Agriculture - Economic aspects

International maize and wheat improvement center

CIMMYT Economics:

An Agenda for the Future

CIMMYT Economics Program

Background paper for CIMMYT's Strategic Plan, 1988
Slightly revised and updated, 1991

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Introduction

This paper synthesizes the outcomes of discussions at the 1986 and 1990 meetings of the CIMMYT Economics Program, which formed part of CIMMYT's overall strategic planning exercise. At that time, CIMMYT's economists, crop scientists, and management strongly felt that it was appropriate for the Economics Program to consider a somewhat broader range of activities and clients when planning its future work. Three factors contributed to this understanding:

- The perception that the Economics Program's past, almost exclusive, concentration on on-farm research (OFR), while successful, had peaked;
- The need to address changes in CIMMYT's external environment, especially changes in the maturity and composition of some national programs; and
- The increased demand within CIMMYT for information and analysis for decision making, as a result of the strategic planning exercise.

This paper develops a conceptual framework for viewing the roles and potential activities of economists based in agricultural research institutes and then applies that framework specifically to economists at CIMMYT. Potential activities, clients, and outputs of CIMMYT economists are then viewed against our evolving environment. Finally, the allocation of resources within the Economics Program is considered.

To clarify terminology at the outset, "economists" is used as shorthand for "economists and other social scientists," whereas "technical scientists" refers to physical and biological scientists. "Research systems," "research institutes," and "national programs" are used interchangeably to designate research organizations involved in technology generation.

Conceptualizing the Role of Economists in Agricultural Research Institutes

Economists in National Agricultural Research Programs

Economists and other social scientists have generally been latecomers to agricultural research programs and in most cases still seek an appropriate role within them. That role must be defined in terms of the major objective of agricultural research institutes, which is the development and dissemination of improved technology to increase the productivity of defined groups of farmers. Table 1 uses two broad categories to summarize the activities that economists might undertake to achieve this objective:

1) Improving the *internal efficiency* of research so that resources are marshalled more effectively to meet the objectives of the research institute. Two major activities contributing to this role are a) technology design and evaluation and b) analysis of research resource allocation decisions.

2) Improving the *external efficiency* of research systems by helping to remove constraints that impede the adoption or efficient utilization of *appropriate* improved technology at the farm level. An example of this kind of activity is research on input markets that stimulates policy changes that make appropriate inputs available to farmers, enabling them to use improved technology.

These activities imply several potential clients for economists in the agricultural research system (Table 1). In improving the *internal* efficiency of the research system, the major clients will be research managers and fellow research scientists. Research managers may benefit from information and analyses that contribute to better decisions on allocating research resources. Studies of the impacts of research may be useful to research managers as well as clients outside research systems, such as policy makers, who fund agricultural research. Economists can also help bring a "farmer orientation" and/or disciplinary perspective to setting priorities for breeding or agronomy research, and so improve the chances that technologies developed will be relevant to farmers' circumstances.

Table 1. Research activities and clients for economists in national research programs

	Clients					
	Within research systems			Outside research systems		
Major activity	Extension/ farmers	Agronomists	Breeders	Managers	Policy makers	General[a]
Internal efficiency						
Technology design and evaluation						
On-farm research	••	••	•			
Varietal development			••			
Research resource allocation		••	••	••		
Research impacts		•	•	••	•	•
External efficiency						
Policy issues in technology utilization				•	••	•
Commodity subsector studies		•	•	••	•	•

a Professional colleagues, the development community, and the public.
•• = Primary client.
• = Secondary client.

The analysis of policy issues in technology utilization is the major activity aimed at improving the *external* efficiency of the research system. The principal clients for this work are policy makers and institutions that influence the environment in which new technology is to be used. These clients might include local-level decision makers who influence factors critical to the dissemination of the technology, such as seed production, extension, local input distribution, and product marketing. Alternatively, these clients might be national-level decision makers who set the input and output prices that determine the profitability of the technology.

Within this broad range of activities that potentially influence the productivity of agricultural research, economists working at research institutes must assess their own comparative advantage relative to economists in specialized economics research institutes, policy analysis units, and universities. Factors that influence this comparative advantage are:

- The potential for interaction with technical scientists in the research system, and hence the ability to acquire specialized technical (for example, agronomic) skills and knowledge and to conduct multi-disciplinary research.

- The opportunity to specialize over time and develop expertise in the particular commodities or farming systems that come under the mandate of the research institute and, consequently, the opportunity to be able to synthesize a broad range of information related to those commodities or systems.

