



**Training**

**at**

**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 research efforts of developing countries to increase the quantity, quality, and dependability of maize, wheat, barley, and triticale production. CIMMYT's mandate is global; the center cooperates with virtually every maize- and wheat-producing country in the world. CIMMYT's headquarters, located 45 kilometers northeast of Mexico City, serves as the center for many program activities, even though nearly 30 percent of the CIMMYT international staff are posted in developing countries other than Mexico.

**CIMMYT HEADQUARTERS, El Batan, Mexico**



CIMMYT currently receives funds from more than 20 different governments, international development agencies, and private foundations, and is a member of the Consultative Group on International Agricultural Research (CGIAR)—a consortium of 13 research centers and associated programs working to increase food production in the developing world.

CIMMYT's contributions to national agricultural research efforts fall in the following categories:

- (1) Development of improved germplasm
- (2) Development of procedures for crop improvement and production research
- (3) Training
- (4) Consultation assistance
- (5) Information services



# CIMMYT Training Programs

Training is a major CIMMYT activity. Through the years, training activities have evolved as an essential component in the development of improved agricultural technologies.

The principal objective of CIMMYT's various training programs is to heighten the professional expertise of agricultural personnel in developing countries. CIMMYT trainees accept the challenge to further improve national 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.



# **Training Objectives**

- To reinforce the trainees' research motivation within an interdisciplinary setting for identifying and overcoming 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 develop know-how to prevent or correct these conditions;
- To teach trainees the steps and principles involved in selecting research objectives, and those involved in the design, layout, management, analysis, interpretation, and reporting of field experiments;
- To teach trainees procedures for developing production recommendations suitable for farmers.

**Most of the time, the fields are the trainees' classrooms and the crops are their basic texts.**

# **Training Categories**

## **In-Service trainees**

Participants in the in-service training courses constitute the largest group of trainees at CIMMYT. They are outstanding young scientists or technicians associated with national crop improvement programs and come from developing countries all over the world. For information on qualifications, nomination, and selection, see page 8.

## **Predoctoral fellows**

A small number of degree candidates spend 12 to 18 months at the institute, working on their thesis research under the supervision of CIMMYT senior scientists. About 50 percent of these predoctoral trainees come from developing countries, and most plan to return to their homelands after completing their graduate work.

## **Postdoctoral fellows**

CIMMYT also works with 10 to 15 promising postdoctoral fellows who generally spend two years at CIMMYT as working scientists. These young scientists play active roles in all phases of CIMMYT's research and training programs. Some eventually join CIMMYT as senior international staff members.

**CIMMYT's small, specialized library and Mexico's national agricultural library (located 4 km from El Batán) serve the needs of CIMMYT trainees.**

### **Visiting and associate scientists**

A considerable number of scientists 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 from their countries' national crop improvement programs, may spend from one week to one year, depending on the nature of the visit.

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 CIMMYT's approach and methods.



## **In-service Trainees: Nominatio**

In-service trainee candidates must be recommended by their employer. CIMMYT's acceptance of nominated candidates will be based upon a review of appropriate documents and a personal interview made by a member of CIMMYT's staff or by a person designated to act in the Center's name.

Candidates for the CIMMYT in-service training programs should:

- be employed by a public or private institution, working in research or in related regional or national programs for the improvement of maize or wheat production;
- have studied to the bachelor of science level, or the equivalent;
- obtain permission from their parent institutions, both to ensure continued payment of trainees' salaries and to guarantee their employment after training;
- have command of either English or Spanish (CIMMYT's official languages);
- preferably be under 35 years of age;
- have excellent physical and mental health.

**Potential CIMMYT in-service trainees are among the best of their home countries' young professionals, having already demonstrated exceptional capacity and motivation.**

## Selection, Financing

Scholarships to CIMMYT's in-service training programs may be provided by the employers of prospective trainees, national agencies, international agencies or institutions, or CIMMYT. While at CIMMYT, trainees receive a stipend for room, board, and incidental expenses. Local travel, medical insurance, supplies, and materials are also provided. CIMMYT will send a registration form with all details and costs involved in administering the 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 enter the production agronomy research schedule, with maize improvement next in size. Schedules for protein evaluation and experiment station management (descriptions follow) are tailored for on-the-job experience, and trainees work alongside CIMMYT staff in their everyday tasks. All trainees, however, are involved in portions of the production research schedule; each spends some time in on-farm research and on field trips.



