARDA has always considered a wide range of options, including the interests of the national programmes. In Morocco, ICARDA, noting the rapid growth of local expertise, phased out its staff presence and is relying on national collaborators. The Regional Office for North Africa is now located in Tunis. ICARDA has retained a liaison office in Rabat, Morocco, with an ICARDA affiliate to maintain its strong links with the Moroccan national programme.</p>
<p>Recommendation 3.2 With due regard to the importance that must be assigned to training as part of capacity-building in NARS, the Center should ensure that all aspects that bear on the effectiveness of the program (such as preparation of training materials) are adequately covered and, in this spirit, the filling of the Head of Training vacancy should be a high priority.</p>	<p>The recommendation has been fully implemented. The position of the Head of Training was filled in December 1994. In 1997 the position was changed to Head of Human Resources Development Unit (HRDU) to include responsibilities for conferences, meetings, workshops, visitors, transport and tele-communication services.</p>

<p>Recommendation 4.1 Responsibility for developing and managing a BOT-endorsed process for nominating and electing members to the Chair and Vice-Chair should be assigned to a BOT Committee.</p>	<p>The recommendation has been fully implemented. Procedures are in place and the Board handbook has been updated accordingly.</p>
<p>Recommendation 4.2 The Program Committee and the full Board should assess their mechanisms for oversight and reach a fresh judgement as to whether the traditional roles remain appropriate given the new challenges of the strategy, the new Medium-Term Plan, and the increasingly constrained funding situation.</p>	<p>The recommendation has been fully implemented. The mechanisms now in place are described in Section 8.1.2.</p>
<p>Recommendation 4.3 The BOT should introduce a more systematic and objective process for annual evaluation of the performance of the DG and for the oversight of the evaluation of other top management officials.</p>	<p>The recommendation has been fully implemented. The performance of the DG is assessed periodically by the Board, while the ADGs and Directors are evaluated by the DG and the Board Chair. The procedures are systematic and objective.</p>
<p>Recommendation 4.4 The BOT should reassess its self-defined role and strategy in overseeing operations and management of ICARDA. At a minimum, the BOT should assign explicit responsibility for reviewing and assessing the full range of ICARDA’s administrative and management systems, either as an expansion of the Audit Committee’s role or as an assignment to a separate standing committee established for that purpose.</p>	<p>The recommendation has been fully implemented. The Audit Committee of the Board now pays special attention to the review and assessment of ICARDA’s administrative and management systems; a CCER of these systems has also been conducted.</p>
<p>Recommendation 4.5 The BOT should oversee the development and implementation of a plan delineating delegation of authority that strikes a new balance between Program freedom and fiscal/administrative control in an effort to devolve more authority to the Programmes.</p>	<p>The recommendation has been fully implemented. The Centre has moved to a project-based budgeting and management system, which along with the responsibilities assigned to Research Project Managers, devolves more authority to the Programmes.</p>
<p>Recommendation 4.6 If the current organizational structure is retained, ICARDA’s Management should</p>	<p>The recommendation has been fully implemented. At the end of</p>

<p>examine primary responsibilities and demands on its members, in efforts to identify what the boundaries of responsibility should be for the DDG-R. The plan for delegation of authority (recommendation 4.5) should include a carefully reasoned work program for the DDG-R that enables the incumbent to focus on research leadership and oversight.</p>	<p>1996 a new, streamlined structure, approved by the Board, was put into place. The new structure clearly delineates and distributes responsibilities more evenly as described in Section 8.2.1.</p>
<p>Recommendation 4.7 ICARDA Management, working closely with the Board, should develop and implement a detailed, explicit, long range funding strategy.</p>	<p>The recommendation has been fully implemented. The Centre now has a well thought-through strategy, which has successfully overcome the steep decline in core funds.</p>
<p>Recommendation 4.8 When the Board and Management reach agreement on the basic concepts and outline of a project-based budgeting system, ICARDA should (a) designate a single project manager to be responsible for coordinating the total system design and implementation effort; (b) assign the project manager the task of developing - collaboratively with research and financial/administrative personnel -- a time-phased systems design and implementation plan, including staff orientation and training components, with appropriate milestones; and (c) establish a regular reporting schedule in the Board on progress, problems and contemplated changes in the approved system design, if any.</p>	<p>Partially implemented. An integrated system was developed and commissioned but has not been utilized by all staff. The Panel has made a recommendation, which reinforces that made in the 1993 EPMR.</p>
<p>Recommendation 4.9 ICARDA should draw up and implement a human resource planning and development strategy. This should include a comprehensive “human resource needs plan” a skills/career development component, leadership progression/ succession considerations, and a model of appraisal/rewards that are fiscally responsible and organizationally sound.</p>	<p>Partially implemented. The Centre had appointed an internationally recruited, senior staff Human Resource professional, who would have embarked on this project. However, the individual resigned within a year of appointment for personal reasons in Dec '97. A successor was appointed in June '98 and will devote time to working on this recommendation.</p>
<p>Recommendation 4.10 An external evaluation of P-level* (especially P3 and P4) staff by international experts in the candidates field of expertise should be incorporated into the promotion review process. (*Internationally recruited senior staff)</p>	<p>Partially implemented. After considering the pros and cons of external evaluation, the Centre ruled it out as a practical option. Instead, the Centre has used visiting scientists opportunistically in peer assessments, which are taken into account in the promotion reviews conducted by the Executive Committee.</p>

APPENDIX IV

Center-Commissioned External Reviews (CCERs) conducted at ICARDA during the period 1994-1998

Date	Title	Panel Members	Affiliations
June 7-9, 1994	Review of MTP Projects 15, 16 and 17 (Forage Activities)	Dr M. Bounejmate, Forage Agron. Dr E.C. Correal, Forage Agron. Dr G.E. Pollott *	INRA, Morocco CIDA, Spain Wye College, University of London UK
February 19-23, 1995	Review of MTP Projects 1, 2, 13, 19, 20 and 21 (Range Activities)	Dr B.A. Stewart, Agronomist * Dr H.H. Le Houerou, Range Plant Dr S. Suna, Economist Dr T.G. Kelly, Economist	Texas Univ., USA CNRS, France ESCWA, Jordan ICRISAT, India
November 10-17, 1995	Review on the ICARDA Farm Mechanization Operations	Dr Amir Khan, Farm Machi. Spec.* Dr L. Bashford, Agric. Engineer	USA Univ. of Nebraska, USA
March 3-7, 1996	Review on Projects concerning Cool Season Legumes and Seed Production	Dr F.J. Muehlbauer, Food Leg. Breed.* Dr C. Francis, Forage Leg. Breeder Dr B. Greg, Seed Specialist Dr B. Malik, Nat. Pulse Co-ordinator	WSU, USA CLIMA, Australia Mississippi State Univ., USA NARC, Pakistan
Jan.26-Feb.1, 1997	Review of Cereal Germplasm Improvement & Genetic Resources and Integrated Mgmt. of Pests and Diseases of Cereals and Legumes	Dr D. Plucknett, Research Advisor * Prof. M. Duwayri, Cereal Breeder Dr P. Frank, Pathologist Prof. Dr K. Hammer, Genetic Res. Prof. W. Powell, Biotechnologist Dr G.W. Wilde, Entomologist	ARDI, VA, USA JUST, Jordan Pflanzensucht Oberll., Germany Gene Bank, Germany Scottish Crop Res. Inst., UK KSU, USA

Date	Title	Panel Members	Affiliations
February 2-5, 1997	Review of Human Resources Development and Communication, Documentation and Information Services	Dr Abdel Wahab Hafez, President * Dr D.L. Plucknett, Research Advisor Dr J.A.C. Noolan Mr D. Bruaer, Editor	Ain Shams Univ., Cairo, Egypt ARDI, VA., USA BOT, ICARDA D+C, Bonn, Germany
January 7-16, 1998	Review of Finance and Administration	Mr R. D. Havener * Mr R. A. Smith, Finance Consultant Dr J.A.C. Noolan	Chair, CIAT Board, USA USA BOT, ICARDA
February 2-8, 1998	Review of CBSU	Prof. Dr Ahmed Rafea * Mr M. Schneider	CLAES, Egypt Cornell Univ., USA

* Chairperson of the concerned CCER.

**Recommendations of the Center-Commissioned External Review Panel
for Projects 15, 16 and 17, and ICARDA's Response**

Review held on 7-9 June 1994

Note: Recommendations and suggestions extracted from “Consultants’ Report for the PFLP: Review of Medium Term Plan (1994-98) Projects 15, 16, and 17.” Page numbers cited are from this document. Actions taken are those occurring between June 1994 and 31 December 1998.

