REPORT OF THE INTERIM EXTERNAL REVIEW

OF THE

INTERNATIONAL CENTER FOR
MAIZE AND WHEAT IMPROVEMENT
(CIMMYT)

CGIAR SECRETARIAT

The World Bank

March 1993
REPORT OF THE
INTERIM EXTERNAL REVIEW
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(CIMMYT)

Panel: Sir Ralph Riley (Chairman)
Mr. W. John Griffith
Dr. John Monyo (TAC Secretariat)
Ms. Elizabeth Field (CGIAR Secretariat)

CGIAR SECRETARIAT
WORLD BANK
March 1993
March 3, 1993

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Dear Alec and Alexander,

With this letter I formally pass to you the Report of the 1993 Interim External Review of CIMMYT. The Review Panel, consisting of Mr. W. John Griffith and myself, was assisted by two resource people namely Dr. John Monyo (TAC Secretariat) and Ms. Elizabeth Field (CGIAR Secretariat).

We spent 10 working days at CIMMYT's headquarters in Mexico and four days completing our report in Washington, D.C. From the size of the Panel and from the time involved it is apparent that although we worked intensively it was not possible to go into detail nor to visit any NARS or outreach personnel. Despite this I believe that we have formed an accurate impression of the state of CIMMYT in 1993 and of the ways in which it has changed in the interval since the last full reviews in 1988.

This has been possible because of the openness with which we were able to interact with Dr. Winkelmann and his colleagues. They provided excellent documentation which displayed the essentials of their work without burdening us with a superfluity of information. It was also valuable to be able to talk to two members of the Board of Trustees.

All of this leads me to conclude that interim review processes like this can be conducted successfully and make a useful contribution to the operations of the CGIAR System. However, the success depends, to some extent, on the Panel members and resource persons having previous knowledge of the Center and of the CGIAR System. Moreover in the case of CIMMYT we were able to use the work carried out by members of internally managed external reviews of scientific research activities over the period since 1990.
Turning to CIMMYT in 1993, its principal objectives are congruent with those set out in its Strategic Plan. It contributes successfully by delivering improved germplasm of maize and wheat to its partners in the NARS. The scale of the impact of its germplasm on agricultural productivity is truly remarkable. Moreover, although there are fewer staff members than previously the overall structure of the Center remains unchanged and fully effective.

The attitude of the Center to disciplinary science has undergone a transformation as is revealed by the numerous papers that are now published in the international scientific literature. Related to this are the considerable achievements of the Applied Molecular Biology Laboratory which we recommended to CIMMYT should be recognized as a free standing Program.

CIMMYT explained to the IER its anxiety to extend into Natural Resources Research. After detailed examination of the arguments either way we concluded that very worthwhile results could come from this and recommended that there should be a Natural Resources Research Unit.

A number of improvements are now being made in the processes of financial and human resource management and the next review should reexamine these capabilities in the Center.

In conclusion, CIMMYT is a dynamic and flexible institution which is making, and will continue to make, outstanding contributions to the output of the CGIAR.

Yours sincerely,

Sir Ralph Riley

Attachment

cc: Dr. Burton C. Matthews, Chairman, CIMMYT Board of Trustees
    Dr. Donald L. Winkelman, CIMMYT Director General
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SUMMARY

1. The purpose of the 1993 Interim External Review (IER) of CIMMYT was to assess the Center five years after the major Reviews of 1988 with the anticipation that a large scale review could be delayed. The IER examined changes at the Center since 1988 and studied the ways in which CIMMYT’s strategy has evolved.

The Team of two members and two resource people spent 10 working days in Mexico and four in Washington, D.C. to complete the report. In Mexico they interacted with Management and staff and talked with two Board members. In addition to the headquarters at El Batan they visited an experiment station (Tlaltizapan).

2. Despite the reduced size of its staff and more limited resources than in the past CIMMYT continues to be a very effective research and training institution. It is well able to make its traditional input into the solutions of the many formidable problems that face developing countries that grow maize and wheat.

3. The strategic direction of CIMMYT (section 1.2.3) is essentially unchanged since its Strategic Plan was published in 1989. Its objective is to increase the production of maize and wheat principally by the supply of improved germplasm. The aim has not been distorted despite the Center’s more constrained financial environment. Perhaps the greatest change is the development of an earlier concern for sustainability into one in which, in response to worldwide concerns, CIMMYT recognizes a responsibility for the natural resource base.

All of this is reflected in CIMMYT’s current mission statement which reads (section 1.2.1):

"To help the poor by increasing the productivity of resources committed to maize and wheat in developing countries while protecting the natural resources. We do this through agricultural research in concert with national research systems."

4. Many of the recommendations and suggestions in the 1988 Reviews related to Governance and Management. CIMMYT has accepted these with very minor exceptions and the IER concluded that the Center is well governed and managed overall (section 2). The research and training part of CIMMYT’s work is now managed by its Deputy Director General of Research leaving the Director General greater freedom to deal with broader, more strategic issues. Decision points have been devolved in the Maize and Wheat Programs putting management closer to hands-on science. Policy formulation is more participatory and the IER encouraged further moves in that direction. Internally managed external reviews have become an important component of the Center’s planning and review processes, as recommended in 1988.

The 1988 Reviews also recommended that disciplinary research should be brought out of the Crop Programs to improve its status in CIMMYT. The Center decided not to do this, and the IER concludes that, in view of the increased number of CIMMYT publications in the scientific literature, the objectives of the original recommendation had been attained by another route.

5. The impact of the work of the Maize Program can now be estimated more closely (section 3.1) to show that about half of the 58.5 million ha of maize grown in developing countries have germplasm deriving from CIMMYT in some degree. Now, even more than in 1988, greater attention is being paid to the use of maize hybrids. This is because 38% of the area planted to maize in developing countries
was in hybrids in 1985 although this was biased by the large areas in Argentina, Brazil and China. It is to be expected that the area in hybrids is even greater now. CIMMYT estimates, and the IER agrees, that a great deal of the future of maize in developing countries lies with hybrids.

Considerable success is being achieved in the Maize Program in the production of genotypes resistant to a range of insect pests and diseases as well as to drought. A "stress team" doing this work should work closely with CIMMYT's biotechnologists who can mark with molecular tags the complexes of resistance genes involved.

6. The tremendous impact of the Wheat Program (section 3.2) is revealed by a single figure. It is that in developing countries more than 75% of the wheat grown is in varieties to the breeding of which CIMMYT has contributed. Often that contribution has been on a very large scale. So CIMMYT has made a major impact on wheat production.

The IER recognized that the control of wheat diseases is a major problem and takes up a large part of the Program's resources. The strategy of breeding for "durable" resistance is clearly correct where it can be done because it removes the need for breeders to seek new resistances as the pathogen evolves to become more virulent. The IER suggests, however, that where the durable strategy cannot be employed, for whatever reason, the work of "maintenance breeding" should be contracted out to a developing country with skilled agricultural scientists and with environments in which the particular species of pathogen prevails.

The IER applauds the Wheat Program's efforts to broaden the genetic base of its breeding material and especially as this affects attempts to control that pernicious pathogen, Karnal Bunt.

7. Since 1988 the Economics Program (section 3.3) has been transformed from one with a major involvement in on-farm research (OFR) and training in outreach to one which is very much research oriented. This is in step with what the EPR recommended in 1988. The research is about the design and evaluation of agricultural technologies, priorities in breeding programs, strategic studies on variety usage and alternative approaches to breeding problems. Particularly helpful has been the Economics Program's impact studies. Moreover the IER is particularly impressed by the value of the regular publication of "Maize (or Wheat) Facts and Trends."

The IER concluded that CIMMYT's Economics Program is making a very valuable contribution.

8. CIMMYT believes that it can make a unique contribution to research on natural resources (section 3.6). It has unrivalled knowledge of the biology and agriculture of wheat and maize and of certain mega-environments in which the crops are grown. After long experience of determining the effects of the environment on the crop it contends that it can be equally effective at studying the effects of the crop on the environment.

The IER discussed this at length with CIMMYT especially over whether this change in perspective might distract CIMMYT from its major commitment which must continue to be its delivery of improved germplasm in maize and wheat. In the end the Panel concluded that it was right that CIMMYT should go this way and therefore recommends that: CIMMYT should continue to examine the ways in which it can contribute to Natural Resources Research (NRR) and that it should make its commitment to the creation of a NRR Unit as soon as possible.
9. The Applied Molecular Biology Laboratory has made great progress and has produced original research (section 3.5.1). It is likely to provide the base from which new plant breeding technology will emerge for CIMMYT and is not merely a support service for the crop Programs. Consequently the Panel recommends that: CIMMYT should consider urgently according to Applied Molecular Biology the status of Program in recognition of its achievements and of its importance in the development of new plant breeding technologies without which CIMMYT will not be able in the future fully to discharge its responsibilities to developing countries.

10. The Support Services (sections 3.5.2 and 3.5.3) including the Soil and Plant Analysis Laboratory and the Biometrics and Computing Services are all under strain because of declines in personnel numbers and resources generally. CIMMYT must watch carefully so that either its scientists are adequately served or more stringent priorities must be imposed on the use of Support Services.

11. A Seed Health Unit was established in 1989 following a recommendation from the 1988 EPR. It appears to be working well with its head reporting directly to the DG (like an internal auditor.) The major challenge is caused by Karnal Bunt of wheat which has prevented spring wheat nurseries being dispatched in 1993. Chemical treatments against it have been ingeniously developed in the Unit but it remains a cause of concern in CIMMYT.

12. CIMMYT runs a powerful and effective Information arm and Library service (sections 3.5.5 and 4.3.2). It recognizes that the failure to transmit information and knowledge would largely negate any other achievement. When the IER was there, CIMMYT was asking itself questions about information strategy and how it can most successfully and cost effectively communicate with its many audiences. The IER expects to see changes in CIMMYT’s information-handling in the immediate future. As the dominance of the written word gives way to the visual image the IER would like CIMMYT to reassess where its balance should be.

13. CIMMYT’s approach in International Cooperation and Outreach (section 4) is in line with its revised mission statement and priorities and strategy. It has good and extending links with advanced institutions. As the commitment to outreach has declined CIMMYT’s policy needs to be thought through in relation to objectives, complementarities between headquarters and outreach, links with headquarters and cost effectiveness.

Training continues to be a major output from CIMMYT although it has successfully devolved some crop management research (CMR) courses to Kenya and Argentina with Thailand and Brazil in prospect. The IER notes that CIMMYT is considering who its clients should be especially in relation to maize germplasm.

14. CIMMYT has further developed and fine tuned its budgeting processes in accordance with the 1988 EMR recommendations (section 5.1.1). The new system appears to be valuable to the staff. The IER would like to see the Management Advisory Committee brought more fully into the budgeting process. New management information systems are just swinging into use and should provide a timely improvement to the analytical aspects of CIMMYT’s review and planning processes.

Internal and external audit functions (section 5.1.3) appear sound and the Audit Committee of the Board works in a conscientious way. The IER is, however, anxious that the most economical and effective way of managing every part of CIMMYT’s endeavor shall be explored and improvements made where possible.
The long-term viability of CIMMYT's Experimental Stations, that was discussed by the EPR in 1988, still sets problems with the exception of Tlaltizapan where considerable improvement is occurring (section 5.2.2). At headquarters administrative services and facilities work smoothly. This is a tribute to the hard work and commitment of CIMMYT staff (section 5.2.1).

15. Many human resources issues raised in the 1988 EMR have been addressed (section 5.3). New challenges have emerged primarily relating to downsizing and how decisions were communicated. Overall the process was well managed, although insecurity concerning CIMMYT's future weighs on staff morale.

Performance appraisal is now an accepted and valuable part of CIMMYT management. Staff training efforts have been upgraded, and the Center conducts regular studies of local market compensation trends.

The balance between the wisdom and experience of long serving staff members and the innovation and drive of newcomers is an issue faced in every organization. It is being addressed by CIMMYT now and it is attracting the careful judgement of its Board and Directorate.

Spouse employment is apparently a constraint to recruitment (and retention) of highly qualified international staff. Management is giving attention to this difficult issue which, in the Panel's view, might be assisted by a more interactive approach involving staff and spouse inputs. There would be benefit if CIMMYT had a human resource expertise experienced in the handling of expatriate staff.
1 - INTRODUCTION

1.1. The 1993 Interim External Review of CIMMYT

At its Mid-term meeting in 1991 the CGIAR considered a TAC paper "External Reviews - Which Way Forward?" which examines several approaches to improve the external review process. The CGIAR decided to authorize TAC and the CGIAR Secretariat to experiment with the conduct of external reviews. One of the approaches proposed by TAC was to commission an interim external review if it was felt that the period between two regular external reviews could be extended from five to about seven years. CIMMYT was chosen to be the first Center to try the new approach.

The purpose of the 1993 Interim External Review (IER) of CIMMYT is to look at major changes in strategic direction that have taken place at the Center since the 1988 External Reviews, to highlight the main achievements, impact and challenges facing CIMMYT, and recommend issues that require a more comprehensive examination by the Center and the next regular External Review(s). The Panel is not expected to carry out a thorough assessment of CIMMYT but to make an independent general appraisal of the Center by identifying and focusing on significant trends and critical issues.

The Review was undertaken from 17-26 February 1993 at CIMMYT headquarters. The Panel was chaired by Sir Ralph Riley, who had chaired the 1988 External Program Review. It consisted of one other Panel member, and was assisted by two resource persons. Prior to coming to Mexico the Panel solicited the views of CIMMYT's outposted staff through a survey questionnaire. Once at CIMMYT, in addition to meeting with staff at all levels, the Panel interacted with a team commissioned by CIMMYT to review the activities of the Maize Germplasm Bank, and visited the experiment station at Tlaltizapan.

1.2. Developments Since the 1988 External Reviews

1.2.1. Evolution of mission, program and management

In 1992 CIMMYT amended its mission statement to draw attention to the potentially negative effects of agriculture on the environment, and to highlight the importance of collaboration with national research systems. It now reads: "To help the poor by increasing the productivity of resources committed to maize and wheat in developing countries while protecting the natural resources. We do this through agricultural research and in concert with national research systems".