Economists at research institutes obviously have a comparative advantage in issues related to the internal efficiency of the research system--technology design and evaluation and research resource allocation. These economists probably also have a comparative advantage in the analysis of policy issues in technology transfer, such as input distribution. However, they enjoy little advantage for analyzing macroeconomic policies (e.g., price policy analysis). In fact, the location of research institutes away from national-level policy makers and sources of secondary data is in many cases a disadvantage in conducting macroeconomic policy analysis.

Nonetheless, it is important that agricultural research decisions be made with a good understanding of the macroeconomic environment and national policy priorities. To accommodate this need we have added a third category of activities for economists in the research system, which we will call *commodity sector studies* (Table 1). Commodity sector studies interpret 1) long-term supply and demand trends for the commodity and 2) major features of the macroeconomic and agricultural policy environments (especially prices) influencing those trends.[1] These studies are more in the nature of background studies and will rarely be aimed at solving specific problems. Rather they improve the general understanding of the environment in which researchers are attempting to develop and disseminate improved technology. The audience for these studies is more diffuse than for other areas of economics research, ranging from research scientists and managers to policy makers.

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1 **For a research institute with a mandate for a particular region or agroclimatic environment, these background studies would review production, pricing, marketing, etc., of all crops within that region or environment.**

Economists in International Agricultural Research Centers

The potential role of economists in international agricultural research centers (IARCs) such as CIMMYT differs little from the role just outlined for economists in national research institutes (Table 2).The main differences are:

- The clientele for the CIMMYT Economics Program's work is somewhat broader and includes econmists, technical scientists, and managers of national research programs as well as technical scientists and managers in the IARC itself.

- The outputs of IARCs for national programs are "intermediate" goods rather than finished technologies. They include research methods, information, and training.

Economists in the IARCs engage in essentially the same research as national program economists--that is, studies designed to improve internal efficiency (of the IARC or national programs) or external efficiency (of national programs), and commodity sector studies (i.e., of a global nature for the IARC or at the national level for national research programs). Our comparative advantages and disadvantages as economists in an institute having a technical mandate are also similar to those of economists in national research programs.

Table 2. Research activities and clients of the CIMMYT Economics Program

	CIMMYT			National programs				Donors
	Crop program scientists	Crop program managers	Director General's office	Econo-mists	Crop programs	Research managers	Policy makers	
Technology design, evaluation, and utilization	•••[a]	•	•	•••[b]	•••[b]	•	•	
Resource allocation and impacts	••	••	•••	••	•	••	••	••
Commodity sector analysis	••	••	••	••	••	••	••	••

••• = major client; •• = intermediate client; • = minor client.

a Primarily work in varietal development.

b Includes work on sustainability.

The products of work undertaken by IARC economists vary according to the clients. For clients within the IARC, the principal product is information and analyses to improve decision making. For clients in national programs, a major product will be improved research methods and training associated with those methods. This is especially the case for an IARC such as CIMMYT, which serves over 70 national programs in countries where wheat and/or maize is an important crop. Information and analyses provided directly by CIMMYT economists could serve only a small number of these programs, especially because in these client countries wheat and maize are produced under a considerable range of agroclimatic and socioeconomic conditions. Improved and robust research methods and formal training courses, or informal training through research collaboration, have the potential to reach a much wider audience.

Evolution of Major Activities of CIMMYT Economists

Economics research began at CIMMYT in 1971, five years after the Center was founded. Until 1977 the Program remained small, composed of one or two economists searching for a role within the broad framework of potential clients and activities presented above.[2] In the early years, most resources for economics research were devoted to a series of varietal adoption studies commissioned in the wake of the Green Revolution to examine the criticism that large-scale farmers were the primary beneficiaries of improved technology. However, by 1977 the Program had established a set of clearly defined activities that emphasized improving the internal efficiency of national research programs through developing methods for OFR, offering training in those methods, and documenting them in training materials (see CIMMYT 1988, 1980). Those research methods had a rather narrow focus, being directed primarily toward resolving a critical weakness in many national programs--the lack of a farmer orientation and systems perspective in designing technology and recommending improved technology to farmers.

The work in OFR clearly established national agricultural research systems as primary clients of CIMMYT Economics, especially production agronomists and sometimes economists involved in adaptive research. From 1982 to 1988, over half of the Program's resources were devoted to training and providing support to national agricultural research programs; both of those activities were aimed at institutionalizing OFR methods.