Recommendations and Suggestions	Response
Improvement of Small Ruminant Production	
<p>“[The CCER Panel] were provided with no evidence that ICARDA had clearly formulated a research strategy for livestock or increased livestock research as directed by the EPMP [of 1993].” (page 2)</p>	<p>During 1996 and 1997, several important consultations were held with NARS of WANA and regional and international organizations working with small ruminants. The results were used to re-formulate ICARDA’s project on small ruminants for the MTP 1998-2000. In October, 1997 ICARDA organized a major International Consultation on Setting Livestock Research Priorities in WANA that produced a comprehensive research strategy that is consistent with ICARDA’s own objectives and investments in small ruminant research.</p>
<p>“The facilities of carrying out such key research [on small ruminants] are lamentable, given the unique position of ICARDA in the region.” (page 3)</p>	<p>A new modern animal research facility was built and furnished at ICARDA during 1997-98. The facility contains both laboratories and areas for conducting animal nutrition, physiology, and productivity trials.</p>
<p>“The priority given to nutritional aspects [of feed] is very relevant. The involvement of an economist is appropriate in preparatory technology transfer work.” (page 3)</p>	<p>A senior agricultural economist as been working closely with the Small Ruminant Project. Various economic studies involving production and the role of small ruminants, including the first steps to modeling using linear programming were conducted and published.</p>

<p>“a more comprehensive approach to the questions [about sheep as dual-purpose meat/milk animals] would provide useful answers to some unique problems in the area.” (page 4)</p>	<p>Studies involving liveweight gains were complemented with initial studies on milk production and the effects of feeding systems on milk composition and quality. More detailed studies of the amount and quality of milk production performance by Awassi sheep are planned.</p>
<p>“one key strategic role for ICARDA would be to evaluate the range of feeding systems available worldwide on typical local diets and livestock, with a view to developing an adequate model if current models are inadequate.” (page 4)</p>	<p>Note the comment below on feed calendars and feed systems in the region. Work is being done on methods to assess the nutritional value of common feedstuffs used in the region.</p>
<p>“The proposed new project on mineral requirements and mineral deficiencies in relation to livestock and human nutrition seems important, but more work should first be done on finding out what small ruminants get from their diets (from rangelands, cultivated pastures and cereal by-products) before moving into such basic research.” (page 4)</p>	<p>Research on mineral deficiencies was not yet started in full. However, as a first step, information is being collected on feed calendars and feed types in major production systems in the region. This is in line with the suggestion of the Panel.</p>
<p>“It is recommended strongly that no work be started on animal genetics or health.” (page 4)</p>	<p>No formal work on animal genetics has been done. Limited work on animal health, such as assessments of parasite loads on production, was carried out by a Japanese (JICA) team at ICARDA. It is anticipated to initiate work on the genetic (molecular) characterization of regional breeds and their environmental potentials.</p>
<p>“The publication of a manual of available breeds and their characteristics using data available in the WANA countries would be worthwhile.” (page 5)</p>	<p>Efforts to develop a regional program to characterize the breeds of small ruminants in WANA and Central Asia were begun in 1998.</p>

<p>“There is potential for ICARDA to act as the focal point for a number of Awassi breeding programs already being operated by NARS... This activity could take the form of advice on breeding program design and operation in the first place. It could be extended to cover genetic parameter estimation, breeding value estimation and dissemination of improved stock as and when required.” (page 5)</p>	<p>ICARDA does not plan to undertake a breeding program of its own. It does plan, however, to contribute to NARS breeding programs through provision of information on breed characterization at the genetic level (see above).</p>
<p>“Outreach is an essential part of ICARDA’s work and this problem [of lack of livestock research in ICARDA’s outreach programs] needs to be solved as a matter of priority.” (page 5)</p>	<p>On-farm evaluations were conducted in several countries through the Mashreq and Maghreb Project, including assessments of the fertility status of flocks in the major production systems. A program of technology transfer was implemented and a follow-up adoption study was completed. In Central Asia, participatory appraisal surveys were conducted in 1997 and 1998 to assess production constraints and identify potential market-oriented interventions. Trials were conducted on early weaning and fattening.</p>
<p>Improvement of Sown Pastures and Forage Production</p>	
<p>“the pasture management scientist should devote more effort towards exploring [pasture species] beyond medics.” (page 6)</p>	<p>The work on medic/wheat (ley farming) systems has decreased considerably. More emphasis is now given to vetch as a replacement for fallow and cereal monoculture. Small-seeded legumes are also being used to improve the productivity of degraded rangeland in Syria and Lebanon.</p>
<p>“because the adoption by farmers of ley farming may take a long time, the time and resources expended on this subject should be reduced. Efforts should be made to work on a larger scale (producing more seed) in cooperation with NARS...” (page 6)</p>	<p>See above response. Research on ley farming is minimal. Efforts are being made with NARS of Syria and Morocco in on-farm medic seed production. Two manuals for medic seed production have been published in English and Arabic. Two machines have been developed to facilitate production (a pod sweeper and a thresher).</p>

<p>“Efforts with forage legumes should continue in order to provide forage options as alternatives to continuous cereal cultivation” (page 7)</p>	<p>Efforts to promote forage legumes have been strengthened. Particular attention has been given to working directly with farmers through partnerships with NARS. The Mashreq and Maghreb Project is a prime example of this.</p>
<p>“In West Asia, the current efforts on mechanization [of forage legume harvest] should continue.” (page 7)</p>	<p>Development and demonstrations of small-scale machinery have continued, including rollers, mowers, pod sweepers, and threshers.</p>
<p>“Although the areas sown to forage legumes are increasing, an economic analysis to determine the profitability of these crops used as grazing material, hay or seed and straw is recommended.” (page 7)</p>	<p>Farm surveys to collect primary data and an economic analysis of the results were undertaken. Four papers have been published so far on this subject.</p>
<p>Improvement of Native Pastures and Rangeland</p>	
<p>“Most NARS in WANA have adopted shrubs as a priority for rangeland improvement. Therefore, ICARDA should strengthen its program, particularly with regard to germplasm collection and evaluation.” (page 7)</p>	<p>Under the System-wide Livestock Program, ICARDA has a project on “Production and Utilization of Multi-purpose Fodder Shrubs and Trees in West Asia, North Africa, and the Sahel” with eleven NARS that became operational in 1996. In 1997, a major international workshop on the use of fodder shrubs was organized by ICARDA in Tunis. ICARDA has joined with INIA Spain on fodder shrubs germplasm collection and evaluation.</p>
<p>“New experimental sites [for the stocking rate – P fertilizer trial] should be selected in coordination with satellite imagery so that the dynamics of the vegetation could be followed up overtime with the help of the satellite imagery and aerial photography.” (page 8)</p>	<p>ICARDA has discontinued its long-term experiment on stocking rate and P fertilization at Tel Hadya and is publishing the results. Extension of this work into other sites will be done at the request of NARS partners and using appropriate site characterization and selection techniques.</p>
<p>“It is important for ICARDA to work in the cold dry rangelands of West Asian countries and in the new independent countries of the former USSR.” (page 8)</p>	<p>Since 1997, ICARDA has been active in resource inventory and degradation assessment of rangelands in Central Asia. This complements existing work in northern Syria.</p>

<p>“The work on fodder shrubs should be expanded in coordination with the Genetic Resources Unit (to provide more species with potential for the area.” (page 8)</p>	<p>See previous comment above. Additional shrub germplasm is being collected.</p>
<p>“The proposed research [on native species for the reseeding of highly degraded rangelands] is relevant, but it should be postponed as it takes a lot of time to collect and multiply seeds.” (page 8)</p>	<p>A modest rangeland plant species seed multiplication effort is taking place at Terbol Station in Lebanon for the purpose of working with farmers in degraded rangeland rehabilitation in the Bekaa Valley as part of cooperative projects with the Lebanese NARS and a local NGO.</p>
<p>“We recommend to establish closer collaboration with institutions and colleagues of other WANA countries to expand the results of ICARDA’s work on management and P fertilization responses to different rangeland situations.” (page 9)</p>	<p>This is being facilitated by the WANA Pasture, Forage, and Rangeland Network coordinated by ICARDA.</p>

**Recommendations of the Center-Commissioned External Review Panel
for Projects 1, 2, 13, 19, 20, and 21, and ICARDA’s Response**

Review held on 19-23 February 1994

Note: Recommendations and suggestions extracted from “Consultants’ Report of the Internally Appointed External Review (Projects 1, 2, 13, 19, 20, and 21.” Page numbers cited are from this document.

Recommendations	Actions Taken
<p>ICARDA should develop as soon as possible a map and supporting documentation delineating homogeneous ecoregions for the WANA region. This should take priority over all other activities in the [Agroecological Characterization] project. (page 3)</p>	<p>Following the appointment of a senior Agroecologist in 1996, the Agroecological Characterization project was reformulated for the MTP 1998-2000. This recommendation was carefully considered during the process. While in agreement with the need for delineated homogeneous ecoregions in WANA, exclusive focus on this task would detract from larger objectives within the project. To invest all its resources in a single activity, that covers only one aspect of AEC needs, would limit the contributions of the project to ICARDA’s mission. Different mega-environments have been identified by ICARDA’s crop improvement projects. What is now needed is to make recommendations for crop technologies and natural resource management practices to specific niches within each mega-environment.</p>
<p>Immediately fill a core position with a soil conservationist to initiate and coordinate a regional project to halt, and possibly reverse, land degradation. (page 4)</p>	<p>A senior soil conservation and land management scientist was recruited in 1996, and project encompassing the objectives stated in the recommendation was incorporated in the MTP 1998-2000.</p>

Recommendations	Actions Taken
Initiate additional work on land degradation assessment and arid rangeland degradation evaluation using remote sensing and GIS techniques in conjunction with field studies and ground truth. (page 4)	A draft landcover/land use map of Syria (1:200,000) has been developed from satellite images with significant ground truthing input. A spatial database for Syria on agricultural and other biophysical data relevant to land degradation has been compiled, and ten thematic digital maps have been produced. Currently, arid rangeland degradation assessment incorporating GIS techniques is being pursued in sites in Morocco, Egypt, Syria, and Uzbekistan.
Investigate the use of marginal waters and salt-tolerant plants species into viable production systems. (page 4)	A senior marginal water management specialist was recruited in 1998. The program of work in MTP Project 3.1 includes the topics identified in this recommendation.
Immediate attention should be given to the future of the long-term wheat-based study at Tel Hadya and the barley-based experiment at Breda. Although we recommend that these be continued, we do so only if they can provide meaningful data on the sustainability of the soil resource base and this will require additional laboratory and field measurements. (page 6)	Field activities for both trials were terminated in 1998. Soil quality parameters such as organic C, nitrogen, biological activity, aggregate stability, and hydraulic properties have been measured in both trials. Long-term trends in barley-based rotation trials have been analyzed for productivity, role of feed legumes and risk of continuous barley cultivation. A series of papers is in progress from the 12-year data set of the wheat-based rotations that considers crop yields, water-use efficiency, nitrogen relations, soil physical properties, and economic performance.
Recruit a resource economist to fill a critical void. (page 8)	The position of senior resource economist was advertised in 1998, but no suitable candidate was identified. The post was re-advertised at the end of the year, and the recruitment process is continuing.

