The International Maize and Wheat Improvement Center (CIMMYT) is an internationally funded, nonprofit scientific research and training organization. Headquartered in Mexico, CIMMYT is engaged in a worldwide research program for maize, wheat and triticale, with emphasis on food production in developing countries. CIMMYT is one of 13 nonprofit international agricultural research and training centers supported by the Consultative Group for International Agricultural Research (CGIAR). The CGIAR is sponsored by the Food and Agriculture Organization (FAO) of the United Nations, the International Bank for Reconstruction and Development (World Bank), and the United Nations Development Programme (UNDP). The CGIAR consists of 40 donor countries, international and regional organizations, and private foundations.

CIMMYT receives support through the CGIAR from a number of sources, including the international aid agencies of Australia, Brazil, Canada, China, Denmark, Federal Republic of Germany, France, India, Ireland, Italy, Japan, Mexico, the Netherlands, Norway, the Philippines, Spain, Switzerland, United Kingdom and the USA, and from the European Economic Commission, Ford Foundation, Inter-American Development Bank, International Bank for Reconstruction and Development, International Development Research Centre, OPEC Fund for International Development, Rockefeller Foundation, and the United Nations Development Programme. Responsibility for this publication rests solely with CIMMYT.

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About CIMMYT

The International Maize and Wheat Improvement Center (CIMMYT) is a non-profit agricultural research institution dedicated to supporting and complementing the agricultural research efforts of developing countries. The Center’s main purpose is to help increase the quantity, quality, and dependability of maize, wheat and triticale production. CIMMYT’s mandate is global; the center cooperates with virtually every maize- and wheat-producing country in the world. Nearly 50 percent of CIMMYT’s international staff are posted in developing countries other than Mexico, and CIMMYT’s headquarters, located 45 kilometers northeast of Mexico City, serves as the hub for many of the Center’s activities.

CIMMYT currently receives funds from various sources. The international aid agencies of 19 different governments, as well as a number of international development agencies and private foundations, contribute to the Center’s funding.
CIMMYT Training Programs

Training is a major activity at CIMMYT. The principal objective of the Center's various training programs is to increase the professional expertise of agricultural research personnel in developing countries. After completing their courses of study, CIMMYT trainees are better equipped to meet the challenge of further improving their home countries' capabilities for agricultural research and food production.

CIMMYT can hope to train only a fraction of the thousands of agricultural specialists needed by national crop programs. Therefore, CIMMYT attempts to reach those candidates who demonstrate leadership ability and who are potential future research leaders in national programs. Agricultural personnel from developing countries often spend one crop cycle in Mexico fully participating in CIMMYT's research programs. The Center's training philosophy stresses practical and applied skills directed toward increasing the level and dependability of crop yields.

Most of the time, the fields are the trainees' classrooms.
Training Objectives

• To reinforce the trainees' research motivation (in the context of an interdisciplinary, team approach) to identify and help overcome factors limiting productivity and farm income.

• To increase the trainees' technical knowledge and skills in crop improvement and production research, including a greater sensitivity toward the factors affecting farmers' decisions in the adoption of new technologies.
• To help trainees identify, under field conditions, the more common plant diseases, pests, and nutrient and physiological disorders, and to develop the knowledge needed to prevent or correct these conditions.

• To teach trainees the principles and steps involved in selecting research objectives, and in the design, layout, management, analysis, interpretation, and reporting of field experiments.

• To teach trainees procedures for developing production recommendations suitable for farmers.
Training Categories

In-Service Trainees
Participants in the in-service training courses constitute the largest group of trainees at CIMMYT. These are outstanding young scientists or technicians associated with national crop improvement programs from developing countries all over the world. (For information on qualifications and the nomination and selection process, see page 9).

Predoctoral Fellows
A limited number of degree candidates spend 12 to 18 months at the Center, working on their thesis research under the supervision of CIMMYT senior scientists. About 50 percent of
these predoctoral trainees come from developing countries, planning to return to their home countries after completing their graduate work.