In defining its future approach to the conduct of research, CIMMYT has made conscious choices, and changes are evident since 1988:

- the level of disciplinary and strategic research has increased, while on-farm research and institution building – most notably training – has declined;

- research capacity has been strengthened at headquarters relative to that in the regions - in recognition of the increasing strength of some NARS, developments in science, increased concerns for natural resources management in the CGIAR, and funding constraints;

- the organization of research has been modified as part of an ongoing process to decentralize decision-making and accountability to scientists.
During the past five years CIMMYT Management and the Board have been challenged to reassess research activities and program priorities due to budgetary circumstances. The growth trend that characterized CIMMYT's earlier years was reversed, and from 1988 to 1993 CIMMYT's total budget has declined by about 13% in real terms. Staff redeployment and downsizing has resulted. The international staff has been reduced by 19% since 1988 (from 128 to 104, or 106 to 93 core), primarily in outreach, where the decrease was 43% (from 47 scientists in 1988 to 27 currently). Support staff has been reduced by 14% from 607 to 539 (almost all of whom are headquarters based). In addition to reducing staff, Management has examined operations in efforts to discover new efficiencies.

The changes have been evolutionary, but in the form of directed evolution. During this period, the Panel also notes that the Government of Mexico has ratified CIMMYT's new Headquarters Agreement, granting the Center international status — a process that was underway and had been discussed in the 1988 External Reviews.

1.2.2. Response to the 1988 External Reviews

The 1988 External Reviews of CIMMYT had 84 recommendations: 36 recommendations from the External Program Review (EPR) and 48 recommendations from the External Management Review (EMR). Appendix 3 lists the recommendations and CIMMYT's response. The IER Panel is generally satisfied that CIMMYT has given careful consideration to those recommendations and responded in ways well suited to the Center's needs. It notes that good progress has been made in the areas of strategic planning, governance, research organization and management, and research focus and orientation. Further discussion on the implementation of the recommendations as accepted follows in appropriate sections of this report.

1.2.3. Strategic directions

In 1988 the External Program and Management Review Panels used a draft of the Center's Strategic Plan as its base document. This draft was subsequently revised in the light of the reports of the Review Panels and of TAC's comments on those reports and on the draft of the Plan. The Plan was subsequently published in November 1989 in two parts under the titles "Toward the 21st Century: CIMMYT's Strategy" with a supplement "Toward the 21st Century: Strategic Issues and the Operational Strategies of CIMMYT".

The dispositions of resources required to fully implement the Plan were predicated, in the five-year budget, on the assumption that senior core staff positions would grow from 77 in 1989 to 94 in 1994. This change was expected to be associated with the growth of core budgets from US$26.4 million in 1989 to US$36.6 million in 1994. It hardly needs to be stated that the reality has been different.

However, CIMMYT had never visualized its Strategic Plan as being immutable and so set in place a, so called, Evergreen Reporting System to update the Strategy according to changes in

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1 Total funding is expected to rise from US$32.0 million in 1988 to US$36.2 million in 1993, or from US$26.2 million to US$28.5 million core.

2 "International staff" includes senior and associate level scientists and administrative staff, in this IER report. In addition to this group, CIMMYT has pre- and postdoctoral fellows whose numbers declined from 25 to 10 from 1988 to 1993.
circumstances. The changes that Evergreen monitors include advances in relevant sciences and evidence on variation in the physical environment that might affect crop production. Also variations in the objectives of the CGIAR are considered together with world economic trends especially as they affect maize and wheat production and consumption. Also the changing capacities of the NARS in relevant R&D are factored in.

Of course, the major impediment to full compliance with the Strategic Plan has been the need to reduce the size of the staff and to curtail CIMMYT's program in order to live within the resources provided. Remarkably and to CIMMYT's credit these reductions have not distorted the overall aims of the Plan. The principal objectives of the Center continue to be the genetic enhancement of maize and wheat with the purpose of increasing production and the reliability of production. In addition CIMMYT's vision is that by contributing to increased food production it will relieve poverty. As a consequence there will be reduced population growth and pressure on the environment. In this way the Center will contribute to the conservation of natural resources.

Nevertheless, as we shall report later, there is no direct reference in the 1989 Plan to Natural Resources Research but proposals for direct participation in this activity are included in the Medium-Term Plan and Budget for 1994-1998.

2 - GOVERNANCE, ORGANIZATION, AND RESEARCH MANAGEMENT

2.1. Governance

Since 1988, the Board of Trustees, in close consultation with Senior Management, has implemented essentially all of the recommendations of the 1988 EMR.

The Interim External Review Panel notes that the Board undertakes some of its business with the help of Audit, Nominating, Program, and Executive and Finance (EFC) Committees. Since 1988 and on the advice of the EMR the Audit Committee has been created. The 1988 EMR suggested that there should be a Nominating Committee. We were told that nominations are made by the EFC acting as a Nominating Committee. By reviewing minutes of meetings and discussions with a few selected Board members, the IER has sought to review the effectiveness of the workings of the Board and its Committees.

The Panel was encouraged that the Board, primarily through the activities of the EFC, is intensively involved with the program and managerial aspects of the Center's operations and that Management is preparing adequate briefing materials. The full Board and the Audit Committee meet once a year; the EFC two times; and the Program Committee once.

Board members interviewed reported that the program and budget review discussions are lively, constructive, and generally accepting of Management's proposals. Each year the Board assesses the performance of the DG and this process appears to work satisfactorily. Discussions with the External and Internal Auditors have been satisfactory and a number of their suggestions have been implemented. As core financial resources diminish, the Board's, and Management's attention to fund raising has increased. As the 1988 Review recommended, this is now receiving a lot of attention in terms of understanding the "mechanics" of successful fund raising including the respective roles to be played by the Chairman, individual Board members (present and future) and Management. As information is gathered about this critical function, a clearly articulated fund raising strategy should be a high priority for the Board.
Furthermore, the continuation of the Strategic, and Medium-Term planning processes, has provided the Board with an excellent vehicle for assessing progress on an ongoing basis.

The Panel concludes that governance is effective and efficient; that Management-Board relationships are good; and that the Board is focusing on the essential governance questions of programmatic, managerial, financial, and political content. The operations of the Board in some of these areas were criticized in the 1988 EMR. The brief review undertaken in 1993 suggests that appropriate corrective actions have been taken but no doubt the next full review will return to this subject.

2.2. Leadership and Senior Management Structure

At the Senior Management level, CIMMYT has implemented the changes recommended in 1988. The positions of Deputy Directors General, Research and Administration/Finance were redefined in 1990. The organization structure was modified along program/subprogram lines and existing planning and budgeting systems were revamped to better allocate scarce resources and control expenditures against plan. A Management Advisory Committee (MAC) consisting of the DG, DDGs and Program Directors was substituted for a pre-existing committee. It meets monthly or more often as necessary and has formal procedures (see section 2.3). A Research Coordinating Committee was established to review and integrate the Center's research activities (see section 2.4).

Externally, of course, the biggest change over the past five years has been the substantial drop in core funding. Both the internal and external changes are causing a fundamental shift in the operating patterns of the institution. Gone are the days of generous resources: scientists and administrators alike are having to examine the cost-effectiveness of each activity within their spans of control. Furthermore tough decisions have been made in reducing core funded positions and further funding shortfalls are possible.

Not surprisingly, this shift sits uneasily on some, who feel a sense of "remoteness" from decision-making, and that external forces, rather than scientific accomplishments per se, are beginning to intrude on program planning. This is worrying some of the senior staff.

Strong leadership in difficult times is essential and the Panel notes the effectiveness with which the DG carries out his functions. One of the leadership challenges in such times is to achieve the appropriate balance between open and democratic decision-making on the one hand, and the need for quick, decisive actions aimed at minimizing conflict and stress. On this issue, staff views were mixed. Some senior staff feel left out of the key decision-making processes. (As an example, a number of managers of budget units believe they have little or no input on the absolute level of resources given them by the DG's office at the start of the budget cycle.) Strong leadership will continue to be required as the senior staff are encouraged, indeed mandated, to look for new, innovative, cost-effective ways to maximize the use of scarce resources. The leadership challenge, then, for the DG over the next two to three years will be the extent to which, having introduced a new modus operandi, he can now gain the staff's strong commitment.

2.3. Organization

The structure within which this governance and leadership is exercised appears to be about right for now. As noted above the organizational changes suggested by the 1988 Review have been implemented and appear to meet the Center's needs. The Program/Subprogram structure (see Figure 1) has enabled and supported the decentralization of decision-making to lower levels and a number of staff commented favorably on the freedom given them to implement their approved budget.
Figure 1

General organization of CIMMYT

- Board of Trustees
- Director General
  - D. L. Winkelmann
- CGIAR
- TAC

- DDG/Research
  - P. R. Rowe
- Maize Director
  - D. Hess
- Wheat Director
  - R. A. Fisher
- Economics Director
  - D. Byerlee
- Information Services
  - T. Harris
- Internal Auditor
  - M. Terrazas
- Office of DG
  - A. Acosta
  - G. Martínez
- Seed Health
  - L. Butler
- Biotechnology Laboratory
  - D. Hoisington
- Biometrics
  - J. Crussé
- Soil/Plant Analysis
  - J. López
- Software Development
  - R. Van Wachem
- Computer Services
  - J. Vargas
- Geo. Info. Systems
  - J. Corbett

- Administrative Office
  - J. Ramírez
- Experiment Stations
  - M. Bell
- Financial Office
  - D. MacArthur
- Human Resources
  - M. de la Fuente
- Training Services
  - G. Hernández
- Visitors Services
  - L. Ainsworth
The MAC has proved to be an excellent vehicle for enhancing communications of the senior management group (the DG, DDGs, and Program Directors) and has enhanced the decision-making capabilities of the institution. In the light of observations noted in section 2.2 above on budget resource allocations, the Panel suggests that the MAC be the vehicle for deciding on the allocation of the overall budget resource envelope between Programs and other offices/units.

The MAC has occasionally invited staff with specialist skills/knowledge on a topic to its meetings. The Panel encourages the practice — particularly in those instances when strong financial/analytical skills are required.

2.4. Research Management

The nature of the management of research at CIMMYT has changed markedly since the 1988 Reviews. The three Programs of Maize, Wheat and Economics remain but now their Directors report through the DDG-R rather than directly to the DG. The DDG-R and the Directors as well as operating by the practice of conventional line management also meet corporately to deal with cross-program business in the Research Coordinating Committee (RCC). Associate Directors of Programs may substitute for Directors at these meetings and other members of staff are invited to attend as is required by the business.

The RCC meets infrequently and the IER Panel believes that full value is not being obtained from what could be not only a useful management tool but also a means of producing genuine corporate, CIMMYT-wide approaches to research.

The DDG-R receives the line reports of the Program Directors and of the heads of the support units for which he is responsible. He does not attempt to be a total block between the DG and other senior staff but he is a reasonably fine filter. He helps Program Directors and all the staff who report to him to define their objectives for the year ahead as well as reviewing their achievements during the past year. He takes part in the regular reviews of the programs at some of which priority setting takes place.

The DDG-R has a major responsibility for budget manipulation in respect of research and similar activities. As far as possible he leaves international staffing matters within Programs to the Directors but he contributes to decisions on staffing at more senior levels and in the support units.

The DDG-R has responsibility for all internally managed external reviews (see p.7) which he plans and arranges and he takes responsibility for action on their recommendations.

Since the 1988 Reviews the internal structures of the Maize and Wheat Programs have been modified to decentralize decision-making and bring it closer to operational action. This has been achieved in each Program by creating four subdivisions. In Maize these four deal respectively with Agronomy and Physiology, Source and Stress Resistance Germplasm, Subtropical Midaltitude and Highland Germplasm and finally Lowland Tropical Germplasm. Each of these subdivisions is crossed by other activities involving Crop Protection, the Germplasm Bank, International Testing and Training.

The subdivisions in the Wheat Program are Germplasm Improvement (dealing with all types of wheat, international testing, grain quality, training and outreach), Genetic Resources (dealing with the Germplasm Bank and Wide Crosses), Crop Protection (dealing with fungal, bacterial and viral diseases, insects and outreach and training). The fourth subdivision concerns Crop Management and Physiology
which includes breeding — support agronomy, cropping systems and sustainability, adaptive Crop Management Research (CMR) and training and outreach.

The organizations of the Maize and Wheat Programs have what may amount to internal matrices. More likely, however, their operations are best depicted as changing patterns of linkages between people that are determined by the components of the problem being addressed.

The IER Panel understands that financial resources are to be separately provided to each of the Program subdivisions. However this arrangement is relatively recent and its benefits cannot yet be adequately assessed. Nevertheless we took the view that the devolution of responsibility through Programs must increase the commitment of scientists to their work. However Program Directors must recognize the risk that these arrangements could separate them to some degree from scientists doing hands-on research. They will need to devise methods of management that prevent this, or their capacities for leadership will be eroded. Clearly, however, as was proposed by the Reviews of 1988, much of the minutiae of management has been lifted from the Directors leaving them to consider longer term and strategic issues.

The Economics Program is smaller than the other two and so it does not need a subprogram structure. It is clear that the Director is well able to cover the entire range of work for which he is responsible.

All three Programs organize their work on a project basis but no project crosses Program boundaries. In Economics nevertheless numbers of projects are undertaken in collaboration with staff of the Maize or Wheat Programs. Wheat has 243 projects and the system is dynamic with terminations and initiations each year. Economics has 44 projects which record the year of initiation and of expected termination. Its objectives are always clearly and concisely defined.

CIMMYT is moving forward with this system of research management in which there is the capacity to modify objectives over time. We encourage CIMMYT to add to the present system in which project descriptions include information on the objective, the duration and the people involved. To this the inclusion of financial information would simplify management and enable benefits to be related to costs more easily. Of course it would not be effective to attempt this kind of project management if the number of projects is very large.

The 1988 Reviews were anxious that a system of "external peer reviews should be built into the life of the Center" (p.26, EPR). Rewarding internally managed external reviews now occur regularly. We saw reports of six such review starting in June 1990. They appeared to have been very useful to CIMMYT. In addition, during the time that we were in El Batan an External Review of the Maize Germplasm Bank was in progress and so it was possible to observe some of the process. The review team was chaired by Dr. Steve Eberhart, Director of the National Seed Storage Laboratory, Colorado, and included other internationally distinguished members. CIMMYT staff participated in the review with enthusiasm. They received advice and recommendations on maize germplasm and its use in crop improvement and they were updated on the latest thinking in this area from some of the prime movers and innovators. A member of the Board with appropriate expertise was a member of the review team.

CIMMYT has gone through a learning process on how to get the most benefit from internally managed external reviews and now knows how best to set the terms of reference and to organize the program of the review. That distinguished scientists are prepared to help CIMMYT by contributing to the review process acknowledges the respect in which the Center is held.
The 1988 EPR recommended that CIMMYT should have research groups whose membership would be drawn from the Maize and Wheat Programs to undertake research relevant to scientific disciplines. CIMMYT has preferred to retain disciplinary research within the Programs. The IER does not object to this because of the tangible evidence of the number of scientific papers published that disciplinary research has moved forward at CIMMYT.

