THIS IS CIMMYT

Contents

Summary

CIMMYT is a private, internationally funded, nonprofit scientific research and training organization. Headquarted in Mexico, CIMMYT is engaged in a worldwide research program for maize, wheat, and triticale, with emphasis on food production in developing countries.

Financing. CIMMYT is associated with the Consultative Group on International Agricultural Research (CGIAR), which is an informally organized group of more than 35 donor organizations, composed of governments international financial agencies and foundations, that supports international agricultural research focusing on the food production problems of the developing world.

Staff. CIMMYT employs approximately 700 people. Eighty of these are professional senior scientists and administrators representing 34 different nationalities. About 50 of the international senior scientists are stationed in Mexico and the reminder are posted to regional and national program assignments in Africa, Asia and Latin America.

Trustees

(as of February 1989)

Lucio Reca (Chairman), Argentina
Consultant
Argentina

Peter Day, England
Professor
Rutgers—The State University of New Jersey
USA

Seme Debela, Ethiopia
General Manager, Institute of Agricultural Research
Ethiopia

Jorge de la Vega Dominguez, Mexico*
Secretary of Agriculture and Water Resources (SARH)
Mexico

Donald N. Duvick, USA
Senior Vice President—Research
Pioneer Hi-Bred International
USA

Gao Liangzhi, China
President, Jiangsu Academy of Agricultural Sciences
China

Khem Singh Gill, India
Director of Research
Punjab Agricultural University
India

Ahmed Goueli, Egypt
Governor, Province of Damiett
Egypt

Ricardo Magnavaca, Brazil
Maize Breeder, Brazilian Agency for Agricultural Research (EMBRAPA)
Brazil

Burton C. Matthews, Canada
Professor, Department of Geography
Faculty of Environmental Studies
University of Waterloo
Canada

Joseph M. Menyonga, Cameroon
International Coordinator of the Semi-Arid Food Grain Research and Development Project (SAFGRAD)
Organization of African Unity (OAU)
Burkina Faso

W. Gerhard Pollmer, West Germany
Professor of Plant Breeding
University of Hohenheim
West Germany

James G. Ryan, Australia
Deputy Director, Australian Centre for International Agricultural Research (ACIAR)
Australia

Manuel Villa Issa, Mexico*
Chief Executive, National Institute of Forestry, Agriculture, and Livestock Research (INIFAP)
Mexico

Donald L. Winkelmann, U.S.A.*
Director General, CIMMYT
Mexico

Hikoyuki Yamaguchi, Japan
Professor, Laboratory of Radiation Genetics
University of Tokyo
Japan

* Ex-oficio position.

CGIAR-Supported Centers

CIMMYT is one of 13 CGIAR-supported international agricultural research centers (IARCs). The first IARC was established in 1960 and 12 others have subsequently been founded to provide agricultural research and training assistance to developing nations.

IRRI — The Philippines
International Rice Research Institute
Research on rice. Founded in 1960.

CIMMYT — Mexico
International Maize and Wheat Improvement Center
Research on maize, wheat, barley and triticale. Founded in 1966.

CIAT — Colombia
International Center for Tropical Agriculture
Research on farming systems for the tropics, with emphasis on beef, swine, cassava, field beans and rice. Founded in 1967.

IITA — Nigeria
International Institute of Tropical Agriculture
Research on farming systems for the humid tropics, including work on roots, tubers, food legumes, maize and rice. Founded in 1968.

CIP — Peru
International Potato Center
Research on potatoes. Founded in 1971.

WARDA — Côte d'Ivoire
West African Rice Development Association
Research on rice production in 15 West African countries. Founded in 1971.

ICRISAT — India
International Crops Research Institute for the Semi-Arid Tropics
Research on sorghum, millets, food legumes and farming systems for the semi-arid tropics. Founded in 1972.

ILRAD — Kenya
International Laboratory for Research on Animal Diseases
Research on diseases of African livestock. Founded in 1973.

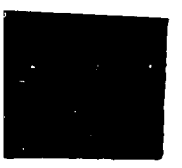
ILCA — Ethiopia
International Livestock Center for Africa
Research on African livestock production. Founded in 1973.

IBPGR — Italy
International Board for Plant Genetics Resources
Promotion of an international network of genetic resources centers to further the collection, conservation, documentation and use of plant germplasm. Founded in 1974.

IFPRI — USA
International Food Policy Research Institute
Research on world food problems and public policies to increase global food supplies and equity in distribution. Founded in 1975.