Recommendations	Actions Taken
<p>All diagnostic studies aimed at farming system characterization and production system diagnosis should be transferred to Project 1 (Agroecological Characterization). This may well include work on characterizing preferred technology characteristics, e.g., identifying alternative grain and plant traits, for a particular AEZ (Agroecological Zone). (page 10)</p>	<p>Over the past ten years, the work in production diagnosis and farming systems characterization has produced effective research designs, field methods, and analytical procedures, and many NARS partners have been trained in their application. Scientists of all relevant disciplines and research areas have been involved. Most of the diagnostic work is now institutionalized within the NARS, with some exceptions in countries where the research system is still relatively weak.</p>
<p>As a general rule, diagnostic activities and characterization work should be done in collaboration with fellow ICARDA and NARS scientists (agronomists, soil scientists, breeders). Isolated efforts should be discouraged. (page 10)</p>	<p>See comment above. The MTP 1998-2000 and subsequent up-dates do not isolate diagnostic work within any single project. All diagnostic work is undertaken within relevant projects and regional programs.</p>
<p>All adoption studies (in particular, ex-ante technology evaluation) should be brought into the relevant projects for technology improvement in GP, PFLP, and FRMP. The primary purpose of that is to ensure that these studies are truly demand-driven and that information derived from these studies are effectively used by the scientists who ask for them. Resources will come from the project itself. If these projects must “buy” social scientists time in these studies there may indeed be some reluctance to commission such studies. This is not necessarily a bad thing. It may be indicative of the fact that the outputs (i.e., the information) are either not believed or are not highly valued by scientists. Better to find that out as early as possible. (page 10)</p>	<p>ICARDA’s view on the positioning of adoption studies is similar to that taken for diagnostic research. Adoption studies will continue to be done in full collaboration with biophysical scientists to identify environmental, technological, and farm household circumstances that may constrain, or enhance, adoption of new technologies. The MTP project “Socioeconomics of Production Systems” aims to consolidate methodologies for adoption studies and impact assessment developed and applied within other ICARDA and NARS research projects. The activities are, by necessity, integrated with the activities of other projects. As full partners with their biophysical colleagues, ICARDA’s social scientists are not in the business of “selling” their time to others.</p>

Recommendations	Actions Taken
<p>Impact studies are thus the sole surviving component of this [Socioeconomics of Production Systems] project. This could stand alone as an impact assessment (ex-ante and ex-post) project and could thus focus on assisting the institute in research priority setting and I documenting ICARDA's achievements. The primary clients for this kind of information are ICARDA senior management (research and administration) and donors. (pages 10-11)</p>	<p>Like diagnostic and adoption studies, ICARDA's MTP follows a decentralized approach to impact assessment. All projects bear a shared responsibility for impact assessment. MTP projects 4.1, 4.2, and 4.3 are loci for methodological development and specific applications of impact assessment. Impact assessment has been given a high priority in the current MTP, but not just for the purposes of further priority setting or providing management information within ICARDA. A major focus of the work is impact assessment by national programs for national program objectives, and to do this ICARDA follows a networking and capacity building approach. ICARDA has been working with various IAEG initiatives in the application of standardized, formal procedures and methods of economic analysis of research and returns to research.</p>
<p>More focus is required; the demand for adoption type studies clearly exceeds the available supply and thus some mechanism for undertaking selective studies should be adopted. Priority should be given to supporting ICARDA program research (vis-à-vis the national program's) in the areas of diagnostic studies, adoption studies, etc. – but not done in isolation. Teams of scientists should undertake these studies. However, wherever possible, collaboration with national programs should be encouraged. Thus, serious consideration should be given to reducing the number of single country studies on either adoption, diagnostic or impact. A preferred model is to select one or two countries for each of these types of studies and use these as a model and training ground for NARS scientists from other countries. (page 11)</p>	<p>See comments above. ICARDA views its research as a continuum in which the Center's mission is linked through its own research projects and regional programs to those of the NARS with which it has partnerships. Priorities are given in terms of fulfilling the mission, but equally important are contributing to the priorities and priority definition of our partners. ICARDA's regional program network approach to diagnosis, adoption studies and impact assessment has proven a successful model of how both methods and results can be transferred and shared among a group of partners.</p>

Recommendations	Actions Taken
This [Policy and Public Management] is the highest priority research. It falls squarely in the heart of ICARDA's mandate and should be supported even without special project funding, if necessary. (page 12)	Two post-doctoral fellows were jointly appointed by ICARDA and IFPRI in 1995 through the Mashreq and Maghreb Project. In 1998, their appointments as senior scientists were extended for a further two years. ICARDA has been successful in obtaining additional funding to support their research on policy reforms, community modeling, and property rights.
The panel recommends that ICARDA reconsider their project structure. (pages 12-13)	The projects and their structure and content in the MTP 1994-1998 considered by this CCER were extensively reviewed and revised for the MTP 1998-2000.

**Recommendations of the Center-Commissioned External Review
of Projects Concerning Cool-Season Food Legumes
and Seed Production, and ICARDA's Response**

Review held on 7-3 March 1996

Recommendations	Response
Key Recommendations	
<p>1. <i>Establish a single well-resourced well-coordinated Food Legume project.</i> This integrated project would include chickpea, lentil, faba bean and peas. We believe this will result in a much more effective program, which can be efficiently coordinated and enable inputs to important crops such as faba bean and peas, while benefiting from experiences with chickpea and lentil. The need for additional resources can be minimized by the use of DBM principles in the genetic improvement of these crops.</p>	<p>A single food legume project covering faba bean, kabuli chickpea and lentil improvement has been incorporated into ICARDA's Medium Term Plan.</p>
<p>2. <i>Re-establish the faba bean project at ICARDA.</i> In doing so, the project should strive toward (1) inclusion of the NARS in germplasm development decisions and (2) rapid dissemination of early generation breeding materials. Because of the relative complexity of faba bean breeding, as a minimum this initiative will require appointment of an experienced sub-project leader. In addition, the outreach program will need to be strengthened to accommodate the expected added responsibilities for faba bean in WANA.</p>	<p>Faba bean improvement re-established within ICARDA food legume project. Budget restrictions dictated that faba bean re-establishment was at the expense of pea research, which has been discontinued.</p>

<p>3. <i>Remodel Food Legume improvement projects.</i> The chickpea, lentil, pea and faba bean sub-projects should be modeled along DBM lines. The immediate result would be early access to enhanced germplasm by NARS. Less intensive selection and refinement at ICARDA, increased probability of meeting local needs, and more efficient use of ICARDA's resources, particularly labor.</p>	<p>Lentil breeding is already decentralized; and decentralization of chickpea breeding is in progress for South Asia. Impacts at the farm level are in Bangladesh and Pakistan from lentil decentralization. Faba bean improvement has been re-established in a decentralized and pre-breeding mode with no yield trials at ICARDA sites. A closer and more positive relationship with NARS results from decentralization.</p>
<p>4. <i>A more focused forage legume project.</i> The forage legume improvement project should focus on innovative types of <i>V. sativa</i>, species to support the high altitude program, and consideration of the low ODAP character in <i>L. sativus</i>. As recommended for food legumes, genotypes should be distributed to NARS target areas without selection for adaptation in Syria. The range of less well-established forage legumes in the project should be increased and farmer acceptance and potential for animal production determined.</p>	<p>In 1996 there were ten forage species in the program. As a result of focusing, the current target species and environments are:</p> <ol style="list-style-type: none"> 1. Hungarian vetch (<i>Vicia pannonica</i>) and woolly pod vetch (<i>V. villosa</i>) for cold, high elevation areas (Turkey, Balochistan) with Turkish program. 2. <i>Lathyrus sativus</i> and <i>V. narbonensis</i> for lowland Mediterranean dry areas. 3. Common vetch (<i>V. sativa</i>) for wetter Mediterranean environments. 4. Improved nutritional quality (reduced toxicity) of <i>L. sativus</i>, a major protein source for people of lowest income (Bangladesh, China, Ethiopia, Nepal, and Pakistan).

<p>5. <i>Retain the seed unit as an organizational entity.</i> The seed unit should be a permanent organizational entity, placed where it can operate effectively and support the ICARDA overall program. It should focus more effort on alternative farmer seed supply to improve supply of food and forage legume seed.</p>	<p>Administratively, the <i>status quo</i> has been maintained. Increased focus has been given to alternative seed supply systems.</p>
<p>Specific recommendations</p> <p>1. The winter chickpea technology developed at ICARDA needs more focused extension in countries with mild winters and where is good prospect for success. An additional budget allocation may be needed to promote this activity.</p>	<p>Attempts to attract special project funding for winter chickpea technology have been unsuccessful to date. Some strictly limited use has been made of core funding for this activity.</p>
<p>2. Target germplasm collection areas for potentially new sources of Ascochyta blight resistance in chickpea. Introgress additional genes for resistance into enhanced germplasm at ICARDA and distribute the material to the NARS for selection and to assess adaptation to local conditions according to DBM guidelines.</p>	<p>Fifty-five new accessions were collected by ICARDA in Ethiopia in 1997 but authorization to export the seed is not yet forthcoming. All available sources of resistance of Ascochyta blight are being used in breeding.</p>
<p>3. Plan for upgrading the plant growth facilities, particularly the plastic houses. The current plastic houses are marginal and not always reliable for growing plants. ICARDA scientists should have available for their use facilities where plants can be reliably grown in any season.</p>	<p style="text-align: center;">No action possible within existing budgets.</p>
<p>4. Develop additional cold tolerant forage options. In view of the major move to cold tolerance for high altitudes, acquire germplasm, e.g., <i>Lotus corniculatus</i>, <i>Onobrychis</i> spp., and cold tolerant <i>Medicago sativa</i>. Linkages need to be established with international institutions such as USAID and Universities in the U.S., Canada and elsewhere.</p>	<p>The aim is to replace fallow and/or interrupt cereal monoculture in highland and CAC areas. We focus on annual re-sown forages: Hungarian vetch (<i>Vicia pannonica</i>) and wooly pod vetch and (<i>V. villosa</i>) <u>Not perennials</u>. But we cooperate with Turkey in a project including <i>Onobrychis</i> spp. (sainfoin).</p>