In conclusion the IER Panel acknowledges the tremendous changes that have taken place in research management since 1988. We recognized that some of these changes are still in progress and that in other cases the rewards have not yet been fully attained. By the time that the next full review of CIMMYT takes place it should be possible to see further improvements in the effectiveness and efficiency of the management of CIMMYT's research.

3 - PROGRAM ACHIEVEMENTS, IMPACT, AND PLANS FOR THE FUTURE

3.1. **Maize Program**

The organizational structure of the Maize Program is described in section 2.4 and although this has changed since 1988 the general objectives of the Program have not. They are to provide improved germplasm for developing countries, to conduct strategic crop and natural resources management research to improve maize production without environmental damage, to advance research effectiveness to conserve maize germplasm and to train maize research workers.

The Program has 30 international scientists of whom four are supported by complementary or special project funds. There are 19 international scientists located in Mexico.

The Program works for 28 mega-environments each covering more than one million hectares in which a distinct class of maize is grown. These fall within the general agro-ecological categories of lowland tropical, subtropical, mid-altitude and highland.

Assistance is provided to developing countries to enable them to grow, in these agro-ecological regions, maize forms that may be open pollinated varieties (OPV) or hybrid varieties of a number of different kinds. The overall impact of germplasm improvement in maize cannot be so readily assessed as in wheat. First OPVs spread less easily and also an improved OPV of maize is less readily distinguished. Nevertheless estimates made by CIMMYT in 1990 indicate that about 50% of the 58.5 million ha in developing countries using tropical or subtropical maize were planted with improved varieties (1991/92 CIMMYT World Maize Facts and Trends). Since most improved varieties will contain some CIMMYT germplasm the overall impact of the work of the Maize Program is impressive.

The Program has adopted the mega-environment concept with enthusiasm and with the help of the Economics Program is beginning to associate socio-economic factors with those concerning climate, soil and grain type. This accords with views taken by the 1988 EPR Panel. Clearly the greater use that can be made of genotype x environment interactions the more valuable will be the Program's material to the national programs.

The 1988 EPR Report comments on the switch of CIMMYT's policy in 1985 to give attention to the use of hybrid maize (p.34). This policy has now gone much further and by 1993 a significant part (perhaps 35%) of the work of the Program is concerned with heterotic groups, inbreeding and the
exploitation of hybrid vigor. Historically the switch from hybrids to OPVs in late 1960s or early 1970s was prompted by a perception that the seed industries of most developing countries were inadequate for the delivery of hybrid seed to farmers each season.

CIMMYT's much greater commitment to the use of hybrid maize arises from the expansion of the seed industries of a number of countries. The 1986 edition of CIMMYT World Maize Facts and Trends estimates that 45% of the maize area of developing countries was planted with bought-in seed. Moreover 38% of the total area was planted with hybrids. However Argentina, Brazil and China are major users of hybrids and excluding them leaves 16% of the area planted with hybrids in other developing countries. Nevertheless the use of hybrid maize is apparently the future for the crop in many developing countries so it is necessary that CIMMYT should respond to this trend.

The IER is anxious that CIMMYT should clearly define its policies with respect to hybrid maize since the seed must be delivered to farmers by a seed industry which may be the state itself, parastatal companies or private sector companies or any combinations of these. CIMMYT must consider to whom it releases its inbred lines or heterotic groups and on what terms. The IER expects that by the time of the visit of the next full review panel these issues will have been resolved and that the place of hybrid maize in CIMMYT will be unequivocal both as to its significance in the research agenda and in the politics of technology transfer.

One of the components of the Maize Program is a team of four senior scientists and one associate charged to develop maize that is resistant or tolerant to a series of very damaging insects and diseases. Simultaneously there is selection for drought tolerance. This team together with crop protection scientists have recently had significant success in maize genotype enhancement to provide resistance against these hazards. The IER considers that this group is close to helping maize farmers as they face biotic and abiotic stress in their crops. The work should have full support especially as, since some resistance may depend upon the actions of genes at several loci, the work lends itself to the use of molecular markers. Consequently very close collaboration with CIMMYT's Applied Molecular Biology Laboratory should yield rich rewards in enabling important characters to be held together that are inherited in a complex manner.

Research in maize physiology is leading to valuable advances in our understanding of how the effects of drought can be diminished. Particularly important is the recognition that the shorter the interval between anthesis and silking the more likely it is that the genotype will be drought tolerant. So this is a selectable marker for drought tolerance. It is a good demonstration of the way that research in physiology can aid crop improvement.

The maize germplasm bank activities were generously commended by the Internally Managed External Review Panel and the IER wholeheartedly endorses the view that CIMMYT holds in trust a uniquely valuable assemblage of the world's maize germplasm. The IER was very impressed at the pioneering work of this genebank which has solved problems in outbreeding maize that are an order of magnitude more difficult than those posed by inbreeders such as wheat or rice. Contributions to the understanding of germplasm are made by two senior scientists and two pre-doctoral fellows paid for on extra core funds from France to enable an attempt to be made to transfer apomixis from *Tripsacum* to maize.

Reductions in the Maize Program's activities to accommodate reductions in funds have required the termination of work on quality protein maize and on wide crossing. Neither will prejudice the main
aims of the Program. If the budget for 1994-98 is close to the TAC envelope senior core funded positions would drop to 20 by 1998. The positions that would be eliminated have been identified in the MTP.

In conclusion it is a pleasure to state that the Maize Program is in a healthy and productive form and making a significant impact. All the breeders are active in reorientating research to place greater emphasis on the use of hybrids. Attention must be given to the political and economic dimensions involved in the transfer of hybrid maize technology.

3.2. Wheat Program

The organizational structure of the Wheat Program is described in section 2.4 and although this has changed since 1988 the general objectives of the Program have not. It aims to provide high yielding germplasm which is buffered against hazards of many kinds for developing countries where there are seven mega-environments. The Program also conserves and enhances genetic resources, undertakes strategic crop management research with a natural resources perspective, investigates the genetic control of wheat diseases and takes responsibility for training in several activities.

The Program has 37 international scientists, four of whom are supported by complementary or special project funds. There are 26 international scientists in Mexico.

The impact of CIMMYT's Wheat Program continues to be of the utmost importance to the production of wheat in developing countries. It continues with undiminished vigor the great traditions of its past. This is manifest in the calculation that 75% of the wheat varieties grown in developing countries (other than China) have some components of their genotypes derived from CIMMYT lines. This implies that a very large proportion of the wheat eaten in the developing world owes a great deal to CIMMYT. Moreover there has been a gain in the yield potential of CIMMYT spring bread wheats of 1% per year over the recent past.

A major part of the research on germplasm enhancement is concerned with protecting the gains in yield potential from its erosion by newly arisen susceptibility to pathogens. Indeed the Supplement to the Strategic Plan (p.7, 1989) says, "The Bread Wheat Program currently commits some 60% of its research resources to maintaining and expanding effective disease resistance. In contrast the Maize Program commits about 30% of its research resources to enhancing (rather than maintaining) disease resistance". Because of its anxiety over this large commitment of resources by the Wheat Program the 1988 EPR recommended (p.52) "increased strategic research on germplasm improvement to allow a better understanding of the physiological basis for increases in yield potential and so improve the knowledge needed for a reduction of the present efforts into maintenance breeding".

CIMMYT's approach to this issue has been to place considerable emphasis on attempts to develop "durable" resistance to diseases that vary most and in relation to which maintenance research was necessary. In the past this approach had been effective for stem rust resistance and there are immediate prospects that durable resistance will be developed against leaf rust which is currently the disease that is most challenging to wheat production. The IER accepts that the durable resistance strategy is the right one to follow and hopes that it will be associated with molecular mapping so that the numerous component genes can be held together in subsequent breeding programs.
For diseases to which the durable strategy has not yet been applied, or which cannot be approached in this way, considerations should be given to other procedures for organizing the research. If maintenance breeding of a routine nature continues to be a heavy demand on the Program, in terms of the time of scientists and of financial resources, an alternative should be sought. Perhaps the work on particular pathogens could be contracted out to developing countries where the particular diseases is prevalent and which have able agricultural scientists who may not have adequate operational resources in their own programs. The IER Panel encourages CIMMYT to investigate the feasibility of contracting out research in this way because of the benefits to the efficiency of the Program in reducing its work load and because of the benefits to the institutions in developing countries which would become contributors to the central program of CIMMYT. Their confidence and self-esteem would be enhanced as a result of having such an important contract with CIMMYT.

The Wheat Program is placing heavy emphasis on widening the genetic diversity of bread wheat by wide crosses of various kinds. This should lead to better opportunities to advance yield potential and broaden the genetic basis for the protection of wheat against the many hazards to which it is heir. Among these is the fungal disease Karnal Bunt (KB) to which resistance can be found among the primitive wheat species that have participated in the evolution of bread wheat.

Karnal Bunt has been a particular obstacle to the operation of the Wheat Program since its occurrence in Mexico. It is not a cause for significant reductions in yield but by contaminating the crop it reduces the value of the grain so countries wish to keep free of KB. This limits the freedom of movement of wheat seed from infested areas and is thus an impediment to the distribution of CIMMYT’s nurseries from Mexico. The Wheat Program is working hard and meticulously to overcome the problem and the IER encourages them in these efforts.

Further to the reductions in the personnel of the Program that have already taken place, if CIMMYT were to be held to TAC’s base envelope for 1998 it would then have only 21.5 core-funded senior staff. There would be one less staff member in WANA and core funding would be withdrawn from work on triticale in which CIMMYT still has faith.

In conclusion the IER gladly acknowledges the important impact that the Wheat Program has had on developing country food production. It congratulates the Program in its approach to diseases resistance but encourages it to evaluate the feasibility of contracting out some of its responsibilities to particular developing countries.

3.3. Economics Program

The Economics Program has 12 international scientists of whom nine are funded from core, the rest being on complementary or special project funds. Seven core staff are located in Mexico and their work is supplemented by graduate students and post-doctoral fellows.

The EPR in 1988 recommended (p.78) that the Economics Program should increase its research activities and reduce its commitment to on-farm research. It has made that change and now sees the clients for its research as research workers in CIMMYT, the NARS and the wider community as well as research administrators and donors.

The components of the research activities include methods by which agricultural technologies can be designed and evaluated. Other research is on the ways in which priorities can be assigned in breeding
programs. Additionally there is work on methods by which sustainability and natural resource conservation can be measured. The potential markets for new crops and crop-types, such as triticale, is also being studied.

Particularly significant to CIMMYT's overall work are the examinations that the Economics Program makes on impact and on strategic studies. These include such investigations as comparisons of the use of OPVs in maize compared with hybrids or on the effectiveness of breeding in central or devolved locations. These and numbers of other contributions influence the general strategy of CIMMYT.

The Program also continues the valuable work required to publish on alternate years "Maize (or Wheat) Facts and Trends". This is part of its general examination of the broad economics and institutional circumstances that impact on new technology in maize and wheat. The IER Panel considers this part of the work of the Program to be a valuable contribution to the world maize and wheat community.

Over the period since the 1988 Review, therefore, there has been a major reorientation of the work of the Economics Program. There has also been a marked change in the attention given to the publication of the research findings. The publications list is now very respectable, and the Economics Program is making a very valuable contribution to CIMMYT's output.

3.4. Natural Resources

CIMMYT believes that it has a unique contribution to make to natural resources research because of its special knowledge of certain mega-environments which are under threat. Of course it recognizes that CIMMYT would need to collaborate with other IARCs and with NARS in such work but nevertheless emphasized to the Panel the importance of the role that it could play.

Natural resources research is not mentioned in the strategic Plan of 1989 but CIMMYT's concern for sustainability research was considered in its strategic planning (Supplement p.16). Particularly reference is made to the problems that need to be addressed in the rice/wheat rotation that farmers exploit over millions of hectares in the north of the Indian subcontinent.

From those beginnings CIMMYT's concepts have developed further and the October, 1992, draft of the Medium-Term Plan and Budget 1994-1998 sets out a proposal to create a Natural Resources Research Unit. It is anticipated that the first investigation by the Unit would be of the rice/wheat based cropping system which would be undertaken jointly with IRRI and possibly with IIMI and IFPRI. Together with this there would be new research on soil resources in a maize-based cropping system used on hillsides in Central America. CIMMYT visualizes working in a consortium on natural resources research with CIAT, IICA and CATIE. As CIMMYT expresses it, their wish is now to work on the effects of the crops on the environment in contrast to their traditional concern for the effects of the environment on crops.

The IER Panel discussed the role of natural resources research exhaustively with CIMMYT. We asked whether this different perspective would not conflict with CIMMYT's highly successful commitments to commodity improvement primarily by plant breeding. There was a view that CIMMYT needed to be involved if it were to contribute to the increases in productivity that will be needed both to deal with population increases and to reduce poverty by lowering the price of food. Such productivity
increase could not be at the price of natural resources. Furthermore CIMMYT’s unique knowledge of the biology and agriculture of maize and wheat would be essential to any natural resources research in ecoregions where those crops are predominant. Moreover CIMMYT has close links with many people in the NARS and this would ease the development of the new kinds of relationships that will be necessary for ecoregional research to be successful.

Scientists at all levels and in all Programs seemed convinced of the need for CIMMYT to shift in the direction proposed.

Organizationally it is proposed to create a Natural Resources Research Unit which will have a staff of two agronomists, a socio-economist, a GIS specialist and a soil scientist with modelling skills. The two agronomists would be transferred one from the Maize and one from the Wheat Program. The economist would be transferred from the Economics Program and there is already a GIS specialist position in CIMMYT. So most of the components are already in CIMMYT but questions remain as to where the Unit would fit in organizationally and structurally. We were told that the Unit would have a separate budget and the plans are that it would report to the DDG-R.

The question facing the IER Panel was whether these proposals were appropriate for CIMMYT. The Panel was not in doubt that this initiative would add to the general understanding of natural resources and their relationships to agriculture. Nor were we in doubt about the positive side of the proposal. The next question was whether a move into natural resources research would distract CIMMYT from its primary objectives of germplasm improvement. This seemed to us unlikely because staff transferred from existing Programs were already engaged in activities similar to what they would do in the Unit. Moreover it would be a boost to the morale of the plant breeders to be associated with research which is answering questions that express wide public anxiety and where the motives and products of plant breeders are sometimes impugned.

These considerations suggest that a NRR Unit with this mandate should be separated from the Maize, Wheat, and Economics Programs.

In the light of these arguments the Panel recommends that: CIMMYT should continue to examine the ways in which it can contribute to Natural Resources Research (NRR) and that it should make a commitment to the creation of a NRR Unit as soon as possible.