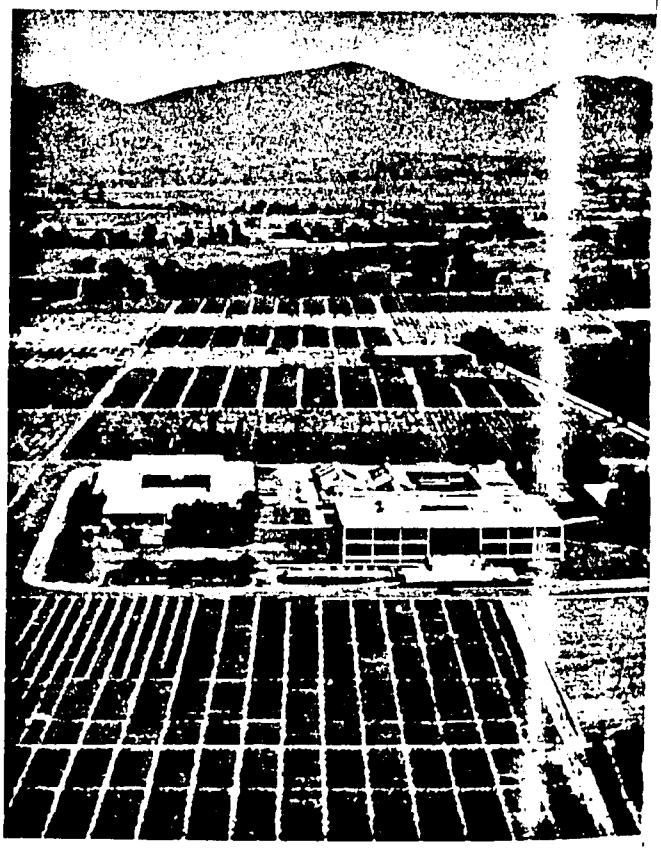
ICARDA — Syria
International Center for Agricultural Research in Dry Areas
Research on farming systems for dry areas, sheep husbandry and crop improvement for durum wheat, barley, lentils and broad beans. Founded in 1976.

ISNAR — The Netherlands
International Service for National Agricultural Research
Assistance to developing country governments to help strengthen national agricultural research institutions. Founded in 1980.



Introduction

CIMMYT is an outgrowth of an earlier collaborative research and training program that began in 1943 between the Rockefeller Foundation and the Mexican Ministry of Agriculture. In 1966, CIMMYT was established as a full-fledged international agricultural research center and charged with helping to raise cereal yields in the developing world.



CIMMYT Headquarter's building, El Batan, Mexico

To improve worldwide cereal yields rapidly and continuously:

- CIMMYT is engaged in crop improvement research on maize, bread wheat, durum wheat, triticale and barley. Each year, breeders make tens of thousands of new plant crosses in pursuit of genetic material with higher yield potential, broader adaptation, increased disease and insect resistance, greater tolerance to environmental stresses and higher nutritional quality. CIMMYT acts as the hub of several international networks for germplasm exchange and testing involving crop scientists in more than 125 countries.

- CIMMYT develops research procedures for conducting more effective crop improvement and production research programs.

- CIMMYT offers a broad range of training and professional advancement opportunities in Mexico for scientists and technicians from collaborating national agricultural research organizations. Training is also conducted outside Mexico through participation in regional workshops and national in-country training programs.

- CIMMYT helps developing nations to organize maize and wheat research programs through collaboration and consultation in national crop improvement and crop management research. Roughly 50 percent of CIMMYT's senior scientists are posted to regional and national program assignments outside Mexico.

- CIMMYT generates and distributes information to developing country scientists and others involved in crop improvement and production.

Maize Research

The world maize crop is generally considered to be the third largest cereal crop after wheat and rice. Approximately 60 percent of total annual world production is harvested in temperate climate countries in the northern hemisphere. Most of this grain is used for animal feed.

Although CIMMYT cooperates with scientists in national programs of temperate climate countries, most of the Center's efforts are concerned with the production problems of developing countries having tropical and subtropical climates. This encompasses most of the world's maize area and, in general, the area where average yields are the lowest. This area also includes the bulk of the world's population who consume maize directly.

CIMMYT emphasizes the improvement of maize populations for a wide range of production circumstances and consumer preferences. In its maize improvement system, the development of open-pollinated varieties is emphasized. Considering the circumstances of most maize farmers in the developing world and the weaknesses in seed production and distribution systems in many developing countries, this research focus is believed to be the most expedient. CIMMYT's maize populations have been used to great benefit, however, in hybrid maize breeding efforts by collaborating countries with hybrid development programs. Today, there are approximately 5 million hectares in the developing world planted to maize varieties and hybrids that carry CIMMYT-developed germplasm in their parentage.

CIMMYT emphasizes the improvement of maize populations for a wide range of production circumstances and consumer preferences.

Maize Germplasm Development

CIMMYT has developed a range of broad-based gene pools and populations to serve the major maize-producing areas of the developing world. International testing plays a major role in CIMMYT maize improvement activities. International Testing occurs at several stages of development, but only after materials are judged capable of offering superior germplasm to developing country national program collaborators.

National program collaborators in more than 90 countries play a key partnership role in the development of experimental varieties and hybrids extracted from the various CIMMYT maize populations. Their on-site selections of superior families from the different populations included each year in the international testing program form the basis for developing future experimental varieties and hybrids.

CIMMYT has made a major research effort to increase the grain yield efficiency of the tropical maize plant. The aim has been to change the harvest index of tropical maize so that it more closely approaches that of the higher-yielding temperate zone maize materials. Through a procedure of recurrent selection for shorter and more manageable plant types, most of CIMMYT's tropical and subtropical materials have been reduced 1-2 meters in height and now have more grain-efficient harvest indices.

Considerable research emphasis is given to the development of maize germplasm with reliable field resistance to the major diseases and insects affecting production in the developing world. Scientists are also working to improve the overall tolerance of tropical and subtropical maize to environmental stress situations, such as those caused by moisture and temperature extremes.

Developing countries normally producing maize on more than 50,000 hectares

CIMMYT is also engaged in a longer-term maize research project to cross related genera to maize. The objective is to introduce genes that will further improve the yield dependability of maize under disease, insect and agroclimatic stress situations. Maize is presently being crossed to *Tripsacum*, a wild relative. Success in this research endeavor can speed CIMMYT's efforts to achieve higher levels of yield dependability in its tropical and subtropical maize germplasm.