<p>5. Establish a strong link with the Vavilov Institute. ICARDA should become a focal point for acquisition of germplasm and should actively pursue international financial support for that role. Additional staff, preferably Russian speaking, may be needed.</p>	<p>Linkages with the Vavilov Institute (VIR) in Russia were established through Australian funded restricted core projects. A total of 1503 VIR germplasm accessions have been safety duplicated at ICARDA in 1997/98 and will be now available to users worldwide. Two VIR germplasm curators visited GRU/ICARDA in 1997/98. A new GRDC project will provide US\$ 550,000 for VIR/ICARDA/Australia collaboration in 1999-2002.</p>
<p>6. Analyzed requirements for seed storage at the germplasm unit, and plan well in advance for perceived needed expansion.</p>	<p>ICARDA management has considered options for additional seed storage facilities. Funds for remodeling and upgrading of the old GRU cold store have to be identified.</p>
<p>7. Legume programs with such a diverse range, and moving into difficult (very cold) environments, will need rhizobia support. If a specialist appointment can not be made in the near future, ICARDA should be proactive in enlisting the aid of external agencies.</p>	<p>Cooperative arrangements with ARIs are in place with CLIMA, Australia as far as budget allows.</p>
<p>8. Future review panels should be allotted two to three additional days to complete the review and present a preliminary report for their findings and recommendations. The materials provided to this review panel were quite extensive, however, we now believe that it was most useful to obtaining a more thorough understanding of the programs under review.</p>	

**Recommendations of the Center-Commissioned External Review
of Cereal Germplasm Improvement and Genetic Resources
and Integrated Management of Pests and Diseases
of Cereals and Legumes, and ICARDA's Response**

Review held on 26 January – 1 February 1997

Recommendations	Response
<p>1. Considering the importance of ICARDA's global mandate for barley and its stewardship of barley genetic resources, the relative small resources at ICARDA devoted to barley, the need for further improvement of the crop, some apparent differences within the program concerning breeding philosophy, the nature of the program in Mexico and its relationship to the work at ICARDA, and the need to solve the question of where Highland research in barley should be stationed, the Panel <u>recommends</u> that ICARDA move quickly to define clearly its long-term strategy to carry out its global mandate in barley. This includes an evaluation of the Center's valuable germplasm, staff needs at Tel Hadya and elsewhere, global strategies to meet continental, regional and national needs, necessary partnerships, involvement of biotechnology and molecular genetics, and the leadership needed to conduct this multi-disciplinary program.</p>	<p>Strategy document has been developed and is now the basis of planning in barley improvement globally.</p>
<p>2. Recognizing that the Durum wheat program is unique and that it is especially important in the WANA region and the Mediterranean area in particular, the Panel <u>recommends</u> that the durum wheat program should receive strong support to maintain its lead as a world center of excellence for durum wheat.</p>	<p>Recommendation accepted within the context of financial support available.</p>
<p>3. Considering that it is vital that the accessions held by ICARDA's Genetic Resources Unit are well characterized and evaluated (both early and secondary evaluations) for a range of traits at both the whole organism and molecular levels; and further, that</p>	<p>For mandated cereals (and legumes) new accessions are grown for initial characterization at ICARDA Tel Hadya and assessed by Genetic Resources Unit (GRU) scientists and the respective breeder. Characterization is done on the morphological and DNA level by</p>

<p>mechanisms must be identified that maximize opportunities for the rapid and efficient introgression of desirable traits into acceptable genetic background (pre-breeding), the Panel <u>recommends</u> that ICARDA develop a systematic, multi-disciplinary, smooth-flowing approach to germplasm evaluation, identification of traits, and pre-breeding centered on its cereal germplasm collections.</p>	<p>GRU. Evaluation is conducted jointly. Wheat pre-breeding is done in GRU in collaboration with GP scientists. Annually 3-4000 accessions move from GRU into the ICARDA cereal improvement programs.</p>
<p>4. Recognizing that the Genetic Resources Unit storage for germplasm is nearing full capacity, and that an increase of material of mandated crops is still expected, the Panel <u>recommends</u> that planning for enlarging the facilities should be initiated soon, including the possibility of storing duplicate samples for important crops of the area that have been collected by NARS.</p>	<p>Options for additional seed storage facilities have been considered by ICARDA management. Funds for remodeling and upgrading of the old GRU cold store have to be identified.</p>
<p>5. The Integrated Pest Management Program appears to be understaffed; as an example, one entomologist and a technician cover both cereal and legume insect pests: hence the Panel <u>recommends</u> at least another technician or post-doctoral fellow in entomology would be beneficial, plant pathology would benefit greatly from the presence of a weed scientist who would also greatly support the overall plant protection capabilities of ICARDA's IPM program.</p>	<p>ICARDA concurs with this recommendation subject to budget constraints. We are also being creative in attracting graduate students on IPM from local Universities and in writing projects for funding.</p>
<p>6. The Panel <u>recommends</u> that biotechnological activities should be conducted within a well-defined, multidisciplinary experimental framework, and that ICARDA's biotechnology laboratories should focus on the application of molecular markers to tackle clearly defined problems in phenotypically and agronomically well-characterized material (germplasm).</p>	<p>The major activity of ICARDA biotechnology laboratories is gene tagging in populations jointly developed with breeders for the most important traits in mandate crops (e.g. Ascochyta blight in chickpea, Fusarium wilt and cold tolerance in lentil, powdery mildew and scald in barley). Breeders, pathologist, entomologist and biotechnologist develop cooperative projects and monitor their progress. Markers (gene tags) are identified for powdery mildew and scald in barley, Fusarium wilt and cold in lentil. Because of the low genetic polymorphism in chickpea, sequence-tagged-microsatellite sites (STMS) markers had first to be developed. The development of markers for resistance to Ascochyta blight in</p>

	chickpea is now well underway.
<p>7. The Panel <u>recommends</u> that the guiding scientific vision of the biotechnology/GRU/germplasm enhancement collaborative effort should be an emphasis on characterization of germplasm using appropriate molecular biology techniques, and this approach should be integral to the Center’s research thrusts; further, molecular biology and biotechnology should not be conducted in isolation, and the scientific ethos of partnerships between molecular biologists, breeders and supporting disciplines should permeate and underpin all germplasm enhancement programs at ICARDA.</p>	<p>A marker application laboratory has been set up and staffed within the GRU for molecular characterization of germplasm with the help of the biotechnology group of the Germplasm Program. ICARDA is routinely evaluating germplasm collections with appropriate marker technology to develop core collections for the crop improvement programs. This activity attracts major interest in NARS collaboration and ICARDA biotechnology laboratories are hosting many short- and long-term visiting scientist working on germplasm characterization. ICARDA has also started to disseminate the technology itself to the NARS of the region. Additionally, the main biotechnology laboratory continues to conduct (breeders’ collections) characterization particularly using new marker technology such as microsatellite-based markers and AFLPs.</p>
<p>8. Because the Central Asian Republics (CAR) and Trans-Caucasus Republics (TRC) of the former Soviet Union grow barley and wheat and other crops related to ICARDA’s mandate, under generally similar environmental conditions; and that several of the Republics share similar problems, cultures, and languages of ICARDA’s partner NARS, and that ICARDA already has had considerable contact and interchange with the eight republics; the Panel strongly supports the concept that ICARDA’s geographical and regional crops mandates be enlarged to include the CAR/TCRs, and <u>recommends</u> that ICARDA examine how best to serve the eight republics, through research partnerships, training, and exchange of germplasm.</p>	<p>Research partnerships, training and exchanges of germplasm with CAC countries have greatly increased.</p>

**Recommendations of the Center-Commissioned External Review
of Farm Machinery Operations, and ICARDA's Response**

Review held on 10-17 November 1995

Recommendations	Response
1. During the next five years, major emphasis should be on replacing the aging fleet of research plot-work equipment.	3 plot drills and 5 plot combines were replaced since 1995 (see 2+3 below).
2. A systematic plan needs to be developed to replace most of the Hege plot combine harvesters during the next couple of years.	A replacement at 1500 working hours is recommended, as compared to 2500 to 3000 hours for a commercial combine. At present 2 machines have reached substantially higher working hours and are listed for replacement in 1999, while a third machine, 1500 hours, is to be replaced at the following occasion.
3. Replacement of the plot-work planters needs to be given priority.	Due to severe limitation of funds only 3 plot planters have been replaced since 1995. Planters are less complex than plot combines and therefore easier to service/maintain. One machine is requested for replacement in 1999.
4. Consideration must be given to the acquisition of additional sprayers if crop production continues to be an important component of the station operations.	One sprayer has been purchased since 1995. Sprayers for plot work and cover crop will be considered in the future, as budget allows.
5. There is a need for replacement of some tractors in the next few years.	2 tractors have been purchased, 2 are requested for 1999.
6. There currently is no need for substantial investment in tillage equipment.	No tillage equipment has been replaced, but for 1999 a duckfoot cultivator is requested
7. Funding support for farm equipment and tractors should be in the neighborhood of \$ 400,000 to \$ 500,000 per year for the next five years.	Due to budget constraints, the level of funding recommended for the equipment alone was not reached . The following are the figures, which include capital expenses of Greenhouses, Horticulture, Agricultural Workshop and Terbol Station. Since 1998 Vehicle Workshop and Metal Fabrication Workshop are also included.