3.5. Research Support

3.5.1. Applied Molecular Biology Laboratory

The Applied Biotechnology Laboratory was established in 1989 with the objective of enhancing efficiency of breeding at CIMMYT through the application of molecular biology techniques. The Laboratory has four international scientists (plus one postdoctoral fellow) and has concentrated on establishing efficient protocols for the use of marker technologies in maize and wheat. In addition to the use of DNA hybridization techniques and adaptation of molecular marker techniques for large scale use, the development of protocols has included optimization of cost-effective experimental strategies, and development of software for fingerprinting databases, molecular data capture and verification cost analysis.
Special emphasis has been given to the evaluation of two types of molecular markers, restriction fragment length polymorphisms (RFLPs) and randomly amplified polymorphic DNA (RAPDs). The Laboratory has successfully adopted a non-radioactive labelling technique for DNA probes. It has also been able to regenerate maize and wheat tissue for use in transformation research.

The Laboratory participates in collaborative research networks with advanced institutions to map the maize and wheat genomes. It is also involved in collaborative research to evaluate genetic diversity of tropical, subtropical and highland maize.

Another major study is looking at the genetic base of resistance to multiple corn borers using RFLP genotyping and field evaluations of several populations segregating for resistance. Results to date indicate that the resistance is polygenic and primarily additive in gene action. The Laboratory is close to identifying RFLP markers that can be used to facilitate the incorporation of insect resistance to maize. In wheat, markers are being developed to enable durable leaf rust resistance genes including *Lr34* to be pyramided.

The Panel notes that the Laboratory has developed good cooperation with the stronger national programs in developing countries, and is doing innovative research. The Panel believes that for the maximum benefit to be derived from this laboratory there should be closer links between it and the crop programs in project formulation and priority setting.

The Applied Molecular Biology Laboratory has made great progress and has produced original research. It is likely to provide the base from which new plant breeding technology will emerge for CIMMYT and is not merely a support service for the crop Programs. Consequently the Panel recommends that: CIMMYT should consider urgently according to Applied Molecular Biology the status of Program in recognition of its achievements and of its importance in the development of new plant breeding technologies without which CIMMYT will not be able in the future fully to discharge its responsibilities to developing countries.

3.5.2. **Soil and Plant Analysis Laboratory**

The Laboratory provides analytical services on soil and plant tissue to the research programs and experiment stations. It has taken over some of the functions of the Cereal Chemistry Laboratory which was closed in 1991. The range of activities include basic chemical and physical soil analysis as well as chemical plant analysis. Some 31,000 soil, plant tissue and water analyses, were done in 1992 compared to 14,000 analyses in 1988. Screening for aluminum tolerance in wheat was done on 200,800 seeds in 1992 compared to about 150,000 seeds in 1988. Additionally the Laboratory screened 3,800 wheat seeds for salinity tolerance in 1992; an activity which started in 1990 with 50 seeds. In the light of the heavy work load of this service a method should be developed of establishing priorities and the need for analysis. If necessary the Laboratory should establish a charge-back service.

3.5.3. **Biometrics and Computer Services**

The Biometrics Unit has developed computer programs to facilitate the use of statistical methods by CIMMYT scientists and national programs. Drawing on the improved data-access and processing facilities at CIMMYT, the Unit has undertaken intensive analyses of international trials data to understand and adjust for genotype x environment interactions. It has also developed computer programs that help to estimate the sample size required for regenerating maize and wheat germplasm. Its research includes
the application of statistical models for assessing genotype x environment interaction and genotype stability, and statistical and population genetic models for conservation of maize and wheat genetic resources. The Unit has one international staff member who is assisted by consultants.

The Systems and Computing Services Unit has two groups, one dealing with hardware and the other with software development. Computers play a central role in all CIMMYT activities. Work stations are now linked by a local-area network. Several software packages have been developed and improved for use by CIMMYT scientists. The Unit has two international staff.

3.5.4. Seed Health

The Seed Health Unit was established in 1989 following a recommendation of the 1988 EPR. It is responsible for ensuring the viability and safety of CIMMYT seed for international shipments, safety of seed arriving at CIMMYT, and implementation of seed health procedures by the maize and wheat programs. All wheat seed for international testing and germplasm exchange is produced in areas declared to be free of Karnal Bunt (*Tilletia indica*). It is further sprayed twice with propiconazole, the most effective chemical against Karnal Bunt, in the multiplication plots. Further, all seeds are washed with sodium hypochloride (the "killer jacuzzi"). The Unit is also working on new chemical treatments for controlling Karnal Bunt as well as other seed borne diseases of maize and wheat. It has one international staff.

3.5.5. Library and Scientific Information

In this section the IER Panel comments on CIMMYT’s activities in scientific information and library services. Publications, audiovisual services, and public awareness are reviewed in section 4.3.2. The Scientific Information Unit (SIU) includes the library. It reports to the Head of Information Services, who in turn reports to the DG.

The library is a large well equipped facility containing an immense amount of literature on maize and wheat. As the volume of agricultural literature has increased, and storage and transmission technology capabilities advanced, the SIU has shifted its emphasis to information access with increased attention to service.

The library provides traditional library services as well as specialized bibliographic services for CIMMYT scientists. Within CIMMYT a network has been established. Based on responses to the questionnaire the Panel sent to outreach staff, these staff greatly appreciate the services of SIU. A wide array of relevant indexing services are being developed in CD-Rom format. Good cooperation has been developed with FAO, UNESCO and other IARCs in software development, data access and inputting.

The SIU has also assisted NARS through advisory and bibliography services, and training of information specialists and librarians. Some countries like Mexico and Brazil have benefitted from this collaboration and are in the process of acquiring CD-Rom technology. The cooperation with NARS and other IARCs could help to avoid duplication in the development of software packages. The Scientific Information Unit has one international staff.
3.5.6. **Geographical Information Services (GIS)**

The GIS unit was formally created in 1992 and has one international staff. It has enabled CIMMYT to develop a robust method for the construction of climate surfaces and to create data sets for an agricultural GIS. Use of these climate data has been enhanced by the development of a method using multi-variate statistics to assist with the classification of ambient environmental characteristics. The GIS unit has also successfully integrated crop and soil erosion models with spatial databases. Specific activities and links to other CIMMYT groups have included the use of spatial data to expand the information describing core accessions in the maize germplasm bank. The GIS unit is participating in the design of a project to identify test sites which meet particular and known criteria. Future plans include the refinement of the mega-environment database for all countries of interest to CIMMYT’s mandate.

3.6. **Overall Assessment and Effects of Financial Stringency**

Over the period from 1990 to 1993 core senior staff years (SSY) devoted to TAC’s six categories of activity have declined from 93.2 to 74.3. This has resulted in a reduction of work on Production Systems from 18.7 SSY to 8.3 SSY mainly due to a decline in work on adaptive and applied CMR. So Production Systems now takes 4.2% of staff time compared with 20.1% in 1990.

Commitments to Institution Building have also declined from 26.6% of staff time in 1990 to 22.3% in 1993 as training on entry level CMR has been withdrawn or transferred to NARS in Kenya and Argentina and prospectively in Thailand and Brazil. In contrast maize and wheat improvement courses have been retained. In the scheme of bringing visiting scientists to CIMMYT advanced training courses have been arranged.

Research support services have also been stringently reduced from 17 SSY in 1990 to 11.5 in 1993. The Center must watch to see whether these numbers provide adequate coverage for the minimal needs of the Programs.

In accord with the prime commitment of CIMMYT to maize and wheat breeding the allocation of staff to Germplasm Improvement has moved only from 40.8 SSY in 1990 to 40.0 in 1993. Because of the reduction in CIMMYT’s total staff this means that it gives 53.8% of its time to germplasm improvement in 1993 compared with 40.8% in 1990. The IER Panel considers it entirely proper to defend germplasm improvement against the rigors of the financial climate.

Interestingly the provisions for Natural Resource Conservation have also increased at CIMMYT, moving from 5.4 SSY in 1990 to 7.2 in 1993. The work under this heading consists of the genetic resources and some strategic crop and resource management research. Natural Resource Conservation activities now represent 9.7% of CIMMYT’s work and the IER Panel thoroughly approves of this positive commitment.

Although the reductions in the size of CIMMYT has obviously been painful in very many ways the IER Panel considers that it still has the resources as well as the expertise, professionalism and enthusiasm to be an effective research institution. Greater clarity of vision has arisen as to the purposes for which CIMMYT works and the costs of providing many benefits have declined.
The Panel also noted with pleasure the big increase in the numbers of scientific papers published in refereed journals. This betokens greater enlightenment in recognizing that the quality of scientific research can only be judged by the peer review of the editors of international journals and their referees. Moreover the findings of scientists cannot be taken into the corpus of knowledge until there has been an opportunity for their work to be repeated by others. CIMMYT now fully accepts that the products of its research are knowledge as well as its traditional output of valuable germplasm.

The Panel observed that the research of the Maize, Wheat and Economics Programs is going ahead vigorously and effectively.

The proposals to expand CIMMYT’s participation in Natural Resources Research has support of the Panel which (p. 13) recommends that CIMMYT should continue to examine the ways in which it can contribute to Natural Resources Research (NRR) and it should make a commitment to the creation of a NRR Unit as soon as possible.

The Applied Molecular Biology Laboratory has made great progress and has produced original research. It is likely to provide the base from which new plant breeding technology will emerge for CIMMYT and is not merely a support service for the crop Programs. Consequently the Panel (p.14) recommends that: CIMMYT should consider urgently according to Applied Molecular Biology the status of Program in recognition of its achievements and of its importance in the development of new plant-breeding technologies without which CIMMYT will not be able in the future fully to discharge its responsibilities to developing countries.

4 - INTERNATIONAL COOPERATION AND OUTREACH

4.1. CIMMYT’s Evolving Approach to its Global Mandate

In section 1.2.1, it was noted that CIMMYT has revised its mission statement to stress the importance of collaboration with NARS, while in section 1.2.3, the system of Evergreen reporting was explained. Since 1988 CIMMYT has consolidated its relations with some of the IARCs and attempts are being made to improve collaboration with others. There is improving collaboration with developed country institutions.

The concept of outreach and its implications for collaboration with NARS has received a lot of attention by CIMMYT Management and staff. Although outreach activities have declined in line with the strategic plan and funding constraints, they are considered to be critical for achieving the mission of the Center. There is recognition that many of the functions performed by outreach staff could not be done at headquarters. The outreach philosophy includes decentralization of decision-making and budget control. Devolution of some activities such as on-farm research and applied crop management research (CMR) training has already been implemented in some regions, as the Center has re-oriented its work towards strategic research.

4.2. Outreach Research and Technology Transfer

The Panel did not visit CIMMYT’s outreach activities, and there was no questionnaire sent to NARS, as would have been done for a regular external review. The Panel Chair sent a questionnaire to all CIMMYT outreach staff, however, to solicit their views on a number of programmatic and management issues as an input to the Panel’s report (Appendix 4). There were 16 respondents out of the 27 staff in outreach — six from the Maize, seven from the Wheat and three from the Economics Programs.
respectively. The regional distribution of the respondents was eight from sub-Saharan Africa, five from Asia, one from Latin America and two from WANA. There was therefore good coverage across programs and regions.

CIMMYT is currently involved in three categories of research in outreach: germplasm improvement for environments which are not represented in Mexico; strategic crop management research (CMR) and natural resources research (NRR); and technology design, evaluation and impact. The first category (breeding for specific biotic and abiotic stresses) often involves shuttle breeding, in which several sites are used in sequence to incorporate stress tolerances that are specific to the sites. The second category (CMR and NRR) tends to be location specific, especially the applied aspects of the research. The third category includes work on diagnostic and adoption studies, farm level experimentation and the development of methods for economic analysis of resource conserving technologies.

CIMMYT's outreach activities in germplasm improvement include: wheat in Latin America, Asia, and WANA (in cooperation with ICARDA), and maize in Latin America, West Africa (together with IITA), Asia, and in Eastern and Southern Africa. Both the Wheat and Maize Programs have outposted staff at selected locations in these regions.

The outreach component of CMR is considered to be vital to the commodity improvement programs. The 1991 internally managed external review of the Wheat Crop Management and Physiology Subprogram concluded that no alternative arrangement was likely to give the same feedback to wheat breeding as the direct involvement of CIMMYT scientists. It is from outreach work that CIMMYT will get reliable insights into the needs and opportunities of research in the different maize and wheat based cropping systems.

The Center has achieved good reputation in developing methods for on-farm research and impact assessment. On-farm research and applied CMR have now been devolved to NARS. It is too early to assess the impact of these changes. An internally managed external review of the Economics Program in 1991 concluded that more attention was needed to ensure that a compatible policy, or institutional framework, exists in NARS to improve the adoption of improved technologies. It also stressed the importance of incorporating a long-term sustainability dimension into the on-farm research methods, and the need to improve feedback to commodity-based research teams.

The overall decline in core and special project funding at CIMMYT has had a major impact on CIMMYT's outreach activities. The number of outreach staff has decreased significantly since 1988; the staff are thinly spread out in the regions, which makes them feel scientifically isolated, and lacking in minimum critical mass at specific locations. Further, the move towards strategic research implies less interactions with NARS scientists who are still struggling with adaptive and applied research. Finally, the Panel notes that while these changes have been occurring, outreach staff — in their view — have been insufficiently involved in CIMMYT's research planning and review processes.

4.3. Training and Information

4.3.1. Training

CIMMYT has reduced its involvement in entry-level training in CMR by devolving this activity to national programs. Regional CMR training courses, managed by national programs, are being offered in Kenya for maize and in Argentina for wheat. Additional courses for maize are being developed for Thailand and Brazil. Since 1991 Egerton University, Kenya has organized two CMR training courses
for 41 participants, and the wheat CMR training courses held in Pergamino, Argentina have attracted 34 participants. This approach has so far worked well but some concern remains regarding its sustainability as CIMMYT decreases its own involvement.

The Center has increased its array of specialized and advanced training activities in maize and wheat. The number of trainees at CIMMYT headquarters since 1988 was 223 for maize and 190 for wheat. The total number of trainees during the last five years (including CMR training in Kenya and Argentina) was 487, compared with 660 trainees during the 1983-88 period. The number of visiting scientists (who will have spent from three weeks to six months working at CIMMYT) during the last five years was 677. Among these 127 participated in advanced training courses. Consequently while the number of trainees has gone down, the training has become more specialized and the number of visiting scientists has increased, in line with CIMMYT’s strategy.