**Postdoctoral Fellows**
CIMMYT also works with a number of promising postdoctoral fellows who generally spend two years at the Center as working scientists. These young scientists play active roles in all phases of CIMMYT's research and training programs.

**Visiting and Associate Scientists**
A considerable number of scientists, both from developed and developing countries, come to Mexico to work with the CIMMYT staff on specific research projects of mutual interest and practical importance. Visiting scientists, often representing their countries' national crop improvement programs, may spend from one week to one year at the Center, depending on the nature of their research project. Associate scientists spend from one to two years at CIMMYT, updating their skills while lending their expertise to the day-to-day functions of a specific program.

**Short-Term Visitors**
In addition to scientists, CIMMYT frequently welcomes agricultural policy-makers and administrators from developing and developed countries who visit for a few days to observe first-hand CIMMYT's research activities.

Recent graduates from studies in agriculture work closely with CIMMYT scientists in the field.
In-service training candidates must be recommended by their employers. CIMMYT's acceptance of recommended candidates is based upon a review of appropriate documents and a personal interview either with a CIMMYT staff member or an individual designated to act in the Center's name.

Qualifications
Candidates for the CIMMYT in-service training programs should have the following qualifications:

- Academic training to at least the Bachelor of Science level, or the equivalent.
- Command of either English or Spanish (CIMMYT's official languages).
- Employment with a public or private institution, working in research or in related regional or national programs for the improvement of maize or wheat production.
• Permission to attend from their employers, both to ensure continued payment of trainees' salaries and to guarantee their employment after training.

• Preferably be under 35 years of age.

• Be of excellent physical and mental health.

Financial Information
Scholarships to CIMMYT’s in-service training programs may be provided by the employers of prospective trainees, by national or international agencies or institutions, or by CIMMYT itself. While in Mexico, trainees receive a stipend for room, board and incidental expenses. Local travel, medical insurance, supplies and materials also are provided. CIMMYT will provide registration forms, as well as detailed information as to the costs involved in administering scholarships, to institutions interested in sponsoring candidates.
Maize Training

Approximately 30 trainees participate in each of two in-service maize training cycles conducted annually at CIMMYT. The training categories described here primarily serve to structure the trainees’ schedules and thus focus on broad research and production issues. Most maize trainees focus on production agronomy research studies, with maize improvement next in size. Protein evaluation and experiment station management studies are tailored for on-the-job experience, and trainees work alongside CIMMYT staff in their everyday research activities. All trainees, however, are involved in portions of the production research study schedule; each spends some time in on-farm research and on field trips.
Production Agronomy Research
Trainees focusing on production agronomy are involved in a variety of activities having the following dimensions:

- Study of CIMMYT’s maize improvement program, including the germplasm bank, the back-up unit, the advanced unit, quality protein maize and international testing.

- Studies of the maize plant: history, botanical characteristics, physiology, pest control, etc.

- Studies of soil fertility and fertilizers.

- Studies of various aspects of maize husbandry: tillage, weed control, moisture supply and plant density.

- Assignment of teams (three to five trainees in each group) to conduct a variety of on-farm experiments at different trial sites in Mexico (experiments are conducted from planting through harvest).

- Assessment of farmer circumstances for the purpose of designing experiments.

- Discussion of on-farm research experiments and development of alternative technologies for farmers.

- Field experience in laying out agronomic experiments on-station, and in farmers’ fields.

- Field visits to other stations, locations, and on-farm case studies.

- Farm machinery operation and maintenance.
Maize Improvement
Trainees focusing on maize improvement participate in the team experiments described in the production agronomy research schedule, with the following added elements:

- Trainees work with CIMMYT professional staff and with visiting and associate scientists learning CIMMYT's system of maize improvement.

- On-station work focuses on the development of genetic materials that will be included in progeny trials and experimental variety trials in the international testing program.