The OFR work initially focused on technology design and evaluation, assuming the policy environment as given. More recently, efforts have been made to use OFR results to influence the policy environment. This work assumes that: 1) many policy decisions made at the local level impose constraints on the diffusion of otherwise appropriate technologies, and 2) these policy decisions often reflect inadequate flows of information, especially technical information and information on farmers' circumstances, from the research system to policy makers. Some evidence suggests that providing information generated by OFR to relevant policy makers can lead to changes in policy which in turn can lead to significant increases in productivity (Martinez, Yates, and Sain 1988).

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2 For a list of Economics Program staff, see Appendix A.

In 1983, a second area of research was initiated to provide improved methods for analyzing *research resource allocation* decisions. This work emphasized one technique, domestic resource cost analysis, which is especially appropriate when major policy distortions hide the underlying comparative advantage of competing commodities or of different production techniques for a given commodity. Domestic resource cost analysis has helped to define conditions under which wheat production is a potentially efficient use of resources and hence where research investments can be justified.

Aside from its work in research resource allocation and OFR, since 1981 CIMMYT Economics has conducted commodity sector studies on global trends in maize and wheat production, trade, consumption, and prices. These studies have had an important educational role for scientists in CIMMYT and in national programs and more generally for policy makers and donors. They have influenced resource allocation at CIMMYT as well (for example, in clarifying options for research on tropical wheats). Commodity sector studies have also been conducted as part of some domestic resource cost studies (e.g., Ecuador and Mexico); smaller individual studies have also been initiated (one example is a study of the use of maize for food and feed in Pakistan).

Overall, CIMMYT Economics has been characterized by strong and effective links with national research programs, especially with agronomists and economists, and by a commitment to institution building in those programs. Our contribution to providing information and analysis to breeders in CIMMYT and national programs and to research management (except for institutionalizing OFR) has been somewhat less impressive. Results of OFR have sometimes provided important feedback to breeders on farmers' varietal needs but, in general, economists at some other international centers (e.g., the International Center for Research in the Semi-Arid Tropics [ICRISAT] and the International Center for Tropical Agriculture [CIAT]) have probably been more influential in setting Center breeding priorities.

Research Agenda for the Future

Several changes in our environment considerably influenced the development of the Economics Program's research agenda:

1) An increasing number of economists are recruited by national research programs, and in some cases OFR has been institutionalized within national research systems. These facts suggest that fewer resources need to be allocated to demonstrating the value of OFR methods and that more attention can be given to economists (rather than agronomists) as our primary clients in national programs.

2) The growth of resources allocated to agricultural research both in national programs and in CIMMYT has slowed. During the 1970s, in the wake of the Green Revolution, research expenditures in developing countries grew at 10% per year in real terms. That growth rate fell sharply in the 1980s and is unlikely to rise considerably in the near future. This slow-down places greater pressure on research managers at the national and international levels to *justify* research priorities and to *document* the productivity of research expenditures.

3) For the near to intermediate future, world grain markets will be characterized by periods of surplus and low grain prices; over the longer term, these markets will be affected by potentially volatile commodity prices and exchange rates. At the national level, many countries have instituted or plan to institute broad policy reforms that often strongly influence supply and demand trends for basic grains. These factors complicate the setting of research priorities, especially for maize and wheat, which constitute the bulk of cereal grains imported by developing countries.

4) Increasing evidence of resource degradation, especially in fragile marginal areas, has provoked great concern over the sustainability of many agricultural systems. CIMMYT should give greater weight in its work on technology design and evaluation to longer term implications for the quality of the resource base.

5) CIMMYT and many national programs are placing greater emphasis on targeting the benefits of their research to the poor. This decision arises from a perception of the incongruity of a world grain surplus existing while a large number of people suffer from malnourishment. The case for merely increasing the "pile of food" without considering how it will be distributed is not very strong for the near and intermediate future.

6) The role of the private sector in research, especially with regard to hybrid maize varieties and biotechnological advances, is growing rapidly in the Third World. Research decisions for the public sector will have to be made in that context.

Given these changes in its environment, the CIMMYT Economics Program has developed a research agenda that fits the conceptual framework outlined above. This agenda assumes that three client groups should receive more emphasis:

1) National program economists, most of whom are newly appointed and hence relatively inexperienced.

2) Plant breeders, both at CIMMYT and in national programs.

3) Research managers, both at CIMMYT and in national programs.

In addition, to the extent that we address policy issues, it will be desirable to promote stronger links with policy analysis units and between these units and economists and research managers in the research system.