4.3.2. Information Services

In this section the Panel reviews CIMMYT’s activities in publication design and distribution, audio-video services and public awareness. In addition to the needs of research staff the Information Services Unit has other target audiences. These include CIMMYT’s Board and Management, the global agricultural research community, and decision-makers in the donor community. The principal activities include publications, video development and public awareness.

The Unit has developed and distributed a number of CIMMYT imprimatur publications such as the annual report, research briefs, impact fact sheets, information bulletins and financial planning documents. The target audiences for these are current and potential donors, and other major stakeholders. Other imprimatur publications included program synthetic reports, the Maize/Wheat Fact and Trends series, etc., for the scientific community.

Since the 1988 External Reviews there has been a shift of priorities in the activities of the Information Services Unit. Increased efforts have been devoted to the publication of technical information, and public awareness. The increased effort on publications has resulted in a significant improvement in the number and quality of CIMMYT’s imprimatur publications and journal articles. Less priority has been given to conference proceedings, general information bulletins, and in-house audio-video production.

Public awareness work at CIMMYT is intended to promote a broader understanding among donors and other stakeholders of the Center’s continuing impact on development and contributions to agricultural science. CIMMYT systematically disseminates nontechnical information about its research and related activities to specific target audiences. Over the past five years CIMMYT has developed a broad range of activities. These include: building and maintaining direct relationships at the Center Management and staff levels with donors and other major stakeholders; raising the Center’s profile in the media; and providing relevant information to visitors. An increasing number of contacts are also being made with major media organizations and independent journalists, NGOs, etc. to try to generate and promote a positive image of CIMMYT and its products.

4.4. Institutional Relationships

4.4.1. Cooperation with NARS

CIMMYT appears to have established excellent relationships with most of the NARS it cooperates with in research, dissemination of scientific information and training, particularly with its host country,
and countries in which it has located its regional staff. Since no questionnaire was sent to NARS the Panel has based its assessment on CIMMYT's Strategic Plan, and the Center's latest "Evergreen Report" on "Strength of NARS."

The 1993 Evergreen Report has reconfirmed that for both maize and wheat the majority of the developing world's crop is produced in a few large countries that have very capable NARS. The Panel notes that although the Strategic Plan is explicit on CIMMYT's collaboration with NARS there are some inconsistencies between the Plan and the Evergreen Report with respect to CIMMYT's comparative advantage relative to the stronger NARS, and how that may affect priority setting by CIMMYT. The report suggests that in the future, the strength of NARS would no longer be a factor in priority setting. The definition of CIMMYT's "primary clients" is also becoming blurred. It is not clear whether the primary clients are still the public sector NARS, or the farmers. The role of the private sector relative to the public sector institutions also needs to be clarified. The Panel expects that CIMMYT will have clarified these by the time of the next regular external review.

4.4.2. Inter-center cooperation

Since the 1988 External Reviews relations with ICARDA have improved tremendously. In addition, CIMMYT also has good working arrangements with ICRISAT, CIAT, IBPGR and IFPRI, all of which have a bearing on its formal mandate. Some strains still exist between CIMMYT and IITA on their cooperation in maize research in sub-Saharan Africa, and between CIMMYT and IRRI on wheat-rice cropping systems in South Asia, as they move into NRR. CIMMYT Management is however confident that the Centers can resolve the problem.

4.4.3. Collaboration with advanced institutions and the private sector

CIMMYT scientists are becoming increasingly involved in strategic research. This has significant implications for CIMMYT with respect to its cooperation with advanced institutions in developing countries. Such cooperation is already gathering momentum, particularly in the fields of applied molecular biology and crop modelling. Advanced research institutes and universities in developing countries are also cooperating with CIMMYT scientists. An example is the CIMMYT/UNDP Maize Transformation Project, a collaborative research network involving at least six advanced institutions: one in Mexico, two in Brazil; the University of Wisconsin, U.S.A.; CIRAD, France; and some institutions in the private sector. As stated in section 3.5.1, CIMMYT is also involved with a number of advanced institutions worldwide in a network to map the maize and wheat genomes.

Relationships with private sector institutions are growing. A number of national and multinational seed companies are interested in CIMMYT's advanced maize germplasm products for hybrid seed development. CIMMYT recognizes the important role of the private sector, but it also recognizes the risks involved in using the private sector as a primary client with respect to intellectual property rights, and the possible alienation of public sector NARS.

4.5. Overall Assessment

The Panel considers CIMMYT's approach to international cooperation and outreach pragmatic and in line with its revised mission statement, priorities and strategy. As more of CIMMYT's research becomes strategic and disciplinary in nature, the scope and scale of collaborative research projects with advanced institutions in both developed and developing countries will change. In this regard CIMMYT needs to be more explicit in its strategy for relations with NARS and to clarify who are its primary clients.
The questionnaire to outreach staff revealed some issues and concerns which are similar to those expressed by CIMMYT's middle management staff at headquarters. The Panel is pleased to note that Senior Management also concurs with the need to:

- define the essential functions of outreach;
- find better ways of assessing the complementarity and productivity of outreach activities relative to work at headquarters;
- assess and strengthen the effectiveness of communications with outreach, especially regarding their input on policy issues; and
- improve the administrative efficiency of outreach activities.

CIMMYT has maintained a strong effort in basic and advanced training in germplasm enhancement. The Panel congratulates CIMMYT for its policy of bringing mid-career researchers to CIMMYT for advanced training courses and to gain research experience, and concurs with the devolution of on-farm research and applied CMR training to NARS. The Panel encourages CIMMYT to review, in time for the next regular External Review, the sustainability of regional CMR training courses, and the implications of devolving some of its applied research programs to the stronger national programs in developing countries.

The Panel commends CIMMYT for the activities of its Information Services Unit. It notes that despite the downsizing from eight senior staff in 1988 to six in 1993, activities have expanded considerably and the quality of publications and service has improved. The Panel notes the decreased emphasis on in-house audio-video production and urges CIMMYT to reconsider the balance between the production of written materials and audio-video products particularly with respect to training in NARS, and public awareness.

5 - ADMINISTRATION AND RESOURCE MANAGEMENT

5.1. Management Processes

5.1.1. Planning and budgeting

CIMMYT's planning and budgeting function is based, appropriately, on the preparation and approval of a strategic plan for the Center. Five year plans and yearly program and budget documents map out the range and size of the activities that will be implemented to achieve the objectives of the strategic plan. The yearly programs and budgets undergo a number of reviews as the absolute level of funding becomes more clear during the early months of the budget year.

In line with the 1988 Review recommendations, CIMMYT has fine tuned, and further developed its planning and budgeting systems in ways that are consonant with the organization structure, basing budgeting at a Program/cost center level, with cost centers analogous in many cases to projects. Many staff commented that the system is a useful management tool and use it extensively within their units. The DG's strong leadership in introducing this system is noted.

The Panel notes that the system is used, at the program level, as a resource utilization tool, rather than as an allocation tool, since the initial resource allocation process appears still to be largely the prerogative of the DG's office — albeit with some reference to the MAC on occasions. The Panel believes that the MAC should be fully included in the resource allocation process — even to the extent of agreeing on the prioritized set of tasks that could be cut in the event of further funding shortfalls. This
greater involvement by the MAC would have the added benefit of improving communications on this always-difficult topic of potential cuts in programs. Overall, however, the successful upgrading of this P and B system is one of the many positive aspects noted by the Panel. This is particularly so given some lingering concerns as to the adequacy of the concomitant control processes required to monitor progress against plan, as noted in section 5.2 below.

To the extent that individual projects within a program are large, or are discretely funded, it may prove possible to extend the system down to that individual project — thereby enhancing the degree of control over that project.

5.1.2. Control and management information

CIMMYT’s financial staff explained the nature of the present reporting activities and outlined the additional information that will be available once the upgraded accounting system is fully implemented. The recurrent problems of data entry errors will be significantly reduced with the new system’s on-line error-correction capabilities, although staff training will still be required to lessen errors. While basic monthly budget-vs-actual reports are available 10-12 days after month-end, the availability and timeliness of other, ad hoc requests was mentioned as a problem by some staff. The new system’s on-line query capabilities will reduce this difficulty.

Nevertheless, the control systems currently in use have proved sufficient to enable the DG to control expenditures in an environment where there was, typically, a surplus of funds at year-end. In today’s scarce resource environment where, for example, costly Bank overdraft facilities may be required, significantly tighter control procedures will be necessary and Administration/Finance should focus attention on these emerging needs as it prepares its own work program for this year.

The availability of accurate cost data on a program, subprogram, and individual line item basis will prove invaluable to program/project leaders as a resource management tool, once they are shown how to develop and use the information. With the system’s upgrade phase nearly completed, a training plan for end-users should be given high priority. The DDG of Administration and Finance must take a strong initiative in educating the scientific staff in the capabilities of the system and how to access/use the available information. External (consultant) assistance may prove valuable in optimizing the use of the newly available data at all levels throughout the organization.

5.1.3. Audit

The Panel met with both the External and Internal Auditor. The 1988 Review recommendations concerning both have been implemented by CIMMYT. The External Auditor now reports directly to the Audit Committee of the Board and confirms that access to, and discussions with, the Board of Trustees’ Audit Committee have been excellent, with the Board being very responsive to suggestions. CIMMYT changed its External Auditor at the conclusion of 1990 and the new Audit firm of Cárdenas Dosal Nieto Astiazarán (a member of the worldwide firm of Klynveld Peat Marwick Goerdeler, KPMG) is now in its second audit cycle. The Panel received an early draft of the 1992 Management Letter and confirms that the Auditors appear to be tracking many of the financial issues that emerged independently during the Panel’s discussions with staff. Apart from any late-breaking developments in its audit work that is now in progress, KPMG believes it will issue an unqualified audit of CIMMYT’s operations for 1992. The minutes of the Audit Committee of the Board were reviewed to confirm that the Board is exercising its governance role effectively. It is.
As regards the Internal Audit function, the Panel noted a number of potential control issues that should be reviewed. In this context, the Board should ensure that the work program of internal audit is closely aligned with the need to focus on control issues, not just in the cash and investment accounts handling areas, but also in regard to the computer systems now being implemented.

A further extension of the Internal Audit function to evaluate computer systems' effectiveness and possibly operations' effectiveness should be considered. With such expansion of audit scope, the question of skills-matching might need to be reviewed again by the Committee.

5.2. Administrative Functions

Six units now report to the DDG of Administration and Finance, these include: Finance, Human Resources, Administrative Office, Visitors Service, Training Services, and Experiment Stations, and employ five international staff (one each in Finance, Administrative and Visitors Services and two in Experimental Stations). Finance and Human Resources are discussed in sections 5.3 and 5.4 respectively; a discussion of the other activities -- the administrative services and facilities -- follows.

The 1988 EMR found that CIMMYT's administrative services and facilities operated generally smoothly, and made two recommendations concerning organizational improvements. Since then the organization has been streamlined, support staff positions have been reduced by about 15%, real costs are being reduced by 6%, and the same array of functions are being carried out. Standards are believed to have declined slightly due to staff cuts, but are still considered fairly high overall, which is credited largely to the commitment and hard work of the staff.

5.2.1. Services

The Administrative Office comprises CIMMYT's purchasing, food and housing, warehouse, central file, general services, telecommunications, chauffeurs' office, mechanic workshop, and building maintenance. Service users commented favorably on the operation of the purchasing office and the food and housing unit, and improvements in telecommunications. They recognized that the travel office (part of general services) is over-worked by a demanding clientele, but felt that services could be improved; in the current arrangement, one travel agency -- which has had CIMMYT's exclusive business for several years -- uses CIMMYT office space and provides services for a commission. Staff feel that the agency has no incentive to offer low fares, and many shop outside to save money. In light of CIMMYT's large travel expenditure, we suggest that other options be explored.

CIMMYT's Visitors Services continues to play an important public relations function by providing tours, organizing conferences and seminars, and offering other services to Center visitors (who average about 4,500 per year excluding trainees). Training Services handles administrative services for training courses and visiting scientists, buffering the scientific programs from these demands.

The DDG of Administration and Finance has been working towards improving service quality through staff training, which the Panel feels is a positive development. Given the current service mix, major savings are unlikely to come from further staff cuts. Future savings must come by "doing things differently", which will require imagination and analysis. [Travel service arrangements may be a place to begin.] The "ideas program" is an interesting initiative that ties financial rewards to savings generated.
5.2.2. Facilities

Laboratories and research support facilities are covered in section 3.5; our focus here is CIMMYT’s five Experimental Stations located in Mexico, where maize and wheat trials are conducted. A CIMMYT senior scientist recently assumed leadership of the Experimental Stations, which had been led by a senior administrator for many years. Under the new Head, responsibilities have been decentralized to station superintendents and a major staff downsizing has occurred, while the total area planted has dropped only marginally. Scientists continue to be satisfied with the services provided.

Issues raised in 1988 concerning the long-term viability of the stations remain under consideration. These now include: urbanization encroaching on El Batan and Toluca, as well as pollution and a dropping water table at the former; Karnal Bunt and financial and labor concerns at Obregon related to the association with INIFAP; problems with soil and labor availability at Tlaltizapan, and soil variability at Poza Rica. In response CIMMYT has: (a) moved some trials from the Tlaltizapan Station to an adjacent piece of leased land in order to alleviate soil stress at the Station, and (b) leased land near Obregon, where Karnal Bunt is not a problem, and moved trials there. (CIMMYT could not export wheat this year, however, due to continued concern of Karnal Bunt.)

The new Head of Stations is undertaking a number of initiatives aimed at improving land use efficiency, worker safety and environmental standards. His recent and ongoing analyses of costs and related trends should be useful decision-making information for Research Management. Traditionally the Stations’ budget has not been part of CIMMYT’s research budget. In our view some portion of this budget (of around US$2.7 million in 1993) should be allocated to the Maize and Wheat Programs, which would then pay Experimental Services for work performed; this adjustment would improve budget accuracy (by reflecting Maize/Wheat trial costs in Program budgets), and would enable Program Directors to consider these activities relative to other priorities, which they have not been able to do thus far.

5.3. Human Resource Management

The 1988 EMR made 16 recommendations concerning human resource management. Management has responded well to a number of the major challenges in this area, through the efforts of the Human Resources Office.

Staff downsizing. Since 1988 the number of international staff has been reduced from 128 to 104 (-19%), while support staff has been reduced from 607 to 539 (-11%). Despite the personal and corporate stresses this created, and questions raised concerning certain decisions and how they were communicated, the Panel found considerable support for Management and the way in which the downsizing was handled overall. Although staff are concerned about CIMMYT’s future directions and financial situation, as well as personal job security, the Panel found a high degree of loyalty to the institute and a commitment to performance by staff at all levels. Ongoing communication will be essential in order to maintain this trust and commitment during this period of change.