CIMMYT has also sought to improve the nutritional quality of maize without sacrificing yield potential. Through the use of the mutant gene, opaque-2, the protein quality of ordinary maize has been doubled, a potentially important contribution to improved nutrition in protein-deficient countries. The problems originally associated with opaque-2 maize, such as the dull, chalky kernel appearance, reduced yield potential, and vulnerability to ear rots and stored-grain pests, have been largely overcome. CIMMYT now has a number of high-yielding quality protein maize varieties that look and taste like normal maize and yet have twice the level of nutritional quality.

Crop Management Research

CIMMYT's maize agronomists have concentrated their work on the development of a research framework that will allow for the development of more appropriate production technologies, especially for small, resource-poor farmers. On-farm research procedures are heavily emphasized in the CIMMYT research model as an effective way of developing and testing new technological alternatives. In recent years, agronomic research on minimum tillage production systems has been emphasized.

On-farm research procedures are heavily emphasized by CIMMYT as an effective way of developing and testing new technological alternatives.

Wheat Research

The world wheat crop provides more than one-quarter of the total world cereal grains and constitutes the main source of calories for over 1.5 billion people. Of the major cereal grains grown in the developing world, wheat has experienced the fastest production growth rate over the last two decades. An important reason for wheat's leading production performance has been the release of hundreds of high-yielding semidwarf wheat varieties by more than 50 developing countries. At least 45 million hectares of developing country wheat area and 15 million hectares in developed countries are planted to improved wheat varieties carrying CIMMYT germplasm in their parentage.

CIMMYT's Wheat Improvement Program has expanded its scope over the last two decades to include research on bread wheat, durum wheat, triticale and barley. Plant breeding work has broadened from an original emphasis on the development of semidwarf varieties—largely for irrigated production conditions—toward a greater consideration of the production problems inherent in more precarious rainfed farming environments. Considerable effort has also been directed toward production agronomy and crop management issues. Several special germplasm development projects, including a wide cross research program, are also under way to further improve the yield dependability of CIMMYT's wheat germplasm.

At least 35 million hectares of developing country wheat area are planted to improved wheat varieties carrying CIMMYT germplasm in their parentage.

Germplasm Development

The Wheat Program's central breeding objective is to develop widely adapted, management responsive germplasm for worldwide distribution, with major emphasis on the developing world. To develop improved germplasm for these wide-ranging production conditions, breeding materials are evaluated each year in Mexico at several research sites with markedly constrasting environments. By shuttling materials between very different production areas in Mexico, and later to hundreds of other locations worldwide through the international nursery program, CIMMYT has been able to develop germplasm with good adaptation between 35° N and 35° S latitude.

Bread Wheat—Bread wheat covers about 90 percent of the world wheat area and accounts for about 95 percent of production. Two major wheat gene pools have evolved: spring-habit and winter-habit. Spring wheats have a continuous growth cycle, generally requiring 3 to 6 months. Winter wheats, by contrast, are sown in the autumn but pass through a dormant stage during the cold winter. The plants resume rapid growth in the spring and mature in summer after a total growing period of 9 to 11 months. Although CIMMYT draws on germplasm from both of these two major gene pools, work focuses primarily on improving spring-habit wheat, the species most commonly grown in the developing world.

CIMMYT currently distributes a broad range of high-yielding bread wheat germplasm. These materials possess good milling and baking characteristics and carry resistance to many of the major diseases found in the principal production areas. The successful introduction of numerous varieties based on CIMMYT materials indicates the broad suitability of the germplasm. In recent years, attention has been given to developing high-yielding bread wheat germplasm with better adaptation to problem soils (such as acidic soils high in soluble aluminum), dry conditions, and heat and cold temperature stresses.

Developing countries normally producing wheat on more than 50,000 hectares

Reduction in the disease susceptibility of CIMMYT's bread wheat germplasm continues to figure prominently in the research program. Particular attention is paid to the rust diseases—leaf, stem and stripe—which still constitute the major disease threats to dependable yields in much of the developing world. The incorporation of greater resistance to a number of other foliar disease problems is also under way.

More attention is also being paid to developing a broader range of earlier-maturing bread wheat germplasm. Such materials are desirable in certain areas, either because of a need for cropping intensification or a short growing season. This research thrust is tied, in part, to CIMMYT's efforts to develop suitable wheat varieties for the warmer subtropical areas where disease problems and a short growing season have so far limited the potential for wheat production.

Durum Wheat—Durum wheat is principally used for making pasta products and certain types of unleavened bread. This species is grown on about 30 million hectares worldwide, with roughly 11 million hectares located in developing countries (principally rainfed production areas in the Mediterranean Basin countries of North Africa and the Middle East, India, Argentina and Chile).

Most of CIMMYT's crop management research in wheat and triticale is carried out through regional and national programs through a growing number of cooperative research efforts.

Yields of CIMMYT's best durum materials have increased markedly over the last decade and now are equal in yield potential to CIMMYT's best bread wheats. Durum varieties carrying CIMMYT germplasm are being grown throughout the Mediterranean Basin countries and in Latin America. These varieties have high yield potential, good industrial quality and relatively broad adaptation. CIMMYT's major durum improvement objective is to develop higher levels of resistance to a number of foliar diseases, especially stem rust and *Septoria* spp. Efforts are also under way to increase the tolerance of CIMMYT's durum materials to the drought and temperature stresses that often affect commercial yields.