Technology Design and Evaluation

On-farm research/farmer perspective in research--Despite our focus on OFR in the past, many issues still require further development through improved methods and empirical estimates of parameters. Examples include:

- Empirical estimates of key parameters in Manual I[3] (for example, minimum acceptable return on capital for technology adoption, adjustment of experimental yields).
- Methodological issues beyond Manual I (e.g., residual or carryover effects of treatments, continuous analysis, accounting for labor costs).*
- Methodological issues beyond Manual II[4] (e.g., refining recommendations and recommendation domains, crop production surveys with agronomic variables).*
- Efficiency and precision in experimentation in a variable environment (e.g., number of replications, sites, and years; precision of recommendations).
- Better methods for assessing technological risk and its importance to farmers, especially in marginal environments.*
- Use of crop models to develop hypotheses on appropriate technological alternatives.
- Appropriate methods for farmer assessment of technologies and for measuring adoption.*
- Improvement of feedback of OFR to on-station research (e.g., a farmer perspective to breeding priorities).
- Institutional issues in organizing OFR, ensuring a client orientation, and developing effective research/extension links.*
- Factors influencing economic returns to adaptive OFR.

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3 CIMMYT (1988).

4 CIMMYT (1980).

* Activity underway in 1990.

In addition, the network of OFR programs in which CIMMYT is involved is now very extensive, especially in maize, probably covering over 20 countries and many more agroclimatic and socioeconomic environments. Experience gained over several years in these OFR programs provides an excellent opportunity to identify the conditions under which specific institutional arrangements or research methods are successful. Furthermore, the spectrum of the OFR programs in maize is probably sufficient for us to draw general implications about maize production constraints and varietal needs in several of the major mega-environments for maize. We should consider ways to better organize and exploit this large database.

Varietal development--About three-quarters of CIMMYT's research resources are allocated to germplasm development (that is, to plant breeding and associated disciplines). In national programs this proportion is somewhat less but probably averages about half of all research resources in maize and wheat. Social science information and analysis play a potentially important role in helping define priorities for varietal development programs. Analyses that might be conducted for CIMMYT's crop programs include studies of:

- Future demand for increased quality in bread wheat because of rising urbanization and a higher level of consumption of industrially processed wheat products, and the consequent implications for yield versus quality as selection priorities.

- Prospects for utilization of triticale in food, feed, and forage in specific environments.*

- The role of quality protein maize for food and feed in specific situations.*

- Economics of alternative methods of achieving durable rust resistance in wheat through breeding, varietal turnover, or use of multilines or varietal mixtures.*

- Demand for maize hybrids versus open-pollinated maize varieties for favored and marginal environments and for small-scale farmers.

In national research programs, the scope for economic analysis to contribute to the varietal development work is similarly large. Especially for maize, grain texture, suitability for local processing, storability, and taste are often important criteria in farmers' adoption decisions. Even where national programs have access to high-yielding CIMMYT germplasm, it must be modified through local breeding to meet farmers' criteria. The large amount of information generated in many national programs by OFR offers an opportunity for OFR to channel important information to varietal development work. Unfortunately, OFR teams' frequent isolation from commodity research teams can limit the amount of feedback. Hence the Program will consider specific studies to define varietal needs, including surveys conducted over a wider area than would normally be regarded as the "research domain" of an OFR project.

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* **Activity underway in 1990.**

At CIMMYT, the Economics Program plans to strengthen its efforts in research related to varietal development. One full-time position is allocated at headquarters for this purpose, and outreach economists will give more attention to issues in varietal development. As with OFR, an important objective of this work will be to develop methods for making decisions on varietal development, including methods for assessing farmers' criteria for varietal acceptance.

Research Resource Allocation

Research administrators require better methods for analyzing and justifying research priorities and allocating increasingly scarce research resources. This demand is evident in some national programs as well as in CIMMYT, whose strategic plan (CIMMYT 1989) calls for an explicit analysis of research priorities in terms of a defined set of criteria, many of them economic.

Methods for research resource allocation--Research resource allocation decisions can be made at different levels:

- Allocation of resources across commodities.
- Allocation of resources between regions/environments for a given commodity.
- Allocation of resources between basic, applied, maintenance, and adaptive research or across disciplines (for example, breeding vs. agronomy) for a given commodity.
- Determining weights for breeding priorities for different mega-environments.