Human resources information system. A new system, encompassing all international and national staff, is in the process of being implemented to enable CIMMYT to better meet its human resource management and planning demands in the future. An external consultant favorably reviewed the system and made recommendations to assist in its successful implementation.

Communication, teamwork, and management skills. The earlier review noted the demands for improvements in these essential skills as being an integral component of CIMMYT’s proposed
decentralization (described in section 2.4). The Panel noted the introduction of management training courses, retreats for senior and mid-level managers, and supervisory and leadership courses for national supervisory and more junior staff. Importantly, staff at all levels feel that communications at CIMMYT have gradually been improving, and Management views the effort as one of ongoing importance.

**Increased attention to performance appraisal.** A management by objectives system (MBO), adopted around the time of the last review, has been implemented in varying degrees of formality throughout the Center for international and supervisory support staff, and is generally considered a useful tool for planning and evaluation. Improvements are ongoing, and this year include standardized criteria of evaluation for the annual appraisal and a system of "milestone reviews" that will entail a rigorous peer review of senior international personnel every four years (beginning with those who have served CIMMYT longest). As experience is gained no doubt further fine-tuning will occur. For support staff, an improved performance appraisal process was introduced a few years ago, that is described in detail in a manual for supervisors. The Human Resources Office should take the initiative in training supervisory staff to ensure that the process is utilized effectively institute-wide.

**Efforts to improve personnel management for support staff.** Since the last review the Human Resources Office has introduced career development guidelines that include extensive internal training and study leave programs aimed at upgrading the skills of support staff. A recently-completed job classification exercise for support staff, when approved, should decrease the number of job categories from about 140 to 70 (which, although a big improvement, may still be a cumbersome number to administer). The salary and benefit package continues to be a concern of support staff, who see their buying power deteriorating in the tightening Mexican economy – a problem that is not limited to CIMMYT or even El Batan. The Human Resources Office has conducted periodic market studies and made regular salary adjustments that, accompanied by the slow-down in wage increases in Mexico generally, appear to keep CIMMYT competitive with market comparators (although no longer "well above" comparators, as was the case about ten years ago). Turnover of support staff has been low, suggesting that CIMMYT's remuneration practices are about right for now. Some concerns were expressed that "the best" are no longer staying at CIMMYT and, possibly related, there are isolated specialized skill areas where turnover has been high and CIMMYT has not been competitive, but corrective measures are being evaluated. The Panel is aware of the significant increase in support staff costs relative to total personnel costs since 1988 (from about 35% to close to 50% of the total); we suggest that Management explore incentives and innovative means of modifying the support staff package in the interests of staff, while remaining within current cost parameters. (One such option might be to offer workers a choice among benefits, including the cash value of some.)

**Tenure of scientific staff.** The Panel notes that almost 50% of the 64 senior scientists in CIMMYT's Wheat, Maize and Economics Programs have been with the institute for over ten years. The question of the balance between older, seasoned staff and younger, less experienced but highly educated staff is always of concern. It would seem that CIMMYT may have released promising young Associate Scientists, and discouraged others from coming, because of its tendency to retain long-serving scientists on a continuing basis while supplementing them with a large cadre of short-term Associates who have little chance of "achieving tenure". We are encouraged that Management is addressing this issue in light of future program needs.

**Gender and family issues.** CIMMYT's recruitment efforts have consciously sought to attract high calibre staff and, in practice, the Panel notes that women international staff are now integrated into all programs - comparable in total numbers to the CGIAR average (of 12% 1991-data), although lower in the senior scientist category (3% vs. 9% 1991-CGIAR average). On the question of family issues, spouse employment continues to prove a difficult issue for both Management and staff alike, and the Panel notes...
efforts on a number of fronts. To improve communications in this sensitive area, the Panel wondered if a more interactive approach — perhaps involving an informal task force comprising Management, staff and spouse representatives — might prove useful. The results of these efforts will impact substantially on the perceived attractiveness of CIMMYT to the "high-flyer", and often younger, scientific personnel that the Center would like to attract (and retain) in the future. The problems are not CIMMYT-specific, but derive in part from societal changes including, *inter-alia*, the emergence of equally highly qualified spouses who wish to enhance their own careers within the marriage context.

*Tax equalization.* The rationale and continued affordability of the policy of equalizing taxes of international staff should be reviewed. We suggest that practices at other CGIAR centers be considered in this regard in relation to future appointments.

*Staffing of the Human Resources Office.* About half of the respondents to the questionnaire sent by the Panel to outreach staff rated the human resources services at headquarters as less than satisfactory. While the poor response time (mentioned by outreach and headquarters staff), may be attributed to a number of causes — distance from El Batan, lack of skills, or low staffing of the function — the Panel believes there is a broader issue that relates to senior expatriate staff needs for attention to problems that are typical of expatriates living abroad. The Panel recognizes that the Human Resources Manager appointed in 1991 has contributed greatly to the achievements noted above, but feels that the original recommendation for a senior staff person professionally trained and with significant "hands-on" experience in handling the concerns of an expatriate population remains an important component of an upgraded human resource management capability.

5.4. Financial Management

In its extensive discussions with the financial staff, with Senior Management and other end-users, and with the Auditors, the Panel notes the improvements that are being implemented in this area, despite the fact that a budget officer was not recruited as recommended in 1988. An upgraded financial accounting package is being introduced; the Policies and Procedures Manual for the Administration/Finance units is partially written, and a number of staffing changes have been made to better match available skills to requirements. Additional computer-based systems have been designed and are being implemented, including those for Purchase Orders, Maintenance Orders, and Cashiers activities.

But the new milieu within which CIMMYT finds itself, places new pressures on the financial management function. Demands for accurate, timely information increase substantially, (or should do so) as program staff seek to optimize scarce resource allocations. The role of the financial office correspondingly shifts from one of primarily ensuring the financial integrity of the Center's operations, to a much broader role that includes, *inter-alia:*

(a) educating "clients" in opportunities for, and methods of, resource allocation under conditions of scarcity;
(b) taking the initiative in reviewing the cost/benefit and cost/effectiveness of a wide range of activities across the Center;
(c) where appropriate, researching and recommending alternative approaches to undertaking current activities (or completely new activities) on its own initiative; and
(d) evaluating "best practices" in other comparator organizations to ensure CIMMYT's financial management systems and procedures are matched to needs.

The Panel observed that, possibly due to pressures related to implementing the upgraded accounting systems, there is, as yet, little evidence that the financial office is embracing the new role
demanded of it. The DG is fully cognizant of this situation — indeed the new roles required of the office have been extensively discussed with staff.

Finally, the Panel observed a number of (relatively minor) areas where existing financial practices should be reviewed, including adequacy of controls over investment decisions and fund balances, timeliness of reporting, and accuracy of data entry into the accounting systems. These problems have also been noted by the External Auditor and will be discussed, by them, with the Audit Committee shortly.

6 - CIMMYT IN THE NEXT MILLENNIUM

It is often said on management courses that to survive is the most important objective of any company or institution. Certainly this should be CIMMYT’s objective. Not just to survive however but to do so because of the important impacts it can make on world development. The Center is devoted to the ideal that the increased supply of food that it can help to assure by agricultural research will reduce prices. Thereby poverty will be alleviated. Less poverty will reduce the birthrate and population growth; so lifting environmental pressures.

There will be a continuing need, into the next century, to increase the supply of food and CIMMYT’s role will be to contribute to this but to do so in ways that limit damage to natural resources. Balancing increased production against maintenance of the resource base is the challenge that CIMMYT’s researchers must accept. That they are willing to do so was revealed by the enthusiasm of their proposal now to create a Natural Resources Research Unit.

It goes without saying that the increases in production will depend heavily on the enhanced germplasm that CIMMYT can provide in its mandate crops. The past achievements have been outstanding but we need to consider whether a new generation of scientists can emulate the successes of their predecessors. How will they do this?

It happens that 1993 is the anniversary of several important happenings. In 1953, 40 years ago, Watson and Crick defined the structure of DNA. Developments from this work have since then had very wide impact. Medical research and treatment, the pharmaceutical industries, forensic sciences, pollution control, and many other areas of technology have undergone major changes. This has not yet happened in plant breeding which is in essentially the same state as in 1953. But not for much longer. By the time that CIMMYT is addressing the problems of 2001 it is likely that molecular technologies will be having a major impact on plant breeding technology. CIMMYT must contribute to the applications of these technologies and not be left behind as a technical dinosaur.

Part of the oncoming revolution in plant breeding will be the greater participation of private sector companies whether working inhouse or by confidential contracts in universities. As a result less knowledge of agricultural science will be in the public domain. CIMMYT must find the way round the complexities of intellectual property rights if by the exploitation of knowledge it is to continue to serve the developing countries as it has in the past.

The involvement in developing countries of private sector breeding companies, especially in maize, is increasing. Indeed CIMMYT asserts that the reason for expenditures on wheat research being higher than on maize, despite the views of TAC, is because of the enlarging participation of the private sector in maize research. If that is true, by the next century CIMMYT’s wheat research may be even larger again than its maize research because of substitute suppliers.
Another anniversary that occurs in 1993 is that of the death from starvation of N.I. Vavilov 50 years ago in a Soviet jail. It was he who pioneered work on what we now call germplasm conservation. It is notable that CIMMYT has for long taken the lead in the collection and preservation of maize germplasm. This important work, which will certainly extend well beyond the turn of the century, is of tremendous importance for all of our futures. It is appropriate that CIMMYT should hold this maize germplasm in trust because its headquarters are situated close to the places where mankind first started to grow maize as a crop. This work is in the Vavilov tradition as is the more recent responsibility assumed by CIMMYT for the germplasm of bread wheat. These germplasm responsibilities, once assumed, can never be abandoned.

Further, as we contemplate CIMMYT in the 2000s, we must attempt to visualize how it will relate to the NARS of that time. The national research systems of the larger and wealthier countries are already becoming much more efficient. As they become competent in such fields as molecular biology and computer science it seems reasonable to anticipate that early into the next century they will be free standing and certainly equal partners with CIMMYT. CIMMYT will then need to adjust its relations with the advanced NARS having a somewhat different posture with NARS that are self-sustaining in R&D compared with those that require closer partnership. It must consider therefore over the next decade what this means for the deployment of its resources and for the balance of its research.

It is certain that CIMMYT will be needed in the 21st Century. The demand for wheat and maize will expand in developing countries and CIMMYT will be essential because it institutionalizes knowledge of these crops for the tropics and subtropics. It will of course have continually updated its knowledge and maintained and increased its skills in information management and technology transfer.

It will not have "Worked itself out of a job".
ACKNOWLEDGEMENTS

The members of the Interim External Review Panel would like to express sincere appreciation to CIMMYT staff, Management and Board members for the time and effort they devoted to the review process. We arrived at CIMMYT well prepared to begin the task, thanks to the excellent (and concise) documentation sent to us in advance. Once at CIMMYT, organizational and logistical arrangements were carefully planned so that we might spend our brief time there as efficiently as possible. Finally, the energetic and collaborative spirit of discussion and debate with members of the CIMMYT community enabled us to formulate our thoughts and assessment of the Center’s work, and made the process a highly enjoyable one.

Roger Rowe (DDG-R) played the main role in organizing the Review for CIMMYT. Claudio Cafati (DDG-A/F) and his staff handled the logistics. Don (DG) and Maki Winkelmann extended gracious hospitality throughout. Mark Bell (Head Experiment Stations) and his staff arranged an interesting and productive visit for us to Tlaltizapan Station. Linda Ainsworth (Head Visitors Services) was attentive to our comfort and ensured that our travel arrangements were in order. The CIMMYT Women’s Community (CWC) offered warm hospitality, and input to our deliberations.

Martha Larios of CIMMYT prepared our preliminary draft and provided administrative support in an always accurate, efficient and pleasant manner. Ingrid Hagen of the CGIAR Secretariat adeptly transformed the draft into its finished form.
APPENDIX 1

TERMS OF REFERENCE for the 1993 INTERIM EXTERNAL REVIEW of CIMMYT

Background

The Consultative Group on International Agricultural Research (CGIAR) has charged its Technical Advisory Committee (TAC) with the responsibility of conducting External Program Reviews (EPRs) of those International Agricultural Research Centers it supports financially. The CGIAR has assigned a similar responsibility to its Secretariat for External Management Reviews (EMRs). TAC and the CGIAR Secretariat normally discharge these responsibilities by commissioning either separate panels or a joint panel to conduct the reviews.

Recently TAC and the CGIAR Secretariat have been exploring ways of improving the external review process, and the organization of the CIMMYT Interim Review follows a new approach. The model is one of the alternative review formats proposed in a TAC paper "External Reviews – Which Way Forward?", that was discussed by the Group at the Mid-term meeting in 1991, and led to a CGIAR decision that TAC and the CGIAR Secretariat should experiment with the conduct of reviews. The new approach that is being tried is to commission an Interim Review when it is felt that the period between two regular External Reviews can be extended to about seven years, as is the case with CIMMYT.

Purpose

The Interim Review will be a small-scale External Program and Management Review. The purpose, in broad terms, will be to look at major changes in strategic direction that have occurred since the 1988 Program and Management Reviews, to consider achievements and challenges, and recommend issues for more comprehensive examination by the Center and the next External Review Panel. The Interim Review should be viewed as one component of the CGIAR’s integrated planning and review process — that is, as a mechanism of accountability in the CGIAR System.

The Review

The Interim Review Panel is expected to make an independent appraisal of the Center, by identifying and focusing on significant trends and critical issues. This differs from the task of an External Review Panel, which is expected to carry out a thorough assessment of several broad topics (see attached list). The Interim Review Panel may use this list for guidance but should be selective in coverage of topics.

The Report

The Panel should prepare a succinct report, in which factual material is kept to the minimum necessary to set the conclusions in context. The report should include clear endorsements of the Center’s activities where appropriate, as well as recommendations and suggestions for changes. Recommendations should be justified by analysis and approved by the Panel.

The Panel should discuss a draft of the report or its general conclusions with the Center’s Management at the end of the review period. The Panel Chair may put the report in polished form during the days immediately following the Review, provided the Panel approves the draft before it is finalized. Once finalized, the report should be formally transmitted to the Board Chairman, the Chairman of TAC and the Executive Secretary of the CGIAR by the Panel Chair.
Broad List of Issues for External Reviews

A. **Recent Evolution of the Centre**

Important changes affecting the Centre since the previous external review.

B. **Mandate**

The continuing appropriations of the Centre’s mandate in relation to the mission and goals of the CGIAR.