Triticale—Triticale is a cross between two different genera, wheat and rye. Like the mule, which is also a wide cross, triticale was

originally sterile, but its fertility has now been restored by plant breeders. CIMMYT's progress over the last two decades in developing high-yielding triticale cultivars has been a remarkable research achievement. The yield potential of CIMMYT's triticale materials has doubled over the past 15 years and is now at a par with the best bread wheat materials. Triticale is not intended to replace wheat except where it has a productive advantage. On very acid soils, such as those found in the lower ranges of the Himalayas, the highlands of East Africa and the *campos cerrados* of Brazil, triticales frequently yield up to twice as much as the best bread wheats.

Triticale is on the verge of commercial acceptance in several developed countries, where approximately 800,000 hectares are now cultivated. Nearly a dozen developing countries are becoming increasingly involved in national triticale research and production programs, and CIMMYT expects this crop to take its place among the cereals grown in the developing world during the 1980s.

Wide Cross Research—CIMMYT's first major involvement in wide crosses was with triticale, a hybrid of wheat and rye. Crosses of bread wheat and durum wheat have also been made to transfer disease resistance and other characteristics from one species to another. New wide crosses are being made with several grass species (*Elymus, Agropyron, Aegilops*).

CIMMYT's principal aim in this work is not to develop new crops, such as triticale, but to transfer genes into wheat for greater resistance to leaf-spotting diseases as well as tolerance to environmental extremes, such as soil salinity. Exciting progress is being made in this work.

Crop Management Research

Most of CIMMYT's crop management research in wheat, triticale and barley is carried out through regional and national programs where a growing number of cooperative programs are under way. Some crop management research, however, is also conducted in Mexico. Agronomists stationed at headquarters are involved in research related to the management of the CIMMYT breeding nurseries grown in Mexico. They are also working with CIMMYT breeders to develop crop improvement procedures that will speed up development of germplasm with greater tolerance to environmental stresses.

Economics Research

Through their research and training activities, CIMMYT economists contribute to the Center's efforts to help developing nations produce and disseminate improved technologies for maize, wheat, triticale and barley. By working with economists, biological scientists and policy makers from developing countries, CIMMYT economists are helping to make crop technologies and agricultural policy more consistent with farmer circumstances. Interdisciplinary research procedures have been designed that ensure the development of agricultural production technologies well-adapted to farmer circumstances, especially those of the small farmer.

The procedures developed feature on-farm research involving farmers, biological scientists and social scientists. They are synthesized from experiences gained alongside colleagues in many national programs. A hallmark is the emphasis given to integrating the interactions among the enterprises of a cropping system in developing improved technologies for a given enterprise. The program procedures are designed to assist in the identification of relevant solutions to important farmer problems and in establishing priorities among competing lines of research. These procedures are increasingly used by cooperating national programs.

CIMMYT economists are helping to make crop technologies and agricultural policy more consistent with farmer circumstances.

The program is working to refine the techniques and to develop formats and materials for training others in their use. Currently, special emphasis is being given to in-country training undertaken through the program's regional staff and in conjunction with maize and wheat staff.

In addition to their participation in national on-farm research programs, the economics staff carry on a continuing program to monitor and analyze important global trends in cereal production, utilization and trade related to the CIMMYT crops. Data bases are being developed regarding these trends. Work is also under way to develop more systematic categorizations of maize and wheat production environments and major production problems.

Finally, the program is currently engaged in framing techniques for analyzing natural and economic advantages in the production of a given crop. In the hands of national program colleagues, these procedures will aid in analysis for decision making on research resources allocation. The procedures will also assist CIMMYT in answering its own internal resource allocation questions.

The on-farm research procedures avocated at CIMMYT are designed to ensure the development of agricultural production technologies well-adapted to farmer circumstances, especially those of the small farmer.

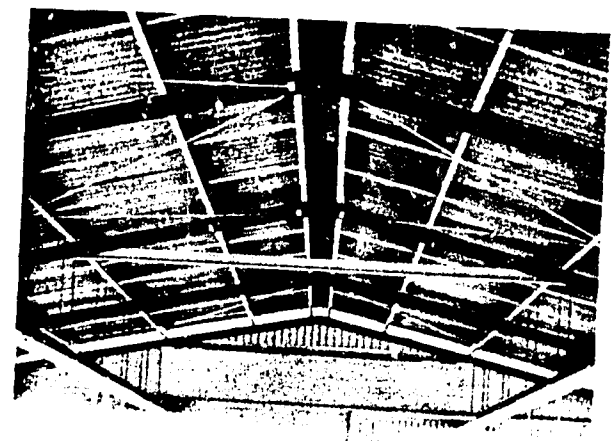
CIMMYT economists share their interdisciplinary research experiences (1) through collaborative research projects with national programs, (2) via active training programs in Mexico and in national programs, and (3) through publications and participation in selected workshops and conferences.