**Production agronomy trainees learn how to conduct experiments on farmers' fields, as well as on research stations.**

## **Production agronomy research**

This schedule exposes trainees to a variety of activities and background information and contains 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, and so forth.
- Studies of statistical analysis, experimental design, and economic analysis.
- Studies of soil fertility and fertilizers.
- Learning sessions on 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 to harvest.
- Field experience in laying out agronomic experiments on-station, and on farmers' land.
- Assessment of farmer circumstances for the purpose of designing experiments.
- Discussion of on-farm research experiments and development of alternative technologies for farmers.
- Field visits to other stations, locations, and on-farm case studies.
- Farm machinery operation and maintenance.

## **Maize improvement**

Maize improvement trainees participate in the team experiments described in the production research schedule with the following added elements:

- Trainees work with CIMMYT professional staff and with visiting and associate scientists in CIMMYT's maize improvement system.
- 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 in: design and layout of breeding nurseries and yield trials; planting trials in the field; insect, disease, and weed control; disease inoculation and insect infestation; maize pollination procedures; individual plant and family selection for various experiments; harvesting of experiments and nurseries; ear selection; data recording and analysis; seed preparation for the subsequent breeding cycles and yield experiments; and seed storage for a breeding program.
- Learning sessions are held on maize breeding methodologies and principles of genetics.

## **Protein evaluation**

Trainees in the maize quality laboratory focus on the evaluation of maize varieties for improvement of nutritional quality. They generally spend three months at CIMMYT and either come from an established laboratory in their country or will return home to establish such a laboratory. CIMMYT has a modern laboratory serving an extensive breeding program for improved quality protein maize. Trainees spend a majority of their time working through laboratory routines in individually-tailored courses that include the following:

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

## **Dates and duration of maize training**

Maize training in production and improvement is scheduled for two cycles each year; each course lasts five-and-a-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 north 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.

# Wheat Training

Approximately 50 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 description.

## **Rainfed wheat agronomy**

This course is conducted annually in Mexico's upper plateau beginning in early May and terminating in early November. The training focuses on applied research conducted mainly on farmers' fields and exposes trainees to procedures for developing improved crop production technology for rainfed environments. Field experience with rainfed cereals (wheat, barley, triticale) 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:

- obtain information through informal survey methods that helps to identify the appropriate research priorities for the development of technologies for 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 for needed action.

**The development of practical, applied research skills provides the focus of the wheat in-service training program.**

### **Irrigated wheat agronomy**

Conducted concurrently with rainfed wheat agronomy in Mexico's upper plateau, this course begins in early May, with upper plateau activities concluding in mid-November. At that time, trainees are transferred to northern Mexico (Ciudad Obregon, Sonora) for one month of intensive irrigation training. The program has objectives similar to that of the rainfed training program, except that trainees focus their attention on water management and other special aspects of wheat production under irrigated conditions.



## **Wheat breeding**

In-service training in wheat breeding occurs annually from mid-February to early October, and is designed for young breeders with several years of experience. At the Mexican government's irrigated station (CIANO) at Ciudad Obregon, trainees are involved in field activities from crossing to harvest. At CIMMYT's rainfed stations (Toluca and El Batan), activities range from planting to 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 wheat varieties and learn:

- to determine breeding objectives and organize a genetic improvement program;
- to identify and describe desirable agronomic characteristics, physiological problems, and insect and disease resistance;
- to arrange a nursery layout, plant and manage a nursery, and obtain and record the appropriate observations;
- the criteria used for the selection of parent material, crossing, and selection of new lines;
- the steps involved in testing and evaluating new lines or varieties;
- about the maintenance of pure seed and the multiplication of seed;
- useful methods for determining grain quality.