C. **Strategy and Programmes**

The policies and strategies of the Centre, their coherence with CGIAR strategies, and the mechanisms used for monitoring and revising them.

The extent to which the Centre’s strategy is reflected in its current programmes; the rationale for any proposed changes by the Centre and their implications for future activities.

The quality of current programmes and activities.

D. **Centre Guidance, Values and Culture**

The overall effectiveness of the Centre’s Board of Trustees in governing the Centre, and the effectiveness of leadership throughout the Centre.

The Centre’s guiding values and culture, and their influence on the Centre’s performance.

E. **Programme Organization and Management**

The mechanisms in place at the Centre to ensure the excellence of the programmes and cost-effective use of resources.

The adequacy of the Centre’s organizational structure, and the mechanisms it uses to manage and coordinate its research programmes and related activities.

F. **Resources and Facilities, and their Management**

The financial resources available to the Centre in relation to its present and future programmes.

The land, laboratories and services available for supporting the programmes.

The Centre’s human resources.

The Centre’s information resources and facilities.
G. **External Relationships**

The Centre’s relationships with national research systems\(^1\) in developing countries.

Collaboration with advanced institutions in research and training, in both the public and private sectors.

Collaboration with other CGIAR Centres and international agricultural research institutions, and undesirable overlap of activities.

The Centre’s relationships with the government of its host country or countries and with institutions therein.

H. **Achievements and Impact**

The Centre’s overall impact, its contribution to the achievement of the mission and goals of the CGIAR, and the methods used for making such assessments.

Recent achievements of the Centre in research and other activities.

The potential of the Centre’s current and planned activities for future impact.

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\(^1\) National research systems include all those institutions in the public and private sectors, including universities, that are potentially capable of contributing to research related to the development of agriculture, forestry and fisheries.
APPENDIX 2

CIMMYT Interim External Review Panel Composition

Panel Members:

Sir Ralph Riley (Chair)
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England

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Chief Financial and Administrative Officer, MIGA
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Resource Persons:

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CGIAR Secretariat
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1818 H Street, N.W.
Washington, D.C. 20433
Sir Ralph Riley

Sir Ralph Riley is a British cytogeneticist who became a research administrator. He was formerly Director of the Plant Breeding Institute, Cambridge, and then head of the UK Agricultural and Food Research Council. He has served on the Boards of IRRI and ICARDA and has been the Chairman of several EPRs and one EMR in the CG System. He is Chairman of the Board of the Rothamsted Experimental Station and is President of the 17th International Congress of Genetics which will be attended by more than 4000 geneticists in August 1993. He is a Fellow of the Royal Society (the UK Academy) and a Foreign Fellow of the Indian National Science Academy and of the Indian Academy of Agricultural Sciences. He is a Foreign Associate of the US National Academy of Sciences and a Correspondent étrangé de l’Academie d’Agriculture de France. He has chaired since 1984 the Scientific Advisory Committee of the Rockefeller Foundation’s International Program on Rice Biotechnology. He shared with Dr. E.R. Sears of Missouri, the Wolf Prize in Agriculture in 1986.

Mr. W. John Griffith

W. John Griffith is an Australian who is currently Chief Financial Officer of the Multilateral Investment Guarantee Agency, a member of the World Bank Group of organizations. Prior to joining the World Bank Group in 1974, he had a number of jobs in the private sector, including a number of years as a Management Consultant with McKinsey & Co. For a number of years, he acted as Financial Adviser to the CG Secretariat and visited most of the centers during that period. He participated in a number of reviews of center operations. He has degrees in Civil Engineering and Business Administration.
Recommendations of EMR (1988)

Chapter 1

1. Strengthen the mechanisms for ensuring the accountability of units and individuals for their performance, while preserving its strong unit and individual autonomy culture.

   *The Director General’s Office established procedures for external review of subprograms and their components. The process to review individual staff performance each year and to set individual work objectives was put into action.*

Chapter 2

2. Acquire a high level temporary staff person within the office of the Director General to assist in the oversight and coordination of the introduction of CIMMYT (INT).

   *CIMMYT Management did not believe another person was needed and the work was completed with available staff. The move to CIMMYT, INT. was completed in 1990.*

3. Appoint a middle-ranking staff member as Board General Executive Officer.

   *The Assistant to the Director General has been appointed as Secretary to the Board and provides administrative assistance*

4. Carefully study the functions it (the Board) has and has not been performing, with an eye toward including the following among its activities:

   *The Board has given more attention to documenting its activities and decisions.*

   i) monitoring the achievement of center objectives;

   *To this end the Board measures progress against the Strategic Plan.*

   ii) evaluating the performance of the Director General and Board members (including the conducting of exit interviews with departing Board members);

   *The Board has implemented a formal procedure for evaluation of the Director General.*

   iii) monitoring CIMMYT’s relationships with the CGIAR and the implementation of CGIAR policies within CIMMYT;

   *This is done primarily through the Chairman who attends the annual meetings of the CGIAR and of the Board Chairs and is aware of CGIAR policies and concerns. He reports these issues to the Board.*
iv) reviewing the broad organizational framework and the management effectiveness of the Center.

This responsibility was given to the Executive and Finance Committee.

5. Examine and improve its (the Board's) internal structure and operational procedures.

The Board established a Nominating Committee and an Audit Committee to give these areas more attention. The general responsibility is with the Executive and Finance Committee.

Chapter 3

6. Establish an Audit Committee.

An Audit Committee was established in 1989.

7. Restrict the use of closed sessions to matters of extreme sensitivity and matters where the protection of classified information is essential.

The Board has taken this recommendation into consideration when establishing agendas. A higher proportion of Board meetings are now "open."

8. Establish the "Office of the Director General" as a clearly defined unit of the organizational structure, with clearly defined functions and appropriate staffing.

The current office of the Director General includes the two DDG's, Assistant to DG, Internal Auditor, Government Relations Officer and support staff. Each have specific responsibilities.

9. Appoint a DDG-Administration and a DDG-Research and Training who would support the Director General by sharing line responsibility for all organizational units of the center except the Director General's office and the office of the internal auditor.

DDG/Administration and Finance appointed 1Jan89 who became DDG/R in April 1989. New DDG/A&F appointed February, 1990. Appropriate line responsibilities for each were developed.

10. Replace the existing meeting of Directing Staff by a Management Committee chaired by the Director General, with formal procedures and responsibility for major policy and management matters.

A Management Advisory Committee was established in January 1989 and it replaces the Directing Staff Committee. The Committee met once per month in 1989 and twice per month in 1990. The MAC settled on a regular meeting once/month with additional meetings when required. Record kept by Assistant to DG.
11. Review and upgrade its management information system and that this be the direct responsibility of the DDG-Administration.

A Human Resources system is in place which provides management reports and on-line access by supervisors. A new accounting software system was installed in 1992. Reports are being improved. On-line access is also available.

Chapter 4

12. Develop and implement a project-based budgeting and management system.

CIMMYT's budgeting and management system is based on Program/cost center, with cost centers analogous in many cases to projects. Upgrading of the financial reporting system should allow greater flexibility in meeting this goal than has been possible in the past.

13. Develop a cost and budget analysis system to facilitate assessment of program and project performance.

The principal cost and budget analysis tool is a monthly summary print out comparing costs and budgets. This is available in both printed and "on-line" options, as are detailed transaction information. Another tool is a monthly analysis showing percent of budget available, which gives an overall indication of program and cost center performance. It is expected that the upgraded financial reporting system should allow automation of this latter report, prepared manually at present. The finance reports allow an assessment of allocations of resources to activities and products. Evaluation of scientific performance and results is done by senior management and external reviews.

14. Decentralize budgeting and management responsibilities to the project level.

While budgeting and management has been decentralized, there are lingering concerns in the DG's office about the extent of control. The upgraded financial reporting system will provide detailed and summary information necessary for effective decentralized budget and management activities at the sub-program level. This theme is currently being reviewed.

Chapter 5

15. Appoint a Deputy Director General-Research and Training to link together all research and training activities of the center.

This appointment made in April, 1989.
16. Create a Crop Protection Research Group and a Crop Production Research group, to which staff of the Maize and Wheat Programs will be assigned for not less than 30% of their time.

More attention has been given to discipline-based activities. Crop Protection and Crop Management Subprograms were organized in Wheat and Maize, but not across programs. Roughly 65% of all staff time is assigned to support plant breeding.

17. Bring all research and training support services under the control of an Associate Director of Support Services.

This recommendation was not accepted because we could not see the justification of another International Staff Position. We do have one national staff member who manages the logistics of training.

18. Establish sub-programs within the Maize and Wheat Programs, based on functional sub-divisions of the programs, with heads responsible for the planning and implementation of strategy for the sub-programs and for the management of day-to-day activities.

Maize established subprograms based on megaenvironments with all leaders in place in 1989. Wheat established four subprograms with leaders. All positions were filled in 1990.

19. At some outreach locations, appoint one staff member to be the "CIMMYT Resident Representative" with responsibility as the formal and legal representative of CIMMYT, for coordination between programs, and for administrative support.

A CIMMYT representative was named for all locations.

Chapter 6

20. Recruit a Human Resources Officer at the international level to take charge of all personnel matters, reorganize the personnel staff, and up-grade the number and quality of services offered in the management of human resources.

A Human Resources Officer was appointed 2 March 1989. Duties include all personnel matters. The person left in Jan. 1990 and a replacement was appointed later that year who is still in the post. Human resource activities continue to improve.

21. Offer staff at all levels counseling and other assistance in career development, including training, study leaves, and other incentives.

These points have received more attention. Our study leave program is functioning for international and support staff. In-house training has been increased.
22. Provide all first-line supervisors training in the art and science of supervision and management.

A local training program was started in 1991 and is continuing.

23. Introduce mandatory in-service training for international staff prior to assignment in outreach and develop training opportunities for key outreach support staff.

All staff serve at CIMMYT before being assigned to outreach posts. Outreach staff also participate in the study leave program.

24. Design more formal procedures to ensure that there is good communication throughout the center with respect both to the center's business and its procedures.

Several procedures are in place to facilitate communication. DG meets quarterly with International Staff and sends quarterly up-date to Board and staff. All programs have periodic meetings. There is a daily coffee time, and the CIMMYT Informa is being upgraded. The MAC held a two-day retreat in May 1992 to focus on strategic issues, and a similar retreat is being planned for middle management in early 1993.

25. Tailor the management by objectives (MBO) system more precisely to the needs of both headquarters and outreach and train personnel in this use.

Underway and recently revisited for further improvement.

26. Adopt an improved performance evaluation system for support staff that ensures close interaction between supervisor and staff member.

Staff evaluation has been studied and improved each year since 1989. The 1991 review was considered more effective than previous years.

27. Appoint a qualified physician on a retainer basis to oversee and advise on health maintenance issues at El Batan, the experiment stations, and in outreach posts.

This recommendation was only partially accepted because of cost and difficulties in implementation. Two physicians from the Texcoco area are on-call 24 hours a day, 7 days a week for emergency purposes.

28. Devise a program to help managers analyze their staffing patterns with respect to the international/support staff ratio.

This is done as part of the regular work to develop 5-year Program and Budget Plans. This ratio was observed closely during the period of reductions in staff number.
29. Standardize and clarify the benefits that accrue to associate international status and investigate ways to provide associates with greater assistance with their career planning.

*The uses of and opportunities for associate scientists were reviewed by management. A policy was established on the definition and role of the position. Most persons who had been Associate Scientists for long periods were moved to International Staff status.*

30. Develop a policy to recognize and remunerate appropriately distinguished scientists for whom it would be in the center's interest to remain full time in research rather than to move into managerial positions.

*Senior scientist salaries are set according to external market and indicators and not in relation to administrative staff salaries.*

31. Identify a senior person within the Human Resources Office to provide liaison with the dependents of internationally recruited staff and respond to their concerns that have impact on CIMMYT's ability to recruit and retain highly qualified scientists and administrators.

*The DDG/A&F and the Human Resources Officer carry out these functions.*

32. Consult promptly on ways to relieve the financial burden placed on national staff as a result of the depressed local economy so as to ensure retention of highly trained and valued employees.

*A detailed analysis of compensation in Mexico is used to determine salary increases and promotions each year.*

33. Review the benefit package offered national staff and adjust it so as to ensure that CIMMYT stays abreast of enlightened employers within Mexico.

*See above (number 32).*

34. Complete the ongoing review of the position classification and salary administration system for national staff as rapidly as possible and ensure that staff are reclassified as necessary into the proper categories with appropriately adjusted remuneration.

*This work was completed in 1992. Reclassifications and adjustments require MAC endorsement for implementation in 1993.*

35. Consider expanding career opportunities for national staff by establishing position levels that carry authority and responsibility above the current S1 ceiling, but below that assigned international staff.

*This is being considered and the Human Resources Officer falls into this general group.*
Chapter 7

36. Together with the Board, carefully study the implications of trends in the availability of and requirement for core-unrestricted funds.

*This matter is reviewed each year with Executive and Finance Committee.*

37. With the guidance and assistance of the Board, develop and implement a fund-raising strategy, in an effort to expand its funding base and reduce reliance on a few donors.

*As a part of this, a strategy for increasing public awareness is being implemented and fund raising itself is being pursued more systematically.*

38. Appoint a budget officer to assist the financial officer in her responsibilities for budget preparation, monitoring, cost analyses, and the implementation of a more comprehensive budget system.

*A budget officer has not been appointed.*

39. Give continued attention to computerization in the finance function.

*Since 1989, the finance department has computerized a number of tasks which were formerly performed manually. Staff have been provided with PC's and relevant training. Work necessary to upgrade the present financial reporting system commenced in September, 1993, and the system is expected to be operational in January, 1993, with automation of integrated Purchase Order/Accounts Payable modules expected to commence by April, 1993.*

40. Transfer the internal auditor to report directly to the Director General. Strengthen the internal auditing function and give it higher rank and status within the organization and better support, give the internal auditor access to the board's Audit Committee and instruct the internal auditor to report to the committee on the annual and longer term work plan, on work carried out, and on follow up of audit recommendations.

*Completed in 1989. The Internal Auditor reports to Director General and to the Audit Committee. Follow up on recommendations accepted by Internal Audit Committee are being done by Internal Auditor and the DUG/A&F.*

41. Approve an investment policy for the center and ask management to report regularly to the Board on investments made and the return on those investments.