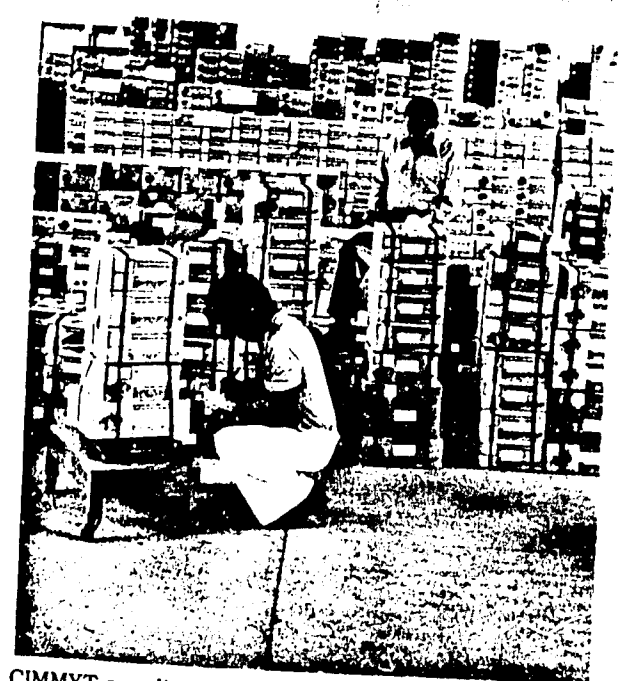
Initially, all CIMMYT economists were based in Mexico and travelled to developing countries for consultation and to foster collaborative research. As the number of requests and collaborating countries grew, CIMMYT economists were posted to regional assignments in the major developing country maize and wheat production areas.

International Germplasm Testing

CIMMYT has been a pioneer in the establishment of international germplasm sharing and testing networks which opened a modern era in plant breeding. International testing ushered in a new willingness by individual breeders to share advanced generation un-named lines as well as early-generation materials with each other. This, in turn, accelerated the introduction of materials with genetic variability into national breeding programs. It has become accepted policy that any material distributed in CIMMYT's international testing programs can be used by collaborating scientists for breeding purposes or commercial release, provided that the source of the material is acknowledged.

Today, CIMMYT coordinates the largest and most extensive germplasm testing networks of any international agricultural research institute in the world. Approximately 600 scientists from more than 125 countries request and grow CIMMYT trials and nurseries annually. Each international testing trial or nursery consists of identical sets of experimental lines or populations that are grown throughout the world.



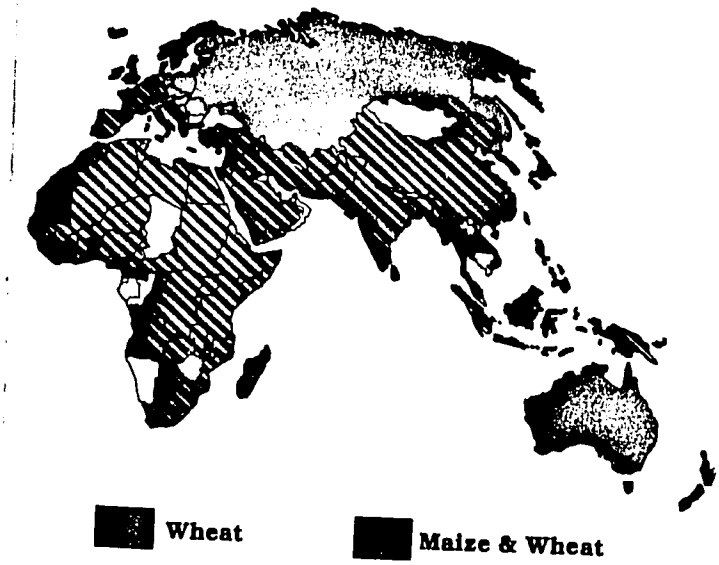


CIMMYT coordinates some of the largest germplasm testing networks of any international agricultural research institute in the world.

Cooperators growing the CIMMYT-distributed nurseries and trials follow uniform procedures and compare these materials with the best locally recommended varieties. National programs are free to use the germplasm directly as recommended varieties or as parental material in their own national cereal crop improvement programs. Data collected from the 2,500 nurseries and trials distributed each year are returned to the Center for analysis. Nursery results are published and sent back to the network of cooperating scientists and other interested parties.

CIMMYT's international testing programs provide cooperators with a low-cost mechanism to observe the adaptation of their own commercial varieties, new lines and other genetic materials under widely differing production conditions. These programs also encourage and facilitate the sharing of valuable genetic material among crop researchers throughout the world. This continual flow of genetic variability has been a key factor in the germplasm successes achieved by international network collaborators over the past two decades.

Countries participating in CIMMYT's international germplasm testing networks



Training at CIMMYT

CIMMYT offers a number of formal training programs and a range of other professional improvement experiences to agricultural scientists and production specialists concerned with maize and wheat production in the developing world.

In-Service Training. Course participants are generally young researchers and production specialists (generally 22 to 35 years old) from developing country national crop research and production programs. Courses are offered in crop management, crop improvement, pathology, economics, laboratory sciences and experiment station management, with most in-service training courses lasting a full crop cycle. Emphasis is given to gaining hands-on experience by working in on-going CIMMYT research programs. Approximately 120-150 individuals complete in-service training each year; more than 1,500 individuals from 81 countries have participated in in-service training at CIMMYT since 1966.

Predoctoral Fellowships. A few opportunities to conduct thesis research at CIMMYT are extended to graduate students in agriculture who have completed coursework and preliminary examinations for Ph.D degrees. CIMMYT may provide germplasm and/or data as well as research support and supervision during the fellowship period. Candidates generally come from developing countries.