	<p>1995 \$ 120 000</p> <p>96 \$ 400 000</p> <p>97 \$ 390 000</p> <p>98 \$ 010 000</p>
8. In spite of some objections to the contrary, custom combine harvesters could be used to alleviate the pressure on the large Claas combine for the production area.	After comparing two village combines with the existing commercial combine it was decided not to use the village combine, which caused volunteer problems.
9. A committee should be organized at the senior staff level, or the scope of the Land Use Committee could be expanded, to address issues relative to the interaction between the scientists and the Farm Operations Unit.	After major discussion among all stakeholders in land use a fixed allocation of all fields required for research was introduced in July 1996, leaving the authority of land management with the senior scientist of any project. This resulted in most cases in a two-course rotation, using fields every second year for trials. The 1998 changes have reduced the research area by approximately 130 ha. A review of land use for the best selection of research areas and possible alternatives to a two-course rotation is suggested to be done in the second half of 1999.
10. ICARDA needs to train, not only the machine operators, but also a substantial number of the research program technicians in the operation of plot-work planters and plot-combine harvesters.	Training for the use of plot equipment has been given to research program staff every year, partially with participation of service engineers of the manufactures (1997). During harvest plot combines are driven 50% by research staff, and 50 % by tractor operators. The driving of all small plot seeders is done by research staff.
11. Priority should be given to cleaning the ICARDA station of non-usable vehicles and equipment.	There is an active disposal committee, and disposal of non-usable items is constantly pursued, with customs issues being the main obstacle
12. When machines are reconditioned, they should also be painted.	This has been done, according to availability of funds and staff.
13. Some experienced workshop mechanics should be added for machinery and vehicle maintenance.	To the contrary, budget constraints have reduced the number of qualified workshop mechanics below a workable level.
14. The Fabrication Shop should be merged with the Farm Machinery Repair Shop.	This has not been done, due to different nature of work, and the supervising engineer's position is vacant.
15. A mobile workshop could be acquired to expedite field repairs.	Budget constraints have limited our response to this recommendation.

16. A radio communication network would assist in attending to off-site field repairs	Radio communication was requested for purchase immediately after the 1995 review. A link with Breda Station is established, but further units, required for internal communication in Tel Hadya are still in custody of Syrian security organizations in Damascus.
17. We have suggested a system that could improve writing-off of surplus inventory and optimizing the levels of parts storage.	Stocks of spare parts have been substantially depleted to the extent that, in the case of mechanical breakdowns, it is often necessary to obtain spare parts by airfreight to expedite repair.

**Recommendations of the Center-Commissioned External Review
of Human Resources Development and
Communication, Documentation and Information Services, and ICARDA's Response**

Review held on 2-5 February 1997

Recommendations	Response
<p>1. The Center pays attention to the continuing development of its own scientists and other staff, so that it will continue to be at the forefront of research and training, and that its basic operations will not fall below international standards.</p>	<p>Within the limitation of the available resources, the Center has been giving due attention to this important issue, particularly for GS and RA staff categories. For example, between 1994 and 1998, 48 staff members were given opportunities for individual non-degree training in new techniques at several advanced institutions in USA, UK, Germany, Indonesia, Australia, Egypt, France, Switzerland, Kenya, Lebanon, the Netherlands and Greece. In addition, 16 staff members have been registered/completed their PhD and 9 staff members their MSc degrees in collaboration between ICARDA and agricultural universities in the region and at advanced universities abroad.</p> <p>The training coordinators believe that a very important element in their own development would be exchanging experience with IARCs through visits, attending regional and/or international courses on training the trainers. The in-house training in computing and biometrics and in operation of farm machinery as well as the in-house seminar series and the language training courses are also being regularly performed.</p> <p>The practice of giving sabbatical leave to senior scientists has, however, not been revived so far, after the freeze applied in 1995 following the funding shortage. The management agrees with the Panel that the Center should give more attention to this in the future and two new committees for human resources development were recently formed to follow-up on this issue.</p>

<p>2. All Training Coordinators be given the opportunity to attend at least one regional coordinating/planning meeting every planning cycle, to put them in touch with regional issues and enhance their own development.</p>	<p>In addition to the Head of Training, there is only one full-time training scientist in ICARDA placed in the Seed Unit. However, full-time training assistants were identified in the Germplasm and Natural Resource Management Program and part-time training assistants in the Genetic Resources Unit and the Computer and Biometrics Services Unit.</p> <p>Designating training scientists/assistants as training coordinators is acceptable. However, it may be useful to have each of the training coordinators participate in a different regional coordination meeting every year on a rotating basis. The increased participation of Training Coordinators in the conduct of Regional Training Courses would be a better mechanism for enhancing their own development and to become better familiar with regional issues.</p>
<p>3. NARS be informed that a minimum number of slots are being made available to women only, and therefore encourage the NARS to seek out qualified women to nominate.</p>	<p>Taking cognizance of the local social customs in the region, the Center continued to encourage qualified female participants to make use of ICARDA training opportunities. However, fixing slots for women would be a difficult standard to apply across all NARS.</p>
<p>4. Some of the time of the new multi-media specialist be made available to the Head of Training and the scientists who are developing training courses, since he has the education and experience that is needed to ensure that course design and delivery are interesting, informative and attracting to the trainees.</p>	<p>The incumbent multi-media specialist was hired and joined the Center in April 1997. The Heads of Human Resources Development and CODIS worked out the details as to how the output of this specialist could be optimized and the training requirements ensured.</p> <p>With the increasing demand for training and the required support for the special-funded projects such as MRMP, SRADP, Yemen and Iran and the recent involvement of ICARDA in Central Asia, there may be a need for full-time training material specialist to be placed within the Human Resource Development Unit.</p>
<p>5. A carefully reasoned training plan, including timelines and milestones, be developed that is consistent with ICARDA's resources.</p>	<p>The recommendation is acceptable and appropriate action is being taken.</p>

Communication, Documentation and Information Services

<p>General Comment</p> <p>6. The Panel in its report describes the training activities conducted by the various Programs and Units of the Center. However, there is no mention of the training activities carried out by the Information Unit. To rectify this, the text in the facing column needs to be added to Section 1.2.5.</p>	<p>The Information Unit conducts regional and on-the-job training courses in library and information management. To date, two courses on “Library/Communication and Information Management” (3–4 weeks), a course on “Automated Library Management and Modern Information Technologies”, and several on-the-job courses have been conducted. These have benefitted some 40 participants from 15 countries. Another four courses are scheduled for 1997. The Unit also organized a meeting for Syrian librarians in 1990, and a workshop on information management for professionals from WANA in 1992.”</p> <p>The editorial staff of the Unit have been offering courses in “Scientific Writing” (in conjunction with “Data analysis” and “Data presentation” courses offered by CBSU) since 1994. To date, four such courses have been conducted to benefit 67 trainees from 8 countries. Another four courses are scheduled for 1997.</p>
<p>7. In view of the reduction in the number of articles prepared for refereed scientific journals, the Panel recommends that ICARDA should give continued high attention to the publication of research results by ICARDA scientists in order to build the image of the institution and to disseminate information vital to NARS and other IARCs.</p>	<p>The recommendation is accepted. ICARDA scientists have been urged to prioritize their time to increase their output of journal articles. The number of journal articles is steadily going up again.</p> <p>However, it would be appropriate to mention here that the number of journal articles dropped, particularly in 1995/96, because there was a substantial reduction in staff numbers in 1993 and 1994. The Center is now recovering from the shock, and is hiring new senior research staff and post-doctoral fellows.</p> <p>There has been increased effort on the part of ICARDA scientists to obtain funding for special projects, with consequent diversion of their time to writing project proposals. Also, in 1996, ICARDA embarked upon the huge task of writing its own Medium-Term Plan for the period 1998–2000. Most ICARDA senior staff were involved in this process in one way or another.</p>

<p>8. The Panel recommends that high priority be given to the regular and timely publication of periodically appearing newsletters such as FABIS, LENS, Rachis, <i>Caravan</i> and other, in order to strengthen the reputation of ICARDA as an efficient and reliable research institution.</p>	<p>The recommendation is accepted. Combined issues of Rachis and LENS have been produced to catch up with the publication schedule. In the case of FABIS, the delay in publication has been due mainly to the lack of material. FABIS frequency has been reduced to one issue per year.</p> <p><i>Caravan</i>, which is distributed throughout the world, is now coming on time with the last issue of 1998 having been published.</p> <p>It may be mentioned here that human resources for editing and writing have been drastically cut. Of the three editorial positions, two were cut/frozen in 1998. The third has been vacant since August 1998, since the staff member holding that position left ICARDA on his own. Recruitment process is under way, and the candidate selected for this position is expected to join in May 1999.</p> <p>The media work, however, has been receiving greatly increased attention. A homepage for ICARDA was developed and posted on the CGIAR Internet Web site. CODIS has also developed its own Web page and has posted it on ICARDA's Intranet. Multimedia products, including an ICARDA video and a CD-ROM, have been produced in addition to the increased presence of the Center on TV channels and in print media.</p>
<p>9. The Panel recommends that some CODIS editorial staff should be insulated more from ad hoc assignments from the Management to allow these staff members uninterrupted and concentrated work on periodicals with firm deadlines.</p>	<p>Although this recommendation is valid, it is not feasible for implementation for the following reasons.</p> <p>Many of the demands put on ICARDA's information team come from the CG Secretariat, often with very short deadlines. Since there are so few senior staff in the Unit, as explained above, it is not practicable to spare an editor specifically to handle these "emergencies." However, the management will look into the possibility of impressing upon the Secretariat to give greater "lead time" for these "ad-hoc" assignments.</p>

<p>10. The Panel recommends that CODIS work with the Programs and Units to find ways to mutually support the development of quality course materials.</p>	<p>The recommendation is accepted. The course materials have always been developed in coordination with the Human Resource Development Unit and Program Leaders, and this approach will continue. A few examples of the recent products are: Soils of ICARDA's agricultural experiment stations and sites: climate, classification, physical and chemical properties; Quantification of tannins: a laboratory manual; Sampling strategies for conserving variability of genetic resources in seed crops; and Manual for the MAKTABI/ICARDA thresher.</p>
<p>11. The Panel recommends that an additional mini-review of the library be undertaken by a librarian with broad current expertise in the fields of special librarianship, agriculture, and the application of technology in developed and developing countries.</p>	<p>The recommendation is accepted, but it would be too early to go for another review because of the following reasons:</p> <p>Until mid-1996, ICARDA's library was managed by an internationally-recruited professionally qualified librarian. After the departure of this staff member, the position was filled in January 1997. A significant proportion of the new incumbent's time is being spent rectifying problems in the library, inherited from his predecessor.</p> <p>In comparing the ICARDA library with those of other CG centers, there is a need to take into consideration the total number of staff working in those libraries. The ICARDA library is understaffed as compared with any other CG centers, yet it provides almost the same services as those centers. In 1998, the position of Library Associate was cut, adding even more pressure on an already small team.</p> <p>The Panel noted that the library did not appear to be heavily used by on-site users. We believe that this is due to the fact that many of the library services, including reference service, Table of Contents, photocopying services, document acquisition and delivery are all provided electronically using the e-mail system and the electronic forms that are available to ICARDA scientists to request various library services. Also, scientists now have on-line access to a large number of databases through the local-area network. This is achieved by accessing the Virtual Library page, available on CODIS homepage on the Intranet, which contains most of the databases that are available in the library, as well as electronic journals, books, and conference proceedings.</p> <p>There is no mention in the report of the important role that CODIS has been playing in strengthening the information and documentation centers in Syria through collaborative agreements between ICARDA and the National Center for Agricultural Information and Documentation (NCAID), ARC-Douma, and others.</p> <p>Under "Overview and Assessment," the Panel states that "the strength of the library staff appears to be in database building and in building in-house automated procedures." Automated procedures, e.g., acquisition, serials management, circulation, and statistics are essential to efficient</p>

management of the library, particularly with the expansion of new technologies for the delivery of information. Until now CODIS been using the UNESCO CDS/ISIS, however, in early 1999 the decision was made to migrate from CDS/ISIS to IDRC's MINISIS. And, now the library staff are customizing the new system to serve the Center's needs and allow the transfer of all the in-house built databases into the new system. It is worth mentioning that MINISIS allows for the publishing of databases on the Web.