The analytical techniques used in making these decisions also vary according to the problem and circumstances being addressed. The range of techniques includes: 1) scoring methods based on crop area and subjective assessment of problems and prospects for research progress, 2) congruency methods based on value of production, 3) crop loss studies, 4) domestic resource cost analysis, 5) ex-ante benefit-cost analysis, 6) demand studies (e.g., triticale used as food versus forage, or quality protein maize), and 7) tradeoffs between production and equity, in which poor farmers or poor consumers receive special weight.

As noted earlier, up to 1988 CIMMYT's work in research resource allocation exclusively emphasized domestic resource cost (DRC) analysis. Although it is useful for developing a longer term dynamic perspective on research investments in economic environments undergoing rapid policy changes, the DRC approach is too narrow to address the types of questions that most research administrators are asking. In the future, DRC analyses will receive much lower priority and, in general, will be shifted to the area of commodity sector analysis. Past work done with DRC analysis is being synthesized and evaluated (see, for example, Morris 1990).

Future efforts in research resource allocation will emphasize both decision making in CIMMYT as well as national programs. With regard to national programs, we believe that our major clients will be found at the subnational level--regional research directors who allocate research resources across commodities within a region, or national maize and wheat coordinators who are charged with allocating maize/wheat research resources across regions. In either case, a precondition for CIMMYT involvement in this work will be strong participation by national programs themselves. An important outcome will be improved methods that national programs can readily apply. We envision that our work in this area will be closely coordinated with that of other centers, especially the International Service for National Agricultural Research (ISNAR), which is developing methods for research resource allocation at the national and global levels.

Maize and wheat research and the poor--In fulfilling its mandate, CIMMYT faces the major challenge of allocating limited research resources across a wide range of environments and potential products according to numerous criteria, including equity concerns. The Economics Program gives special emphasis to studies of the potential impact of CIMMYT's research on the poor. To accomplish this objective, we are developing a better database to determine the role of maize and wheat in the incomes of poor producers and the diets of poor consumers. Beyond that, we have a modest research effort to understand more clearly the distributional consequences of technological change at the macro-level.

We believe that this information will be critical for deciding whether or not to increase research for marginal environments. Recent work has analyzed how poor producers and consumers might benefit from research aimed specifically at marginal environments, compared with how they might benefit indirectly from research aimed at favored environments. The increased effort by CIMMYT economists to analyze the impacts of research and technological change on the poor will remain a strategic research issue for the Economics Program throughout the 1990s.

Research on science policy and private/public sector linkages--The growing privatization of maize research and the private sector's involvement in biotechnology may have major implications for CIMMYT and national programs over the next 10-15 years. The Economics Program has established a modest research effort to monitor and analyze the implications of changing private sector activities, especially their potential equity implications (e.g., Echeverría 1990). The privatization of research may restrict the access of poorer countries and farmers to improved germplasm unless the public sector develops complementary strategies. For Third World wheat and maize producers and consumers, the new biotechnology may also have far-reaching implications which are only beginning to be analyzed.

Research productivity--In the past CIMMYT has given little emphasis to estimating returns to research investments. That choice was partly related to the fact that returns to CIMMYT's wheat research were obviously extremely high and more sophisticated calculations were not needed. However, greater emphasis in the future on problem environments, where gains are likely to be much slower, will require a more careful analysis of returns to research. In addition studies of research productivity have nearly always emphasized plant breeding and have provided little information on returns to other types of research

important in CIMMYT's portfolio, especially maintenance research and crop management research. A modest effort is being made to improve estimates of returns to research in areas important to CIMMYT (we envision much of the analysis being done through PhD thesis studies, such as Traxler 1990). This work, which looks at returns to past research investments, will be closely integrated with work on research resource allocation, which analyzes potential research investments.

Policy Issues in Technology Utilization

Studies of policy issues in technology utilization recognize the critical importance in many situations of policy constraints that slow the rate at which new technology is adopted or reduce the efficiency with which technology is used even when it is adopted. The common element of this work is the identification of policy constraints through OFR and the use of information generated by OFR to analyze alternatives. In most cases the particular constraint will not be commodity specific, so that micro-based policy analysis for CIMMYT can be justified at the national level only when maize or wheat is a dominant crop in the agricultural sector.

We envision that work on policy issues in technology utilization will be conducted by social scientists in national programs, but in some cases a link with economists in planning units maybe useful, especially if national policies are under consideration. CIMMYT will work closely with national programs in conducting these studies but the major push for policy changes will have to come from the national programs themselves. A recent initiative in policy analysis in sub-Saharan Africa, for example, is being implemented through a network of economists from the region.