In CIMMYT's training programs, emphasis is given to providing trainees with hands-on experience by working in the on-going research programs.

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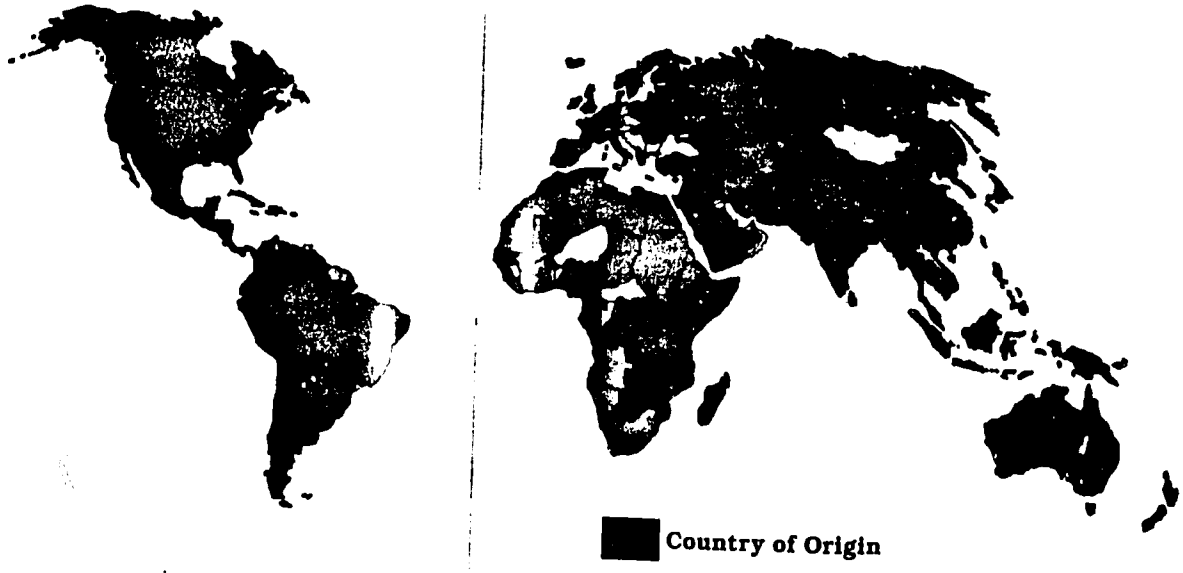
Postdoctoral Fellowships. CIMMYT invites promising recent Ph.Ds in crop research and production to spend from one to two years in Mexico as junior scientific staff members, collaborating with CIMMYT senior scientists in all phases of their research and training programs. CIMMYT limits the number of postdoctoral fellows in residence at any one time to fewer than twenty.

Visiting Senior Scientists. Travel fellowships are provided to senior-level national scientists to spend from two weeks to six months at CIMMYT. While in residence, visiting scientists engage in joint research and routine program work with CIMMYT staff.

Associate Scientists. Most associate scientists at CIMMYT are permanently employed at another organization and are assigned to CIMMYT to contribute specific forms of expertise. This designation is used to describe a longer-term visiting scientist or consultant who generally works within an ongoing research or training program for 6 months to two years.

In-Country Training. CIMMYT staff are also engaged in training activities outside Mexico. This involvement includes participation in regional and national workshops and in national in-service training programs. CIMMYT's outreach staff are especially involved in these training activities, usually in close collaboration with national scientists who are alumni of CIMMYT's training programs in Mexico.

CIMMYT in-service trainees and visiting scientists, 1966-83

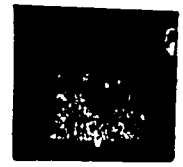


Regional Programs

Roughly 50 percent of CIMMYT's senior scientific staff are stationed in regional program assignments that geographically cover over 90 developing countries. Regional programs have developed as CIMMYT's approach to forging stronger and more effective links with national collaborators. Regional groupings generally consist of neighboring countries where maize or wheat is a major crop, grown under similar climatic conditions, encountering similar diseases and insects, and therefore benefitting from continuous exchange of technology and germplasm within the region.

Regional program staff have important crop improvement and production research responsibilities whenever their particular region, due to its location, has a comparative advantage in carrying out the necessary research. Such research projects are conducted in direct collaboration with national scientists in each area. A number of CIMMYT's international disease-related research efforts have been shifted to regional bases located in disease "hot spot" areas. Research responsibilities in such regions include the development of suitable germplasm as well as the preparation and distribution of regional or international trials and nurseries to national collaborators in affected areas throughout the world.

Roughly 50 percent of CIMMYT's senior scientific staff are stationed in regional program assignments that geographically cover more than 90 developing countries.



Typically, regional program staff will help sponsor periodic workshops for area scientists, circulate international as well as more regionally targeted nurseries, facilitate the exchange of research data, arrange exchange visits among local scientists, offer increased training opportunities for national scientists and improve CIMMYT's consulting services in the region. Issues of special concern to individual regions are emphasized in each regional program.

In several instances, CIMMYT's regional programs are also conducted in collaboration with sister international institutes. A regional wheat program is headquartered at ICARDA as part of a cooperative effort to serve national small grains breeding programs in the region. The West African regional maize research program on streak virus resistance is conducted in collaboration with IITA. CIMMYT's Andean regional maize program also has collaborative ties with CIAT.