- Field techniques are developed for (a) the design and layout of breeding nurseries and yield trials, (b) planting trials in the field, (c) insect, disease, and weed control, (d) disease inoculation and insect infestation, (e) maize pollination procedures, (f) individual plant and family selection for various experiments, (g) harvesting of experiments and nurseries, (h) ear selection, (i) data recording and analysis, (j) seed preparation for the subsequent breeding cycles and yield experiments, and (k) seed storage for a breeding program.

- Learning sessions are held on maize breeding methodologies and principles of genetics.
Protein Evaluation

Trainees working in the maize quality laboratory focus on evaluating the nutritional quality of improved maize varieties. These trainees generally spend three months at CIMMYT and either come from established laboratories in their home countries or will return home to establish such laboratories. CIMMYT has a modern laboratory that serves a significant breeding program for the
improvement of quality protein maize. Trainees spend a majority of their time learning laboratory routines in individually-tailored courses that include the following:

- Sample preparation—dissection, grinding and defatting.
- Tryptophan and lysine analysis, and nitrogen determination.
- Ninhydrin tests and dye binding capacity (DBC) methodology.
- Zein determination.
- Special emphasis on quality protein field trials.

**Dates and Duration of Maize Training**

Training in maize production and improvement is scheduled for two cycles each year; each course lasts five and one-half months. Cycle A begins on December 1 and Cycle B begins June 1. These beginning dates correspond to the planting dates for maize in the northern part of Veracruz State, Mexico, where trainees receive much of their practical training. This area is a tropical lowland zone with distinct wet and dry seasons.

Trainees evaluate the nutritional quality of improved maize varieties in the quality protein laboratory.
About 60 trainees participate each year in the in-service training courses offered by CIMMYT's wheat program. The approximate dates and duration of each course are included with the course descriptions.

**Wheat Production (Crop Management)**
This course is for scientists who are responsible for designing and implementing research programs focused on the production problems of wheat farmers. It is conducted annually in Mexico's high central plateau beginning in mid-April and ending in early November. Experience with rainfed and irrigated cereals (wheat, triticale and barley) in farmers' fields is supplemented with seminars and study tours throughout the region.

Intensive training in wheat production, as well as experimental testing and demonstration methods, equips trainees to do the following:

- Obtain information (through informal survey methods) that helps them determine research priorities for the development of technologies appropriate to the circumstances of representative farmers.
• Develop technologies and perform (with machinery and by hand) selected cultural practices—from seedbed preparation to harvest—that improve upon farmers’ existing practices.

• Interpret the results of on-farm experiments and communicate research findings and production recommendations to appropriate groups.

More specifically, trainees gain competency in the following:

• Identifying and defining production problems.

• Analyzing those production problems using all the available data.

• Proposing alternative solutions for the observed production problems.

• Clarifying the consequences of the proposed alternative solutions.

• Specifying the necessary action to be taken and measuring the progress of such actions.

• Analyzing the actual consequences arising from the decisions.

Wheat trainees develop practical, applied research skills in the field.
All coursework is competency based with clearly stated learning objectives so that trainees know the specific course requirements and direction. Within the context of the course objectives, there is equal emphasis on team and independent work, self-discipline, freedom to explore new areas and democratic planning of activities.

Cereal Improvement (Breeding/Pathology)
In-service training in wheat breeding occurs annually from mid-February to early October, and is intended for young breeders with several years of experience. At the Mexican government’s irrigated station (CIANO) near Ciudad Obregon in northwest Mexico, trainees participate in field activities from crossing time through harvest. At CIMMYT’s rainfed stations (Toluca and El Batan), they participate from planting through selection. Field instruction and skill development is supplemented by discussions, lectures and farm visits. Trainees work directly with the crop research teams in bread wheat, durum wheat, triticale or barley. Trainees gain experience in developing improved cereal cultivars and learn the following:

- To determine breeding objectives and organize a germplasm improvement program.
- To identify and describe desirable agronomic traits, physiological problems, and insect and disease resistance.

Artificial disease inoculation is an important part of the cereal improvement trainees' field work.
• To lay out, plant and manage nurseries, and obtain and record the appropriate observations.