In the same section of the Report, the Panel suggests that CODIS should not rely on computer-based materials such as expert systems. ICARDA's approach to expert systems is indeed a cautious one, and is designed to start by developing a few pilot systems in conjunction with a regional center of excellence (Central Laboratory for Agricultural Expert Systems, ARC, Cairo, Egypt) that has already made substantial progress in the field. These pilot systems will be tested with advanced national programs in the region and will be used to train extension staff in those countries. By the time these pilot systems are actually available, the necessary computer facilities should be available for the extension services. It is to be emphasized that the computer configurations required to run these systems are standard PC equipment. Moreover, the capture of the knowledge base for each of these systems from the subject-matter specialists provides an excellent extra avenue for safeguarding ICARDA's cumulative knowledge.

**Recommendations of the Center-Commissioned External Review of the
Computer and Biometrics Services, and ICARDA's Response**

Review held on 2-7 February 1998

Recommendations	Response
Biometrics Activities; Reduce number of statistical packages (p. 6)	Already initiated. This may affect the users' flexibility but will reduce operational expenditure.
Software Development process; Adopt a complete software development methodology (p. 7)	Pending availability of funding for training of the developers.
Scientific Applications Development; Process of decision should be reviewed and criteria developed (p. 7-8)	Already in place. Project leadership is being assigned to the users.
Management Information Systems; - Migrate Oracle Financials (p. 8) - Outsource payroll (p. 9) - DBA should be with Finance (p. 9)	- In process. We also need to ensure Year 2000 compliance. - Done. - Not accepted. This is a central activity for all databases.
Hardware and Software Support; Provide more PC support (p. 9) - Improve support tracking (p. 9) - Head of CBSU not to be involved in service requests (p. 9)	- Not possible with existing resources. No visible impact. - Already in place. - In place.
Hardware and Software Acquisition; Keep centralized procurement (p. 10) - More transparency (p. 10) - Reduce number of printers (p. 10) - Decentralize specialized software purchase (p. 10)	- In place . This also helps in economizing the resources. - In place. - In process, through sharing of printers where possible. - Already in place.
Local Area Network ; - Migrate to TCP/IP (p . 10-11) - Segment network (p. 11)	- Already being done. This also means less support requirement. - Planned in 1998 but postponed till 1999 for lack of funds.
- VAX Cluster; Phase out VAX cluster (p. 11)	- Planned by the end of 1999. Researchers have been urged to save their CRISP/ICADET/CERINT data in ASCII files for future use. This will help reducing support requirement.

<p>E-mail, Internet, IVDN ; - Develop policies for Internet (p. 13)</p> <ul style="list-style-type: none"> - Review costs (p. 13) 	<ul style="list-style-type: none"> - Already done. - IVDN implementation will take care of this.
<p>Intranet; CBSU role to be technical (p. 14)</p>	<ul style="list-style-type: none"> - It is already technical only. No impact.
<p>Staffing and Administrative Structure; Number of technical staff in organization to be reduced (p. 15)</p>	<ul style="list-style-type: none"> - Done. Economy of resources.
<p>Training for local staff; Charge for training (p. 16)</p> <ul style="list-style-type: none"> - Reduce number of courses (p. 16) - Use outside experts (p. 16) 	<ul style="list-style-type: none"> - Being implemented (to improve effectiveness of training). - Already done. - Will be done when pertinent, and resources become available.
<p>Support regional offices ; Make software available to NARS (p. 16)</p> <ul style="list-style-type: none"> - Connect offices locally to Internet (p. 16) - Use local support resources (p. 16) 	<ul style="list-style-type: none"> - It is done whenever resources are available. It is still more of a wish than a reality. - Most offices have now Internet connection. This will improve information access. - Being done.

**Recommendations of the Center- Commissioned External Review of the
Finance and Administration, and ICARDA’s Response**

Review held on 7 January to 16 January 1998

Recommendations	Response & Status as of 1 April 1999
<p>1. The Panel recommends that appropriate steps be taken throughout the Center and particularly in finance, administration and personnel, to record decisions taken, clarify responsibilities for follow-up and develop a system of tracking actions taken.</p>	<p><i>Response:</i> The Center will endeavor to develop a formalized follow-up system throughout the Center especially Finance, Administration and Personnel. This will be addressed by the Director of Finance and Administration for all sub units reporting to him.</p> <p><i>Status:</i> The Center has developed the system of clearly identifying the responsibility for implementing a decision arrived at in the meetings of its various committees, e.g. the Management Committee/Executive Committee, etc. With respect to Finance and Administration, this process has been specifically addressed, after the departure of the Director of Finance and Administration in July 1998. The Administration segment is looked after by the Assistant Director General - At Large. He has addressed this issue with significant success in terms of recording decisions, responsibility clarifications, etc,. A monthly meeting of all Administrative Unit Heads was convened. A monthly reporting structure is put in place. A monitoring process is put up in place</p>
<p>2. The Panel recommends ICARDA explore alternative ways to cover routine tasks and peak demands and implement a planned system of cross job training at all levels.</p>	<p><i>Response:</i> Cross training will be addressed as a matter of priority in finance, administration and research support areas and a systematic cross training plan will be developed for review and action for the management by Administration jointly with Human Resources Development Unit. The input of the Personnel Officer will be considered.</p> <p><i>Status:</i> Administration studied the impact of cross training happened in PSD and it would like to share the lessons to other administrative units such as ESU, FMU, etc. Personnel section has commenced cross-training in its units.</p> <p>Cross training in finance was completed with the exception of Payroll and Electronic processing of travel claims. Cross training on the payroll is planned after the conversion of the payroll from MAS to Oracle module, which would be during the 3rd Quarter of 1999. Cross training in Electronic processing of travel claims will be addressed once the staffing situation is improved in Finance Department.</p>

Recommendations	Response & Status as of 1 April 1999
<p>3. The Panel recommends ICARDA carefully examine the opportunities for expanding staff support in the Project Office within the International Cooperation area even at the expense of making some staff reductions in other areas.</p>	<p><i>Response:</i> Will be considered at the appropriate time after addressing the financial constraints facing the center.</p> <p><i>Status:</i> It has not been possible to provide additional assistance because of the financial constraints. Moreover, the Research Project Managers (RPMs) are being advised and trained by the Project Officer to take larger responsibility for project development and for preparing reports for donors. This would reduce some pressure on the time of Project Officer. A training on 'log-frame' for RPMs is scheduled in November 1999.</p>
<p>4. The Panel endorses ICARDA's decision not to use accounting treatments in 1997 ICARDA financial statements which are not in accord with Generally Accepted Accounting Principles.</p>	<p><i>Response:</i> This was added as suggested by the Audit Committee. The Center did not use the accounting treatments in 1997 for restating depreciation for past years.</p> <p><i>Status:</i> Action completed</p>
<p>5. The Panel recommends that ICARDA prepare a documented long term Capital Plan, which includes a comprehensive analysis of the existing asset base by broad categories, the probable timing and cost of its replacement, the rate of depreciation, and an analysis of the adequacy of the current level of the Capital Fund.</p>	<p><i>Response:</i> A long term Capital Plan including comprehensive analysis of the existing asset base by broad categories will be developed along with an analysis of the adequacy of the current level of the capital Fund.</p> <p><i>Status:</i> The Capital plan covering a five-year period till 31st December 2000 was developed in 1996. However, the actual capital expenditures during 1998 were far less than the original plan due to the funding situation. Hence the capital plan will be revised based on the current trend of capital outlay including the change in the depreciation rate for the building. A new capital plan for the five-year covering 1999 to 2003 will be developed by the Acting Director of Finance in consultation with the management by the 2nd quarter of 1999.</p>
<p>6. The Panel recommends ICARDA devote increased attention to its financial planning and analysis.</p>	<p><i>Response:</i> Detailed Financial planning and analysis will be mounted during 1998 with total transparency to the Management of ICARDA and to the Audit Committee, Executive Committee and the Board.</p> <p><i>Status:</i> Since July 1998, the financial transparency and forecast have been significantly improved. Close monitoring with Research Program Leaders and RPM's are in place toward careful analyses of the core and restricted core expenditures. Detailed financial analysis was provided to the management in the monthly financial reports and discussed in detail during EC meetings. In addition, the Audit Committee is reported on a quarterly basis with complete transparency of the financial and year end forecast.</p>