Given the area-specific nature of many agronomic problems, most of CIMMYT's efforts in crop management research are carried out under regional or national program auspices. CIMMYT's outposted staff work closely with national program scientists in studies related to maize and wheat production technologies. Most of these collaborative crop management research projects are carried out directly in farmers' fields, which CIMMYT believes to be an important component in the development of more appropriate production technologies for farmers. Studies focus on soil fertility, weed control, water management and farm-level evaluations of germplasm within actual production systems.

CIMMYT Regional Programs	Number of Cooperating Countries	Program Staff
Central America, Caribbean and Mexico	13	Maize Economics
Andean Countries of South America	5	Maize Wheat
Southern Cone of South America	5	Wheat
West Africa	13	Maize
North and West Africa and Iberian Peninsula	19	Wheat
Eastern and Southern Africa	17	Maize Wheat Economics
ICARDA	11	Wheat
Mideast	9	Maize
South and Southeast Asia	12	Maize Wheat Economics

National Program Assignments

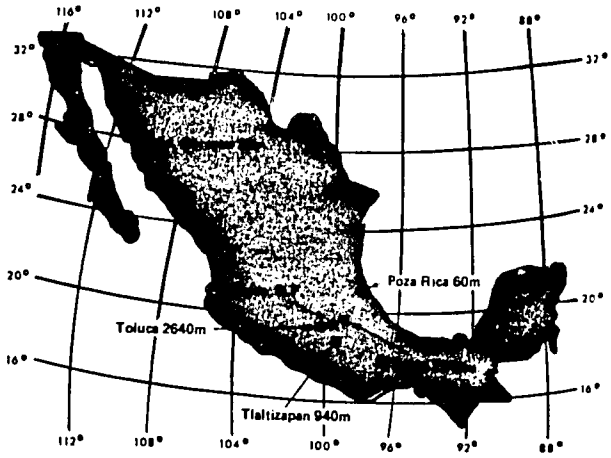
Some CIMMYT staff are also stationed directly within national research programs when a government requests them and when extra-core funding covers the cost. Such assignments are usually for a 3-5 year period and generally occur during the more formative stages in the development of a national program. When the CIMMYT staff assigned to a national program are withdrawn, regionally assigned staff help provide continuity in CIMMYT's support to the national program.

Facilities in Mexico

Experiment Stations

CIMMYT works primarily on five experiment stations in Mexico. Four are operated by CIMMYT and one is controlled by Mexico's National Institute for Agricultural Research (INIA). CIMMYT is also allowed access to several other INIA stations for specific disease and other stress-related research. These Mexican stations range in elevation from sea level to 2,640 meters. Because of the wide range in temperature, moisture and radiation at the different locations, CIMMYT can expose its experimental germplasm to environmental conditions similar to many of the major climates, diseases and insects that exist in the developing world.

Location and elevations of principal stations in Mexico at which CIMMYT conducts research (■ CIANO station of the Instituto Nacional de Investigaciones Agricolas).



El Batan is the site of CIMMYT's headquarters and is one of the highland research stations. The average temperature is 15°C and the average rainfall is 625 mm. The wet season is from May to September; the rest of the year is mostly dry. The growing season is from April to December. Soils are clay loams of lake bottom origin. Soil pH ranges from 6.8 to 7.8.

CIANO, administered by INIA and located 1,800 km from El Batan in northwest Mexico, is the main research station used by the cooperative CIMMYT-INIA Wheat Improvement Program. CIANO has an average temperature of 23°C and is located in a major irrigated production area (average rainfall is 330 mm). The Wheat Program's primary cropping season is from November to May. Soils are brown clay loams and soil pH is approximately 7.5.

Station and Closest City	Hectares Used by CIMMYT		Crop Season
El Batan-CIMMYT	31	(maize)	Apr-Dec
(Texcoco 4km)	33	(wheat*)	May-Nov
CIANO-INIA	150	(wheat*)	Nov-May
(Cd. Obregon, 8km)		(maize)	Jun-Dec
Toluca-CIMMYT	45	(wheat*)	May-Nov
(Toluca, 27km)	5	(wheat*)	Dec-May
	14	(maize)	Apr-Dec
Poza Rica-CIMMYT	41	(maize)	Dec-May
(Poza Rica, 10km)			Jun-Nov
Tlaltizapan-CIMMYT	31	(maize)	Dec-May
(Cuernavaca, 47km)			Jun-Dec

*Includes triticale

Toluca is situated in a high, humid, inter-mountain valley where conditions are ideal for the development of foliar diseases. The station has an average temperature of 12°C and an average rainfall of 717 mm. The wet season is from May to September; the rest of the year is dry. Plantings of wheat, triticale, barley and maize begin in April and are harvested by December. Soils are silty clay loam of volcanic origin, and are light greyish in color. The pH ranges from 5.9 to 6.8.

Poza Rica is the primary tropical research station used by the maize program. It is located in a climatic zone conducive to the development of widely adapted varieties for the lowland tropics of the world. The area has an average temperature of 24°C and 1,200 mm of rainfall. The wet season is from June to November, but rain occurs during the other months, being fairly well distributed. CIMMYT uses two cropping seasons: November to April, and May to October. Soils are sandy loams from recent river deposits, very light brown or beige in color. There is a calcareous condition in the river water that affects the soil pH, which ranges from 7.8 to 8.1.