In addition to these problem-oriented studies, we have a small research program on general issues related to technology transfer. Some topics considered include the role of extension in transferring technologies of different complexity; the potential substitution of applied and adaptive research for extension; appropriate institutional arrangements to enhance research-extension linkages; and research on farmers' acquisition and utilization of new knowledge and skills. These studies aim to improve our understanding of the processes of technology transfer and adoption for different types of technologies and classes of farmers. In most cases these studies are undertaken as PhD theses.

Commodity Subsector Studies and Databases

Analyses of trends in maize and wheat supply, demand, pricing, etc., seem most appropriate when:

- Long-term trends in the supply or demand of maize/wheat or the effects of policy interventions are not widely understood or appreciated by scientists or research managers; or

- A commodity subsector is undergoing substantial adjustment because of technological change, changing price relationships, trends in demand patterns (e.g., from food to feed), or a switch from import substitution to self-sufficiency or export status (or vice-versa).

Comprehensive commodity subsector studies often require substantial commitments of resources beyond the means of CIMMYT and most national programs. Consequently, our work in this area will depend largely on *existing secondary data* or data that can be gathered through *interviews with key informants* (e.g., in the marketing sector). Appendix B describes the content of a subsector study possible within these parameters.

However, we recognize that, where adequate secondary data simply do not exist, special-purpose, often quite large-scale, surveys will be required to obtain the necessary information. This is the case with the current study of the maize sector in Paraguay. Other large-scale studies in process or being planned focus on wheat in Sudan and Kenya, maize and wheat in Vietnam, and maize and wheat in Mexico. Continuing this work will require greater involvement of national program economists than at present. After accumulating experience in this area, we will also need to evaluate the utility of this work for research decision makers.

The popular *Facts and Trends* series, which explores longer term trends in the wheat and maize economies of the Third World, will be continued. Recently the database used for these studies was substantially expanded and "formalized."

Training and Support to National Programs

The bulk of Economics Program resources in 1987 was devoted to training and providing support to national programs. This allocation reflected heavy training commitments in eastern and southern Africa, especially the in-country call-system courses which required trainees to assemble five to six times over 12-18 months for training in the various steps of OFR. CIMMYT Economics has a deserved reputation for training in OFR methods, and we will continue our involvement in this type of training. However, we have begun gradually reducing call-system courses and are developing more specialized courses for social scientists both in OFR and in other areas, especially research resource allocation. We have also invited more Visiting Economists from national programs to reside in Mexico for two to six months and work on specific research projects. Over time, especially with the completion of the current USAID training project in Africa, we expect that the share of resources allocated to training will be reduced to levels that are comparable to those in CIMMYT as a whole.

Funding, Staffing, and Organization

Funding and staffing of the Program expanded steadily until the late 1980s, with particularly rapid growth occurring between 1978 and 1982 (Figure 1). Much of the growth was made possible by special project funding associated with the institutionalization of OFR in the 1980s in sub-Saharan Africa and Central America. As a result the Economics Program receives a high proportion of its total funding from extra-core sources (over 50%, compared to less than 20% for CIMMYT as a whole) (Table 3). As some of these specially funded projects came to an end in the late 1980s, the total budget and number of social scientists fell. Also the Program has begun to shift more resources toward research activities with less in training (Table 4). The Program has initiated a substantial decrease in the share of resources allocated to OFR, offset by a corresponding increase in resources devoted to varietal development and to work on research resource allocation and impacts (Table 5).

Currently the Program considers it essential to maintain four positions at headquarters and one in each major region (Latin America, Asia, and sub-Saharan Africa). Traditionally the majority of Economics staff were posted to regional or bilateral programs, reflecting the strong effort in support of national research programs. Most recent staff cuts have taken place in outreach, while headquarters staff have been somewhat strengthened through the appointment of PhD thesis fellows and postdoctoral fellows (Table 6). This shift places us in a better position to meet the needs of clients within CIMMYT.