Recommendations	Response & Status as of 1 April 1999
	<p>During 1998, the Internal Auditor provided detailed financial analysis, on a monthly basis, to the Management and the Audit Committee as recommended by the Audit Committee. The information on capital budget and the cash flows will be provided on a quarterly basis to the management starting June 1999.</p>
<p>7. The Panel recommends that the Finance Department improve the accuracy of forecasts of operating results.</p>	<p><i>Response:</i> ICARDA will fine tune the budgeting function of the finance department and ensure the accuracy of forecasts of operating results along with an inventory of assumptions and reasons thereof.</p> <p><i>Status:</i> Since July 1998, ICARDA's forecasts of operating results are fairly accurate since the forecasts were based on detailed analysis of various elements including the seasonal expenses such as planting, harvesting, home leave, new employment, etc. In addition the forecast is done with a conservative approach to address any adverse surprises at the end of the year, for example, reduction in core or donor directed grants due to unfavorable exchange rates, ICARDA will continue to further strengthen in this area.</p> <p>The internal budgeting process, monthly financial information to Management will be further improved in 1999. Inventory of assumptions including budgetary and non financial notes will be added to and further facilitate the decision making by Management.</p>
<p>8. The Panel recommends that ICARDA implement a policy which would, with sufficient controls, allow the use of overtime in extraordinary cases.</p>	<p><i>Response:</i> The center would like to follow the rigid policy on overtime. The center is considered one of the best pay masters in the city. Adequacy of reporting and planning will reduce the need for overtime work.</p> <p><i>Status:</i> The management will decide as appropriate based on assessment of situation and case by case. At this stage, the management considers this recommendation as well considered and as addressed.</p>
<p>9. The Panel endorses the ICARDA policy on the rotation of External Auditors.</p>	<p><i>Response:</i> This was added as suggested by the Audit Committee.</p> <p><i>Status:</i> It is recognized that the policy of rotation of auditors, the review panel found to be excellent and not the act of rotating auditors. No actions need to be taken by the management at this stage.</p>

Recommendations	Response & Status as of 1 April 1999
<p>10. The Panel recommends that Finance and Administration take leadership responsibility in completing the implementation of Oracle and utilizing the full advantages of the Oracle software, working collaboratively with the full range of end users.</p>	<p><i>Response:</i> Finance Department will revisit the Oracle Financial and will take the leadership responsibility and complete the implementation of Oracle. The Director of Finance and Administration is the Chair of the MIS working group overseeing the implementation of the Oracle System. The users need will be addressed as an ongoing process of development.</p> <p><i>Status:</i> The upgrading and shift to Windows NT Platform from VAX-VMS of Oracle System are planned to be completed much before June 1999. The Management also considers it a necessary to retain the finance staff on the new version of Oracle Financial. The users need will also be addressed in the new version. The expected time frame might extend to year 2000. The management considers the users need as a priority to be addressed by Finance and expects to be ever growing as a result of familiarity of the software</p>
<p>11. The Panel recommends that as funds or time permit, the Oracle-based payroll system be implemented to take advantage of a synergy with the Oracle Human Resources module.</p>	<p><i>Response:</i> The Center is considering out sourcing for installation and implementation of Oracle Payroll Module and phase out the old system during 1998/1999. The Center will also ensure Y2K compliance.</p> <p><i>Status:</i> The Center has subcontracted the development of the Payroll Module using Developer 2000 based on Oracle RDBMS. The initial visit by the Service Provider to the Center occurred in March 1999. A specification document is being developed. The project is expected to be completed by September 1999. The system will ensure Y2K compliance.</p>
<p>12. The Panel recommends the immediate implementation of encumbrance reporting for purchases and travel to record commitments which have not yet been booked as expenses.</p>	<p><i>Response:</i> As an internal accounting method encumbrance accounting can be used. However, according to CGIAR accounting policy booking of commitments is not allowed for financial reporting. Will be planned and addressed during 1998. Fine tuning will be considered in 1999.</p> <p><i>Status:</i> The finance has introduced encumbrance accounting in 1998 for purchasing function. The travel encumbrance accounting will be introduced in 1999.</p>
<p>13. The Panel recommends that an Oracle Data Base administrator, who would be in the Finance Division, be designated and trained.</p>	<p><i>Response:</i> The issue will be addressed with CBSU and if found difficult, an appropriate position will be created and filled by a period consultant to address significant issues from all Oracle Financial Modules.</p> <p><i>Status:</i> The Audit Committee commented that this is not a task for a consultant but a permanent responsibility in the Finance department. The Management agrees to this and will address the issue during 1999 along with an assessment of the human resources need of Finance Department.</p>

Recommendations	Response & Status as of 1 April 1999
14. The Panel endorses the plans to implement improved procedures for expense reporting and accounting	<p><i>Response:</i> A simple process of sending an electronically processed expense report has been put in place as a matter of priority.</p> <p><i>Status:</i> An electronic expense report form was introduced in February 1998, using Microsoft Access. However, the current process does not interface directly with the Oracle system. The Management would like to wait for the interfacing till an upgrade of Oracle Finances to version 10.7 Windows NT has occurred. Management would also address the issue of Data Base Administrator as well as training of Finance staff in the new upgraded modules.</p>
15. The Panel recommends that management consider the use of an Oracle consultant on a cost benefit basis.	<p><i>Response:</i> This will be addressed.</p> <p><i>Status:</i> ICARDA will consider engagement of an Oracle Consultant as and when the need and necessity arise. The Management is open to specific requests from Finance and CBSU who are responsible for the implementation of Oracle System.</p>
16. The Panel recommends that appropriate steps be taken with some urgency to place the information related to the purchase orders on line for user access in the ICARDA network.	<p><i>Response:</i> Already exists for workshops and ESU and this will be extended to other users in a phased manner.</p> <p><i>Status:</i> As recommended by the Audit Committee, the time frame would be 12 months after completion of migration and upgrade of Oracle System.</p>
17. The Panel recommends that ICARDA move quickly to recruit a highly qualified Personnel Officer as expeditiously as possible and provide adequate support to facilitate his or her work.	<p><i>Response:</i> The recruitment is in its advanced stage of short listing and expected to be completed by April 1998.</p> <p><i>Status:</i> The Personnel officer joined the Center in June 1998. She is reviewing the staffing of her Department. Action completed.</p>
18. The Panel recommends that skills and experience in human resource development planning and implementation be emphasized in the position description and selection criteria of the new Personnel Officer of ICARDA.	<p><i>Response:</i> Will be considered within the context of the responsibility of the position of the Personnel Officer and the Human Resources Development Unit.</p> <p><i>Status:</i> Action completed.</p>

<p>19. The Panel recommends that current Personnel Policies including staff classification, position descriptions and qualification requirements be carefully reviewed as soon as possible to simplify categories and eliminate apparent anomalies.</p>	<p><i>Response:</i> This will be one of the major assignments for the Personnel Officer and is expected to be addressed by June 1999.</p> <p><i>Status:</i> The Personnel Officer is looking into this and expects it to be completed by the end of 1999, although the Audit Committee had recommended its completion by the end of 1998.</p>
<p>20. The Panel recommends that the Personnel Manual be revised and include the relevant specific information that is currently contained in various Administrative Instructions and Director General Circulars. The revised Manual should be distributed as promptly as possible, organized in a loose leaf format. All future modifications (both Policies and the relevant Administrative Instructions and Director General Circulars) need to be distributed directly to each staff member with instructions to incorporate changes in their personal binder. Each Unit Head should also maintain a master copy.</p>	<p><i>Response:</i> Action has been initiated by Personnel to address the consolidation of all administrative instructions, Circulars issued by the Director General in a loose leaf format. A review will be made by the Personnel Officer prior to distribution to all concerned. The intranet facility will be used as an alternative solution to shift to a paper less repository of virtually updated Personnel Manual.</p> <p><i>Status:</i> The Audit Committee recommended that until such time that all staff have access to a computer and training in its use, both paper and computer access are needed. The Management is implementing this. The Personnel Officer has reviewed all the relevant documents and has compiled updated manual for immediate distribution to Programs and Units. The document is also being updated in INTRANET. The process is expected to be completed by end of 1999.</p>
<p>21. The Panel recommends that an institution wide policy and a set of procedures for orienting new staff, including the distribution of the revised Personnel Manual, be developed, and a system established to assure its implementation. Likewise, a system of orientation for family members should also be prepared and implemented, where appropriate.</p>	<p><i>Response:</i> Although, we have a system in place, this will be further streamlined through a coordinated effort between the Personnel Officer and the Human Resources Development Unit.</p> <p><i>Status:</i> The Personnel Officer is now giving a copy of the Personnel, Housing and Vehicle policies to the newly appointed staff. She is also developing an orientation kit for such staff. The Housing Department provides assistance to the family of the newly appointed staff, in addition to the voluntary assistance by the International Women’s Group.</p>
<p>22. The Panel recommends that the Administrative Manual be updated and made widely available to all concerned personnel.</p>	<p><i>Response:</i> The intranet facility will be used for wider circulation among all categories of staff.</p> <p><i>Status:</i> The Administration Manual is available in INTRANET. As recommended by the Audit Committee, the hard copy is also available, with the Personnel Officer.</p>

<p>23. The Panel was told that the internal promotion policies are under review and likely will be changed. We applaud this review and recommend a prompt modification of this policy.</p>	<p><i>Response:</i> The center is expected to address this issue in 1998 and finalize in early 1999.</p> <p><i>Status:</i> The Management has developed a revised staff planning and appraisal procedure and has started its implementation. The process is delinked with the internal promotions, although the performance provides base for considering the staff for promotion / merit increases / bonuses over the time. This fact is brought to the notice of the staff by the Program Leaders/Unit Heads at the time of staff appraisal. The decision on internal promotion/merit increases/one-time bonus is taken by the Executive Committee annually based on past year performance and current year core-funding situations, along with its obligation to have a balanced budget with a reasonable working capital.</p>
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ITINERARY OF THE EPMR PANEL

The whole Panel visited ICARDA headquarters from 16 to 24 April 1999 for the initial phase of the Review to familiarize itself with the Centre. The Panel members interacted with the Board, senior management and staff, and met with External Auditors. During the initial phase, the Panel visited ICARDA's work at its experimental site in Breda and undertook field trips to observe ICARDA's off-station work in Northern Syria. The Panel took the opportunity to interact with farmers participating in ICARDA's participatory research efforts.