**Wheat breeding trainees work side-by-side with CIMMYT scientists throughout the crop cycle.**

## **Wheat pathology**

Training occurs at Ciudad Obregon, Toluca, and El Batan during winter and summer cycles, mid-February to early October. Trainees learn to induce epidemics, take disease notes, and identify virulence in the greenhouse. They also become familiar with laboratory identification techniques.

In addition to the general wheat breeder's training, pathology trainees learn to:

- organize and operate a pathology program in conjunction with a breeding program;
- collect and preserve pathogen inoculum, inoculate plants to induce epidemics of disease, and ensure uniform disease conditions within breeding nurseries;
- identify diseases of wheat, triticale, and barley, and learn about available corrective or preventive measures;
- evaluate disease infection 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.



## **Cereal technology**

Emphasis is on training in laboratory quality evaluation procedures to support a wheat (triticale and barley) breeding program. Field work with the breeding programs in the selection of plants is done at Ciudad Obregon. Laboratory work, as with maize protein quality evaluation, is tailored to the individual trainee's needs and interests.

Graduating trainees are equipped to:

- perform and interpret laboratory tests for evaluating wheat quality;
- organize and manage a wheat quality appraisal laboratory;
- install, calibrate, operate, and maintain laboratory equipment;
- train supporting technicians on the job.



**Experiment station trainees learn, among many important management subjects, the fundamentals of irrigation and drainage management.**

# Training in Experiment Station Management

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 persons who are dedicated to this objective, two courses in experiment station management are held each year. One course, beginning in mid-November and ending in late March, is oriented more toward the maize trainees. A second course is oriented more toward the wheat trainees and begins in mid-April and ends in mid-August.

Candidates for this training are nominated by CIMMYT's maize and wheat programs, and the number of participants in each course is limited so that greater individual attention may be provided to meet specific needs.

Training employs the on-the-job method, and major aspects of the program include:

- station organization, planning, development and operations;
- office records;
- irrigation and drainage management;
- land leveling, seedbed preparation, seeding rates;
- calibration of machinery for weed, insect, and disease control;
- grain drying and storage;
- 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**

Training in economics is designed for agricultural economists who work with biological scientists in national crop research programs. Emphasis is on the methodology and field work needed to assess farmer circumstances and carry out collaborative research with biological scientists. The goal of this research is to develop improved technologies for maize or wheat production that are appropriate to farmers' circumstances in the trainees' country. Classroom exercises and readings on methodological issues support the field work, where trainees learn to conduct both exploratory and formal surveys, including questionnaire development and testing.

Trainees spend approximately six weeks on survey procedures, including four weeks in the field, and six weeks on survey analysis procedures, including economic analyses of agronomic data. They are responsible for planning, conducting, and analyzing actual farm surveys in the field.

Trainees become familiar with agronomic techniques and the elements of on-farm experimentation by working in the field with the CIMMYT maize and wheat production agronomy trainees, by classes with CIMMYT agronomists, and by use of case studies that focus on in-depth issues, including, for example, seed multiplication and fertilizer distribution.

**Economics trainees gain practical experience in conducting informal and formal farmer surveys, analyzing data thus obtained, and developing recommendations for farmers.**

All activities are coordinated with the crop training programs and focus on development of the following skills:

- identification of information on farmer circumstances that is needed for planning technologies appropriate to farmers;
- the use of procedures, such as informal and formal surveys, to collect and analyze information from farmers;
- the economic interpretation and analysis of on-farm experiments in order to formulate recommendations for farmers;
- identification and analysis of policy issues that impinge on agricultural research and extension programs;
- an understanding of fundamental maize and wheat agronomy issues.



## **Living Facilities and Recreation**

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

The El Batan campus includes the headquarters buildings, a library, laboratories, greenhouses, seed processing and storage, and experiment station buildings. The housing and recreation area includes dormitories for trainees. These facilities have 60 individual rooms with private bath and laundry services. Trainees have access to a recreation room, tennis courts, football field, and swimming pool. A cafeteria is open daily for CIMMYT staff, trainees, and visitors.





Detailed information on course outlines and registration may be requested from CIMMYT's training program officers. Requests for additional information should be addressed as follows:

Training Officer (program)  
CIMMYT  
Londres 40, Apdo. Postal 6-641  
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or telex:  
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