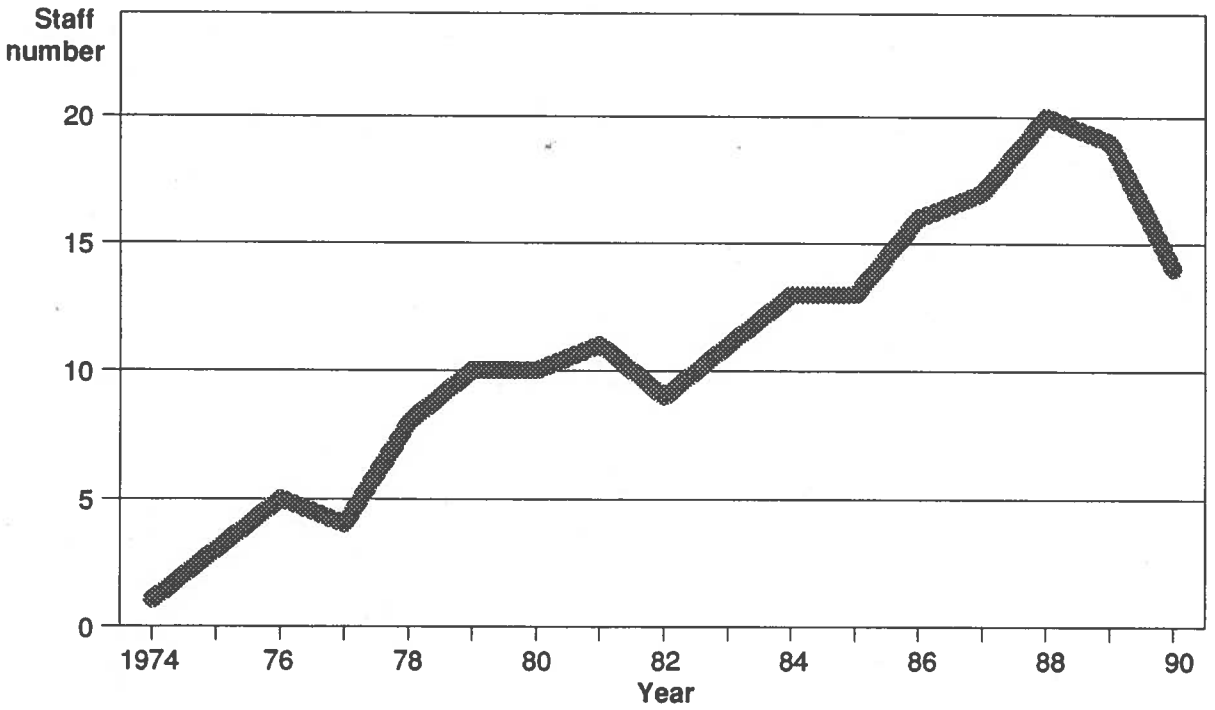

Figure 1. Economics Program staff, 1974-90.

Table 3. Economics Program funding, 1990

	Amount (US$ 000)	Percent
Core	968	34
Core restricted[a]	302	11
Special projects[b]	1,550	55
Total	2,820	100

a Swiss (SDC), Central America; Netherlands, on-farm research; France, maize-based cropping systems, Mexico.
b USAID, on-farm research training, Eastern and Southern Africa, and economists on research stations, Pakistan; CIDA, on-farm research, Haiti; Swiss (SDC), on-farm research, Central America; Rockefeller, Visiting Research Fellow, East Africa; France, on-farm research, Mexico.

Table 4. Past and projected percentage of time allocated to research and support for national programs by CIMMYT Economics Program

	Past allocation			Projected allocation
	Base staff 1987	Outreach staff 1987	All staff 1987	All staff 1994
Research	35	20	26	55
Support to national programs[a]	39	64	53	25
Other[b]	27	16	20	20
Total	100	100	100	100

a Training, information, and consulting.
b Administration and other.

Table 5. Changes in resource allocations in the CIMMYT Economics Program

Activity	Percentage resources allocated 1987	1994
1. Technology design, evaluation, and utilization		
1.1 On-farm research methods, including work on sustainability	75	25
1.2 Varietal development/breeding	3	25
1.3 Policy issues in technology utilization	10	5
2. Research resource allocation and research impacts		
2.1 Research resource allocation	5	10
2.2 Research impacts and returns to research	--	15
2.3 Distributional impacts of research on the poor	--	5
2.4 Science policy and private/public sector linkages in research	2	5
3. Commodity sector analysis	5	10
	100	100

Table 6. Changes in Economics Program staff at headquarters and in outreach, 1987-91

	HQ		Outreach		Total	
	1987	1991	1987	1991	1987	1991
International staff	4.0	3.0	9.0	5.0	13.0	8.0
Associate scientists	0.0	2.0	2.0	1.0	2.0	3.0
PhD thesis fellows	0.0	2.0	0.0	1.0	0.0	3.0
Research assistants (BS/MS)	1.5	2.5	3.0	1.0	4.5	3.5
Total professional staff	5.5	9.5	14.0	8.0	19.5	17.5

The time of headquarters staff is roughly equally divided between technology design and evaluation (especially varietal development work) and other activities (research resource allocation and impacts and commodity sector analysis). Outreach staff give greater weight to technology design and evaluation.