*An investment policy was approved March, 1989. Management has provided annual reports to the Board.*
42. Define comprehensive terms of reference of the proposed Audit Committee of the Board of Trustees to cover in particular.

completed in 1989.

i) discussing with the external auditors the scope of their work plan, audit results, financial statements, and the management action taken on their recommendations;

Appropriate Board Committee meets separately with external auditors each year.

ii) enhancing the independence and effectiveness of the internal audit function through periodic meetings with the internal auditor and reviewing his audit work plan;

Internal Auditor will meet with Board whenever the Board wishes. This normally is at the Annual meeting.

iii) improving CIMMYT’s financial reporting practices and internal control systems;

The internal and external auditors review internal control systems. Financial reporting is done by the Financial Officer.

iv) keeping the Board of Trustees informed of CIMMYT’s financial position and related matters.

A quarterly report is sent to the Board by the Director General.

43. Ensure the external auditors’ management letters, in future, be addressed to the Chairman of the Audit Committee of the Board and, pending its formation, to the Executive and Finance Committee.

Since 1989, the management letter has been addressed to the Chairman of Audit Committee.

Chapter 8

44. Transfer the management of the experiment stations back to the DDG-Administration and combine it with related administrative assignments at El Batan.

The Head of Experiment Stations now reports to DDG/A&F.

45. Consider the establishment of a Station Management Committee with representation from each of the commodity programs and the individual stations in Mexico.

Maize and Wheat Programs have established Experiment Station Committees and meet regularly with Experiment Station staff.
Chapter 9

46. Assign the Head of the Information Services to report directly to the DDG-Research and Training.

   Head of Information Services reports to Director General.

47. Examine the structure, functions and usefulness of its Computer User’s Committee with the aim of enabling it to serve more effectively as a communication and policy review tool.

   The Computer Users Committee meets each month to review issues and to communicate with Computer Services staff.

48. Instruct the programs, in close consultation with DPS, to devise an internal mechanism to synthesize program needs, adequately communicate this information to DPS, and develop and understanding of the costs involved.

   DPS reorganized effective 1Jan90 to SCS with increased strength in management of the development of systems software for scientific and administrative needs. In 1991, the department was divided into two sections, one to deal specifically with software development, the other to deal with hardware and PC users concerns. A charge back system (Programs pay for internal software development) was initiated in 1992 so that each new development is sized and costed and after approval, monitored for progress against deadlines.
Appendix 3. Continued

Recommendations Made by External Program Review Panel
And a Record of Actions Taken by CIMMYT (As reported by the Center)

Recommendations of EPR (1988)

In Chapter 3, Section 3.7

1. Recommends that it carries the Strategic Plan to completion essentially along the lines already established.

   *The Strategic Plan was completed and distributed in 1989. The external factors that shape the plan are reviewed every two years to determine if there are significant changes which would modify the elements of the plan.*

In Chapter 4, Section 4.7

2. CIMMYT should have a Deputy Director General - Research and Training.

   *The expanded Deputy Director General of Research position was created in April, 1989. The three Program Directors as well as the units of Research Support report to the DDG/R.*

3. CIMMYT should follow its commitment to disciplinary research in the sciences associated with plant breeding by the creation of a Crop Protection Research Group and a Crop Production Research Group.

   *More emphasis has been given to disciplinary research. Crop Protection and Crop Management are recognized subprograms in Maize and Wheat.*

4. Research and training support services should be brought together under the control of an Associate Director of Support Services.

   *This recommendation was not accepted because we believed the proposed activities did not justify a new international staff position. These activities are managed by the two DDG's.*

5. The Maize and Wheat Programmes should have sub-programmes, based on functional sub-divisions of the programmes, with heads responsible for the planning and implementation of strategy and for the management of day-to-day activities.

   *Maize established sub-programs based on major activities with all leaders in place in 1989. Wheat established four sub-programs with leaders. All positions were filled in 1990.*
6. At some outreach locations, the Director General should appoint one staff member to be the "CIMMYT Resident Representative".

    *Resident liaison persons were appointed for all outreach locations.*

In Chapter 5, Section 5.7

7. Recommends speedy action in the further analysis of environmental and biological data and especially the provision of a socioeconomic overlay for maize.

    *The definition and elaboration of megaenvironments has received more attention with the addition to the staff of a Rockefeller Foundation Fellow to work on GIS in 1991 and 1992. This will become an essential activity in 1993. The GIS will incorporate socioeconomic databases.*

8. Recommends that CIMMYT undertakes studies to improve the understanding of the economic factors affecting the use of hybrid maize in particular developing countries.

    *A major project was launched in 1992 to analyze these issues in six case-study countries. Results are available for Mexico and Brazil.*

9. Recommends that CIMMYT consider with TAC the importance that should be accorded to food vs. feed and the significance that this has for wheat and maize research.

    *Resource allocation in CIMMYT give greater weight to food than to feed. The economics Program has examined the issue of QPM as feed in Central America. Triticale studies were completed in Mexico and Tunisia and will be done in other countries.*

10. The early implementation of the mega-environment concept and that high priority be given to cooperation with the Economics Programme in research efforts aimed at improving the definition of the mega-environments and application of the concept in priority setting.

    *The procedure was used extensively in developing the CIMMYT 5-year program and budget and in general management, including a formal model of research resource allocation developed jointly between Economics and the Crop Programs. GIS has been used to define further the megaenvironments.*

11. Increased strategic research on germplasm improvement.

    *The wide cross and RFLP labs and the biometrics unit have contributed to an increasing amount of strategic research in germplasm improvement. Genetic analyses for understanding disease resistance and expanded physiology research have been undertaken.*
12. To provide improved germplasm more quickly for the countries of West Asia and North Africa. CIMMYT and ICARDA should work together using their complementary skills.

   A CIMMYT/ICARDA working agreement was signed in 1988. These joint efforts will improve flow of new wheat germplasm to the region. Germplasm improvement is progressing well, as is work in other areas, e.g., CIMMYT and ICARDA collaborated on 1990 "Wheat Facts and Trends."

In Chapter 7, Section 7.3

13. CIMMYT undertakes the development of wheat germplasm tolerant to saline soils.

   Selection for tolerance to saline soils started to receive more attention in 1990 and progress has been made to produce improved germplasm. An in-house review on the subject was held in 1990 to develop research guidelines which are now being implemented. We analyzed the relative priority that should be given to such work and found that it should not be a high priority activity.

14. CIMMYT undertakes more research in integrated crop protection.

   The application of IPM is considered more appropriate for national programs. CIMMYT contributes by providing resistant or tolerant germplasm.

15. CIMMYT gives research emphasis to its new programme in seed health.

   The Seed Health Unit, established in 1988 and reporting to the DG, concentrated first on routine seed testing and is becoming involved in limited research aspects of seed health.

In Chapter 8, Section 8.5

16. The Economics Programme moves toward reallocating its resources by the reduction of its activities in on-farm research and training, and by the increase of its research activities for generating critical information for wheat and maize varietal development, for CIMMYT and commodity programme research resource allocation, and for wheat and maize market policy analysis.

   Resources to OFR have declined and resources to other activities are increasing.

   OFR & Training has been transferred to regional efforts managed by national programs.
17. The medium-term and annual plan of work of the social and biological scientists in the Regional Programmes be prepared jointly, with the participation of the Directors of the respective programmes.

*Joint annual planning sessions are conducted in each region.*

In Chapter 9, Section 9.6

18. CIMMYT expands its headquarters crop management research to strengthen regional and national programme capabilities in crop management research.

> Maize and wheat have strengthened CMR in Mexico and there is interaction with national program agronomists. However, due to reduced resources, some regional crop management activities have been discontinued.

19. CIMMYT accepts greater responsibility providing leadership through research, and training that emphasizes a concern for sustainability with particular view to maize and wheat production in the developing world.

> Issues of sustainability are being considered and appropriate crop-based research is underway with core funding. Examples include the rice-wheat system in South Asia and the hillside maize systems in Central America. Soya-wheat system work is underway with UNDP funding. More research projects have been developed but await special project funding.

In Chapter 10, Section 10.7

20. A research capability in biotechnology should be developed as quickly as possible in order to obtain the benefits of modern science for the creation of germplasm.

> A leader of the biotechnology research work was recruited in September, 1989 and a biotechnology laboratory was completed in early 1990. RFLP work has been emphasized. More recently, work on tissue regeneration has been started with the intent to move into transformation research.

21. Moves to establish an Institutional Biosafety Committee (IBC) to address biosafety issues related to planned biotechnology research.

> A biosafety Committee was established in early 1991.

22. Appoints a certified Radiation Officer and a Biosafety Officer.

> A qualified scientist serves as Radiation Officer, but is not certified in Mexico because CIMMYT does not use radioactive compounds in its research and has no need for a certified radiation officer.
In Chapter 10, Section 10.7

23. Increases strategic research aimed at understanding resistance to biotic stresses and tolerance of abiotic stresses.

Research is underway relative to sources of resistance, host-parasite interactions, the genetics of resistance, and tolerance to stresses (heat, drought, salt, acid soils), and to increase knowledge of how to improve selection efficiency.

24. Undertakes work in agroecology to support strategic research in crop stress physiology and crop loss assessment.

CIMMYT initiated research on the maize-based cropping system on the hillsides of Central America and on the rice/wheat based systems in the irrigated production areas of South East Asia. This is strategic crop management research.

25. Undertakes strategic research in integrated crop protection.

More effort is going to understanding the inheritance of resistance to tolerance, which is an essential component of IPM.

26. Gains access to experimental field sites in Mexico for the research needs of the crop stress physiology programme.

These requirements were examined. No new CIMMYT experiment station is proposed at this time. However, we have a collaborative arrangement with the University of Baja California giving access to their experiment station for salt tolerance screening.

In Chapter 11, Section 11.10

27. Overhauls its international testing programme of nurseries to take better advantage of new technology and trial designs and make more relevant the experimental and analytical components of this important effort.

The international testing programs for both maize and wheat were reviewed with the aim of improving efficiency and increasing the information gained. Some recommendations from these reviews have been implemented.

28. Moves upstream in its research, training and networking relationships with national programmes, while at the same time devising appropriate institutional mechanisms to assist the less developed national systems, particularly in poorer countries.

CIMMYT attempts to meet the divergent requirements of various national programs through a number of innovative partnerships and collaborative research agreements.
29. Provides the lead in searching for appropriate mechanisms for periodic consultations with collaborating national programmes, with the aim of setting specific operational objectives.

"Outreach staff will continue the consulting function but less frequently. Many meetings and workshops are organized in the regions."

In Chapter 12, Section 12.7.7

30. Should not become involved in too many bilateral programmes.

"The Board continues to monitor the number of bilateral and special projects, as well as the balance between essential and complementary activities."

31. Prepares a policy statement on plant genetic resources to include the principles under which it operates; expand its long-term (base collection) storage capacity for maize and wheat; accept a base collection responsibility for a global spring breadwheat and for triticale germplasm.

"CIMMYT has stated its policy on genetic resources, plans to expand the facilities for long-term storage and has accepted base collection responsibility for bread wheat and triticale."

32. Prepares a long-range plan for experiment station development.

"No new stations are planned. Each station has been reviewed and there is a plan for rotation and soil improvement. Minimum till methods and appropriate fallow crops have been studied and implemented."

In Chapter 13, Section 13.2

33. Develops its training strategy to make viable the plan, to reduce its involvement in on-farm research training, and to increase specialized and advanced training.

"On-farm research training activities have been eliminated. Advanced training in germplasm improvement and crop management is offered."

34. Consults with national programmes on their specific training needs, develops regional cross-programme training work plans, defines the specialized courses for which the Center has comparative advantages and begins designing and implementing them.

"Outreach and headquarters staff regularly talk with national programs about needs for training. We continue to emphasize those areas where CIMMYT has most competence; genetic improvement, and mid-career training in CMR. Other training programs have been eliminated, while still others, e.g., wheat industrial quality, function at low levels."
35. Management assumes responsibility for leading the process and catalyzing national programmes commitment for the successful development of national and regional training centers.

Regional CMR training started for wheat in Argentina and maize in Kenya in 1991. A second maize training site is to be established in Thailand in 1993.

36. Develops a dynamic strategy to enable the Center’s audience, both internal and external, to have the best possible benefits from the application of new procedures through information services.

The CIMMYT Strategic Plan calls for publishing information of a more technical nature and to use the newest technologies (CD-ROM, optical disk) to provide quick access to literature and for data base searches. As well, CIMMYT is an active participant of the CGIAR public awareness effort and has expanded Center-specific efforts in this area.
APPENDIX 4

Input of CIMMYT's International Outreach Staff
to the 1993 Interim External Review of CIMMYT

Personal (and Confidential)

Name:
Post:
Years at CIMMYT:
Who do you report to:
Links with headquarters --

how often do you visit headquarters:
how often do headquarters’ personnel visit you:

Program Achievement, Impact and Challenges

A) Areas of most significant progress and/or impact of work from your site in the past five years.
B) Significant scientific challenges facing your program.
C) Significant collaborative challenges facing your program, particularly with NARS and other IARC’s.

Research Management

A) Effectiveness of leadership and oversight/monitoring from CIMMYT headquarters.
B) Adequacy/strength of professional and disciplinary support from headquarters.
C) Adequacy/strength of the composition of the research team with whom you work.
D) Frequency/adequacy of interactions between scientists at your site with those at headquarters or other CIMMYT sites.
E) Degree to which decision-making is decentralized from headquarters to your site.

Planning and Review

A) Effectiveness of CIMMYT’s research planning and review processes, and involvement of outreach staff in these.
B) Usefulness of the project-based budgeting and management system as a tool for planning, review, and accountability, and ease with which you have adopted this system.

Human Resources, Administration and Program Support

A) Adequacy of local staff composition for your support, and adequacy of their working arrangements for facilitating your activities and promoting positive morale.
B) Adequacy of facilities and equipment for the conduct of your work, and provision of facilities by local NARS.
C) Responsiveness of HQ finance, administrative, and program support units to your needs.
External Relationships

A) Responsiveness of CIMMYT to the region’s research and training needs (and mechanisms used for understanding these).

B) Effectiveness of CIMMYT’s working relations with NARS in countries in which you work. (Please highlight strengths and weaknesses and give your view on the reasons for these.)

C) Effectiveness of CIMMYT’s working relations with other CGIAR centers in countries in which you work. (Please highlight strengths and weaknesses and give your view on the reasons for these.)

D) Nature and effectiveness of CIMMYT’s collaborative relations with any other institutions or agencies in countries in which you work (e.g. NGO’s).

Other Impressions and Conclusions

A) Degree to which you are satisfied with your job and employer.

B) Other comments.
# ACRONYMS AND ABBREVIATIONS

**March 1, 1993**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOT</td>
<td>Board of Trustees</td>
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<tr>
<td>CATIE</td>
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<td>CGIAR</td>
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<tr>
<td>CMR</td>
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<td>DDG-R</td>
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