On April 25, 1999 the Panel split up in-groups to see ICARDA's collaborative work in its mandate region. From 26 to 29 April, four Panel members visited ICARDA/ARC activities within the Nile Valley and Red Sea Regional Programme in Egypt. Two of the Panel members continued to Yemen and two to Morocco. Both of the country visits were from April 30 to May 2, 1999. Two other Panel members went to Central Asia from 25 April to 3 May 1999, to see ICARDA's collaborative work in Uzbekistan and Kazakstan. One other member visited Tunisia from 31 May to 4 June 1999, and an other member visited Morocco and Jordan during July to observe the ongoing ICARDA activities. The visits provided further opportunities for Panel members to interact with officials, ICARDA staff in the field, co-operating NARS scientists and participating farmers.

The Panel reassembled at ICARDA headquarters on 25 July 1999 for the main phase of the Review and at Wallingford UK on February 4, 2000 to complete the Report. Panel members interacted with Board, management, scientific and support staff, individually and in small groups. The Panel Chair presented the draft Report of the Panel to the Board and senior management, and subsequently to the staff.

LIST OF DOCUMENTS PROVIDED TO THE PANEL

A. Documents Provided by the TAC and CGIAR Secretariats

To All Panel Members:

1. Priorities and Strategies for Soil and Water Aspects of Natural Resources Management Research in the CGIAR
2. Harvest and Postharvest Problems in Agriculture, Forestry and Fisheries – The CGIAR Contribution to Research
3. First External Review of the Systemwide Genetic Resources Programme (SGRP)
4. CGIAR Priorities and Strategies for Resource Allocation During 1998-2000
5. Report of the 3rd External Review of ICARDA (May 1993)
6. Policy and Management and Institution Strengthening Research and Service in the CGIAR
7. Report of the 4th EPMR of ICRISAT (October 1997)
8. Review Processes in the CGIAR System.
9. Lucerne Declaration and Action Programme (pp. 7-12)
10. Most recent CGIAR Annual Report
11. Most recent CGIAR Brochure and Directory
12. Financial Requirements of the 1999 CGIAR Research Agenda (Agenda Item: 8, Doc. No: MTM/98/05, April 20, 1998)
13. Terms of Reference for External Programme and Management Reviews of CGIAR Centres
14. Organization and Management of the CGIAR System: A Review, 1993. (S. Ozgediz, Public Administration and Development, Vol. 13, 217-231 (1993); copyright 1993 by John Wiley & sons, Ltd.)
15. Reference Guides for CGIAR International Agricultural Research Centres and their Boards of Trustees, August 1997.
16. CGIAR Mid-Term Meeting 1998 Preliminary End-of Meeting Report.

To Relevant Panel Members:

17. Governance and Management of the CGIAR Centres, 1991 (S. Ozgediz, Study Paper No. 27, copyright 1991, first printing October 1991)
18. Most recent volume of the CGIAR Board of Trustees Directory (October 1997)
19. CGIAR 1997 Financial Report (August 1998)
20. Committees and Units of the CGIAR: Roles, Responsibilities, and Procedures (April 3, 1996)
21. Most recent CGIAR financial guidelines and manuals relating to:
 - (a) Financial Management Guidelines, Series No. 1 (January 1988)
 - (b) Accounting Policies and Reporting Practices Manual (October 1993)
 - (c) Financial Guidelines - Audit Manual (July 7, 1995)

B. Documents Provided by ICARDA

To All Panel Members and/or available at the Centre for reference:

22. 'This is ICARDA' – a general information brochure
23. ICARDA's Annual Report 1997
24. ICARDA's Medium Term Plan 1998-2000 (containing ICARDA's Strategic Plan), MTP 1999-2001, MTP 2000-2002 (latest MTP)
25. ICARDA's Charter
26. Schedule of events, agenda and agenda notes for the Programme Committee of ICARDA Board of Trustees, scheduled for 18 to 21 April 1999
27. A 'Synthesis' document, containing key information on our research, achievements, constraints and impact of the Centre Programmes since 1993 and issues confronting the Centre, and action taken on last EPMR
28. The Centre-Commissioned External Reviews (CCERs) conducted at ICARDA since the last External Programme and Management Review as well as the response of ICARDA Management, as approved by ICARDA Board
29. CCER of Finance & Administration, and the BoT approved response
30. ICARDA's 1993 EPMR Report
31. ICARDA BoT Handbook
32. Personnel Policies

33. Purchasing and Supplies Manual
34. Housing Policies Manual
35. Vehicle Policies Manual
36. Audited Financial Reports for the last five years (1994-1998) including the management letter from the external auditors and other special reports
37. Internal Audit Unit Performance (1991 to date)
38. Staff List
39. A list of staff publications during the period under review
40. List of agreements for cooperative activities with other centres and institutions
41. List of ongoing and recently completed contracted projects
42. List of report of major planning conferences, internal reviews, expert meetings, etc. which have had a major influence on the direction of specific Centre Programmes (included in the 'Synthesis' document)
43. The current organization chart, with a brief description of the Centre's internal management structure including the composition and terms of reference of each major committee

Additional Documents provided to Dr. Louis Paul

44. Table showing composition of the Board over the last five years, along with an indication of the term of members and their roles on the Board
45. Table showing allowances, benefits, and salary ranges for each category of staff
46. Table showing personal data on internationally recruited staff by programme, including each job title, incumbent's location, period of tenure, gender, nationality, age, salary over the last three years, funding source (excluding names)
47. Table summarizing turnover of staff over the last five years by staff category
48. List of international staff vacancies and how long position have been vacant

49. Brief description of the Centre's information management systems and procedures (e.g. library and documentation, archives and records management, computer and information technology, management information systems (given as a part of the 'Synthesis' document))
50. More recent Internal audit reports
51. Set of minutes covering Board and Board Committee meetings since the last External Review (and report of board committees to the full Board if not included in the minutes)
52. Activities of Engineering Services Unit and Facilities Management Unit
53. Note on Centre's information management system
54. External Review of the CGIAR Genebank Operation Report
55. 1st External Review of Systemwide Genetic Resources Programme
56. Review of CGIAR Priorities and Strategies, December 1994
57. MTM98, Brazil, CGIAR 1999. Research agenda and Initial Proposals for 2001
58. 1997 CGIAR Human Resources Survey: International Staffing at the CGIAR Centres with a Focus on Gender (D. Merrill-Sands, August 1997)
59. ICARDA Presentations at the 30th Programme Committee Meeting 18-19 April 1999

GLOSSARY OF ACRONYMS

AARINENA	Association of Agricultural Research Institutions in the Near East and North Africa
ACSAD	Arab Centre for Studies of Arid Zones and Dry Lands
ADG-AL	Assistant Director General At Large
ADG-R	Assistant Director-General for Research
AFLP	Amplified Fragment Length Polymorphism
AFSED	Arab Fund for Social and Economic Development
AGERI	Agricultural Genetic Engineering Research Institute
AGRIS	International Information System for Agricultural Technology and Science
ALTR	Anticipatory Long-Term Research
APRP	Arabian Peninsula Regional Programme
ARI	Advanced Agricultural Research Institutes
BOT	Board of Trustees
CAC	Central Asia and the Caucasus
CACPR	Central Asia and the Caucasus Regional Programme
CARIS	Current Agricultural Research Information System
CBSU	Computer and Biometrics Service Unit
CCER	Centre Commissioned External Review
CDC	Centres Directors Committee
CGIAR	Consultative Group on International Agricultural Research
CGIAR-NGOC	CGIAR-Non Governmental Organisation Committee
CIAT	International Centre for Tropical Agriculture
CIHEAM	Centre International de Hautes Etudes Agronomiques Mediterraneenes
CIMMYT	International Maize and Wheat Improvement Centre
CODIS	Communications, Documentation and Information Services
CP	Cereals Programme
CWANA	Central, West Asia and North Africa
DG	Research and Development
D-IC	Director for International Cooperation
EC	Executive Committee
EMPR	External Programme and Management Review
FRMP	Farm Resource Management Programme
GAP	Southern Anatolia Development Project, Turkey
GDP	Gross Domestic Product
GIS	Geographical Information System
GMO	Genetically Modified Organisms
GP	Germplasm Programme
GRU	Genetic Resources Unit
HRDU	Human Resources Development Unit
HRP	Highland Regional Programme
IAEG	Impact Assessment and Evaluation Group
IARCs	International Agricultural Research Centres
IBRD	International Bank for Reconstruction and Development
ICARDA	International Centre for Agricultural Research in Dry Areas
ICRAF	International Council for Research in Agroforestry

ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICTG	Inter-Center Training Group
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
INRM	Integrated Natural Resource Management
IPGRI	International Plant Genetic Resource Institute
IPM	Integrated Pest Management
ISNAR	International Service for National Agricultural Research
IWMI	International Water Management Institute
IWWIP	International Wheat Improvement Programme
LARP	Latin America Regional programme
LGP	Length of Growing Period
LP	Legumes Programme
MIS	Management Information System
M&M	Mashreq and Maghreb
MTP	Medium Term Plan
NANA-SCFO	Near East and North Africa Seed Consultative Forum
NARP	North Africa Regional Programme
NARS	National Agricultural Research System
NGO	Non Governmental Organisation
NPO	National Professional Officer
NRM	Natural Resource Management
NRMP	Natural Resource Management Programme
NRMR	Natural Resource Management Research
NVP	Nile Valley Project
NVRSRP	Nile Valley and Red Sea Regional Programme
PFLP	Pasture, Forage and Livestock Programme
PMS	Project Management and Data Registry
RAPD	Randomly Amplified Polymorphic DNA
R & D	Research and Development
RPCs	Regional Programme Coordinators
RPMs	Research Project Managers
SHL	Seed Health Laboratory
SR	Small Ruminants
SU	The Seed Unit
TAC	Technical Advisory Committee
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development
VIR	Vavilow Institute in Russia
WANA	West Africa and North Africa
WANADDIN	West Asia North Africa Dryland Durum Improvement Network
WANANET	Network on Plant Genetic Resources in the WANA Region
WARP	West Asia Regional Programme
WMO	World Meteorological Organisation
WUE	Water Use Efficiency