There is some specialization within the Program by commodity, with some economists having more detailed knowledge of either maize or wheat. Also, one position at headquarters (commodity sector analysis) is traditionally filled by an economist with a background in marketing or policy analysis. However, all staff members expect to rotate between headquarters and outreach and hence are required to have expertise in both commodities as well as the skills to work at the farm level. To date we have found that these arrangements work well, and we have no plans to move towards greater specialization.

Despite the shifts described above, the Program continues to study issues related to technology design, evaluation, and utilization, which are projected to absorb half of its total resources. Most of this work will continue the tradition of emphasizing a farmer perspective in agricultural research through micro-level studies, which will now be complemented by studies giving greater attention to longer term sustainability issues. Hence although the Program has diversified into a broader range of activities, its established strength for working on technological issues from the micro-level is being maintained.

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Appendix A
Economics Program Staff, 1991

Name	Post	Discipline	Citizenship	Year joined CIMMYT	Degree
Ponniah Anandajayasekeram	Regional Economist (Nairobi)	Agricultural economics	Australia	1982	PhD, University of Guelph
Daniel Buckles	Rockefeller Fellow (HQ)	Sociology	Canada	1990	PhD, Carleton University
Derek Byerlee	Director (HQ)	Agricultural economics	Australia	1977	PhD, Oregon State University
Larry Harrington	Regional Economist (Bangkok)	Agricultural economics	USA	1978	PhD, Michigan State University
Rashid Hassan	Rockefeller Fellow (Nairobi)	Agricultural economics	Sudan	1989	PhD, Iowa State University
Paul Heisey	Regional Economist (Lilongwe)	Agricultural economics	USA	1985	PhD, University of Wisconsin
Miguel López-Pereira	Associate Scientist (HQ)	Agricultural economics	Honduras	1990	PhD, Purdue University
Michael Morris	Macroeconomist (HQ)	Agricultural economics	USA	1987	PhD, Michigan State University
Wilfred Mwangi	Regional Economist (Addis Ababa)	Agricultural economics	Kenya	1987	PhD, Michigan State University
Gustavo Sain	Regional Economist (Costa Rica)	Agricultural economics	Argentina	1983	PhD, University of California, Davis
Robert Tripp	Assistant Director (HQ)	Anthropology	USA	1982	PhD, Columbia University

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Economics Program Staff, 1991

Name	Post	Discipline	Citizenship	Year joined CIMMYT	Degree
Laura Saad	Research Assistant	Economics	Mexico	1988	MS, Universidad Autónoma de México
Piedad Moya	Pre-doctoral Fellow	Economics	Philippines	1991	MS, University of Philippines
Vacant	Thesis Fellow	Economics		1991	
Dr. Mahmoud Mounier	Visiting Scientist	Maize agronomy	Egypt	1991	
Dr. A.A. Tolba	Visiting Scientist	Economics	Egypt	1991	
Dr. Habashy	Visiting Scientist	Economics	Egypt	1991	
A.R. El Tohami	Visiting Scientist	Wheat agronomy	Sudan	1991	
Vacant	Visiting Scientist	Economics	Sudan	1991	
Vacant	Visiting Scientist	Economics	Brazil	1991	
Vacant	Visiting Scientist	Economics	Paraguay	1991	
Vacant	Visiting Scientist	Economics	India	1991	

Appendix B
Topics for Commodity Subsector Studies

	Topics
1. **Production**	Trends in area, yield, input use by region. May include competing crops.
2. **Consumption**	Trends in utilization. May include competing staples.
3. **Trade**	Imports/exports.
4. **Prices**	Trends in prices of maize/wheat and inputs and changes in relative prices. Rough estimates of NPCs and EPCs.
5. **Summary of government policies**	Tariffs, subsidies, other major interventions.
6. **Marketing/processing**	Brief review of major issues (if any).
7. **Looking to the future**	Relate to world situation (if applicable).
8. **Maize/Wheat research resources**	Review current allocation by discipline, region, etc., in relation to projected needs.
	Data sources
1. **Secondary sources**	Official statistics, other published studies.
2. **Key informants**	Large traders or processors, research managers.