Tlaltizapan is an intermediate altitude station for the maize program whose environment permits materials from around the world to be grown. The temperature averages 23°C and average rainfall is 946 mm per year. The wet season is from June to September;the rest of the year is dry. Soils are calcareous clay of varying depth over a limestone rock pan, dark brown to dark grey in color, with white chalky particles. They have a high moisture-holding capacity, and the pH ranges from 8.0 to 8.4.

Laboratories

CIMMYT has access to laboratory facilities at headquarters at El Batan as well as at CIANO in northwest Mexico. The laboratory facilities located at El Batan include:

Protein Quality Laboratory—staff chemically evaluate the protein content and amino acid balance of genetic materials to help breeders select lines with good nutritional value. Their major activity involves protein evaluations of germplasm from CIMMYT's quality protein maize research project.

Milling and Baking Laboratory—staff test and evaluate early generation breeding material for various quality characteristics, such as gluten strength and pigment content. For advanced generations, more complete evaluations are made, including baking or spaghetti processing tests.

Cytology Laboratory—staff support CIMMYT's wide cross research involving wheat and maize. The laboratory has the standard cytological equipment necessary for chromosome studies, as well as facilities for embryo and tissue culture work.

Pathology Laboratory—staff increase maize and wheat pathogens for artificial field inoculations of breeding material, evaluate new techniques for mass inoculation of breeding materials in the field and greenhouse, and monitor changes in the principal races of rust pathogens found in Mexico.

Soils and Plant Nutrition Laboratory— staff provide information on the characteristics and fertility of the soils used in experiments and carry out special laboratory mass screening procedures to identify germplasm with tolerance to soil toxicities such as high levels of soluble aluminum.

Insect Mass-Rearing Laboratory— equipped with 12 chambers with controlled temperature and humidity for incubating insect eggs and allowing larvae development and oviposition. Millions of larvae are produced for field infestations of maize materials for selection of resistant plants.

Physiology/Agronomy Laboratory— equipped for studies on the growth and yield characteristics of different germplasm under development at CIMMYT.

Greenhouse Facility Laboratory— principally used for rust identification and screening and for propagation of materials coming from the wide cross research programs.

Data Processing

CIMMYT's data processing service unit relies on a powerful, multi-terminal VAX 780/11 computer to serve the various research, research support, training and administrative programs of the Center. Major activities include:

(1) the processing of data from the international testing programs, (2) producing field books and tags for the wheat program nurseries, (3) analyses of agronomic and economic data, (4) development and maintenance of various data bases, and (5) processing activities for the administrative and information services programs.

Technical Library

CIMMYT's technical library contains information mainly related to the crops on which CIMMYT works. The journal collection is especially complete. Interlibrary cooperative arrangements exist with Mexico's National Agricultural Library as well as with several other major agricultural libraries around the world. Access to computerized scientific information data bases is also provided through cooperative arrangements with other organizations.

Training, Conference and Housing Facilities

The headquarters physical plant includes a 150-person auditorium, smaller conference rooms, a 60-room dormitory, various recreational installations, a cafeteria, visiting scientist accommodations and 30 apartments for individuals and families on fixed-term assignments at CIMMYT.

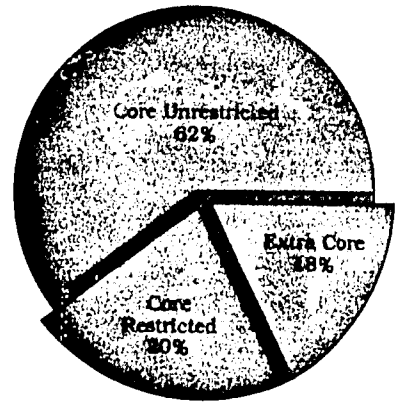
Financial Summary

Over 95 percent of CIMMYT's revenues are in the form of donations and grants from the following donors:

Australia	Ireland
Austria	Italy
Belgium	Japan
Brazil	Mexico
Canada	The Netherlands
China	Norway
Denmark	OPEC Fund for International Development
European Economic Commission	The Philippines
Finland	Rockefeller Foundation
Federal Republic of Germany	Spain
Ford Foundation	Switzerland
France	United Kingdom
India	United Nations Development Programme
Inter-American Development Bank	United States of America
International Development Research Centre	World Bank

These grants are used to support two types of CIMMYT programs: core and extra core. Core programs must fall within the CIMMYT mandate and be approved by the Center's Board of Trustees and the CGIAR, whose members provide CIMMYT with its funding. These programs are divided into two groups: unrestricted and restricted. Unrestricted grants come with only the requirement that the funds be used to support core activities. Core-restricted grants also support core activities but they must be used for an activity mutually agreed upon by CIMMYT and the donor.

Extra-core programs also must fall within CIMMYT's mandate and must be approved by the Board of Trustees. Although extra-core programs fall outside of any direct funding through the CGIAR, they comprise related activities and are generally of four types: 1) direct assistance, e.g., staff assignment, 2) specialized or advanced degree training, 3) collaborative research arrangements, and 4) special exploratory research activities. Coordination of this type of funding is done directly between CIMMYT and the individual donor. The distribution of revenues is shown below.



These revenues are used to fund CIMMYT's direct research and research support programs, conferences and training, information services, general administration and physical plant operations. The cost distribution of these activities is shown below.