• The criteria used for selecting parental material, how to make crosses, and what to look for when selecting new lines.

• The steps involved in testing and evaluating new lines or cultivars.

• How to maintain and multiply pure seed.

• Useful methods for determining grain quality.
The cereal improvement training agenda is flexible, allowing trainees to focus either on breeding or pathology, according to their individual needs and interests. In addition to general wheat breeding, trainees learn how to do the following:

- Organize and operate a pathology program in conjunction with a breeding program.
- Collect and preserve pathogen inoculum, inoculate plants to induce disease epidemics, and ensure uniform disease conditions within breeding nurseries.
- Identify the important diseases of wheat, triticale and barley, and about available corrective or preventive measures.
- Evaluate diseases by type of reaction and by degree of infection in nurseries and commercial fields.
- Identify the virulence of rusts using greenhouse differentials, and how to isolate and identify pathogens in the laboratory.

Plants are selected in the field to be evaluated for grain quality characteristics by cereal technology trainees.
Cereal Technology

Training emphasis in cereal technology is given to laboratory procedures for evaluating grain quality characteristics, in support of wheat (triticale and barley) breeding programs. Plants are selected in the field at the CIANO experiment station, with guidance from the breeding programs. Laboratory work is tailored to trainees' individual needs and interests.

Trainees learn the following:

- To perform and interpret laboratory tests for evaluating the quality traits of wheat, triticale and barley.
- To organize and manage a small grain cereal quality appraisal laboratory.
- To install, calibrate, operate and maintain laboratory equipment.
- To train supporting technicians on the job.
Many CIMMYT trainees return to their national crop programs to become top-level researchers in plant breeding or production agronomy. Others assume the vital responsibilities involved in managing experiment stations. To assist those dedicated to the latter objective, CIMMYT conducts two courses in experiment station management each year. One, beginning in September and ending in January, is oriented more toward maize trainees. A second course, beginning in March and ending in July, is oriented more toward wheat trainees. Candidates for either course are nominated by CIMMYT's maize and wheat programs, and the number of participants is limited so that greater individual attention may be provided to meet specific needs.

Training is done on-the-job, and the major aspects of the program include the following:

- Experiment station organization, planning, development and operations.
- Keeping office records.
• Irrigation and drainage management.
• Land leveling, seedbed preparation and seeding rates.
• Calibration of machinery used for weed, insect and disease control.
• Grain drying and storage.
• Establishing and operating basic weather stations.
• Machinery and equipment operation and maintenance.

Subjects of special interest are also covered in conjunction with other CIMMYT training programs.
Economics Training

CIMMYT training in economics is designed both for economists and biological scientists from national crop research programs. Economics training at the Center's headquarters in Mexico is offered as part of the maize and wheat production training programs. Increasing emphasis is now placed on economics training via regional or in-country courses, coordinated with the activities of CIMMYT's crop programs.
The economics aspects of these courses include the following:

- Survey procedures for collecting and interpreting information on farmer circumstances.

- Methods for selecting research priorities and planning an experimental program.

- The economic analysis of on-farm experiments designed to formulate recommendations for farmers.

- Identification and analysis of policy issues affecting agricultural research and extension programs.

Farmers' circumstances provide the focus for economics training.
Facilities and Recreation

CIMMYT headquarters is situated on 80 hectares of land at El Batan, where most training programs are centered. El Batan is 45 kilometers northeast of Mexico City at an elevation of 2,200 meters.

The El Batan campus includes the headquarters buildings, a library, laboratories, greenhouses, seed processing and storage facilities, and experiment station buildings. A new training and conferences building is under construction, and is scheduled for completion in late 1986. The housing and recreation area includes dormitories for trainees. These facilities provide 60 individual rooms with private baths, and laundry services are available. Trainees have access to a recreation area.
room, tennis courts, football field and swimming pool. The cafeteria is open daily for CIMMYT staff, trainees, and visitors.

Details about the training courses highlighted in this brochure are available, as is additional information concerning qualifications, selection, funding and registration. Requests for additional information should be addressed to:

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