


CIMMYT TODAY/No. 9

CIMMYT TRAINING

The growing commitment to training, at a center devoted originally and primarily to research, has evolved as an essential complement to the development of improved agricultural technologies.

Origin of maize and wheat in-service trainees, 1966-77

Region and Country	Maize	Wheat
Latin America	165	118
Argentina	11	12
Belize	5	—
Bolivia	7	5
Brazil	3	17
Chile	2	6
Colombia	6	4
Costa Rica	4	—
Dominica	1	—
Dominican Republic	9	1
Ecuador	12	10
El Salvador	20	—
Grenada	1	—
Guatemala	14	5
Guyana	1	—
Haiti	7	—
Honduras	23	1
Mexico	14	40
Nicaragua	8	—
Panama	4	1
Paraguay	—	4
Peru	8	11
Uruguay	—	1
Venezuela	5	—
North Africa and Mideast	22	159
Algeria	1	42
Cyprus	—	1
Egypt	12	9
Iran	—	8
Iraq	—	5
Jordan	—	3
Lebanon	—	4
Libya	—	4
Morocco	—	18
Saudi Arabia	—	1
Sudan	—	3
Syria	—	5
Tunisia	3	23
Turkey	3	30
Yemen, A.R.	3	3
Africa south of Sahara	91	40
Cameroon	1	—
Ethiopia	3	11
Ghana	6	—
Ivory Coast	4	—
Kenya	3	7
Malagasy	—	1
Malawi	1	—
Nigeria	12	14
Senegal	1	—
Somalia	—	1
Tanzania	37	3
Uganda	1	—
Zaire	20	1
Zambia	2	2
Asia: South, Southeast	65	83
Afghanistan	—	13
Bangladesh	—	17
India	2	6
Japan	4	—
Korea S.	1	7
Nepal	13	7
Pakistan	19	33
Philippines	16	—
Thailand	10	—
Other countries	2	17
France	—	1
Hungary	—	1
Poland	—	3
Portugal	—	1
Rumania	—	2
Spain	—	2
USA	—	4
USSR	—	3
Total:		
Countries	47	51
Individuals	345	417

CIMMYT TRAINEES 1966-77

Year	In-service	Pre doctoral	Postdoctoral and postdegree	Visiting scientist	Total
1966-71	185	12	15	166	378
1972	73	8	1	47	129
1973	116	7	9	54	186
1974	86	7	3	57	153
1975	96	12	8	74	190
1976	102	8	6	95	211
1977	104	4	4	168	280
Total	762	58	46	661	1527

Introduction

CIMMYT's growing commitment to training, at a center devoted originally and primarily to research, has evolved as an essential complement to the development of improved agricultural technologies. The experience of more than a decade has shown that in all too many cases the improved seeds and farming methods that perform brilliantly on research stations fail to achieve the same success in farmers' fields. Either the researchers have not heard the farmers' questions, or the farmers have not heard the researchers' answers. Too much research is being done around the world that has little relevance to the farmers' actual problems: too much relevant research is not being effectively communicated to the farmer. "The greatest barrier to the development of improved agricultural technologies and their transfer to the farmer," says a veteran CIMMYT agronomist and trainer, "is the fence around the research station." At CIMMYT, improved technologies include training programs that equip and motivate rising agricultural professionals from developing countries to eliminate this barrier, this "fence" between the researcher and the farmer.

At CIMMYT, with its dual commitment to two of the world's major food crops, the maize and wheat staffs have developed separate, parallel training programs. Semi-independently, however, the two programs have arrived at a common purpose: to train agricultural professionals from developing countries to recognize the problems that depress crop production in farmers' fields, to address their research to these problems, and to communicate their research results effectively to the farmer.

By 1977 CIMMYT's maize training program had graduated 345 crop-improvement and production specialists from the national crop programs of 47 countries. The wheat training program, which began in 1960, had graduated 417 trainees from 51 countries. The majority of participants in both maize and wheat training are production agronomists. In addition, 46 postdoctoral fellows from 23 countries and 58 advanced degree candidates from 19 countries had participated in the training programs. (See box).

"The greatest barrier to the development of improved agricultural technologies and their transfer to the farmer is the fence around the research station."

At the most, however, CIMMYT can hope to train only a fraction of the thousands of specialists needed by the national crop programs of the developing countries. The CIMMYT training programs therefore try to attract and encourage those candidates who demonstrate leadership ability, and who are potential future production coordinators in national programs.

Laying the groundwork

"We try to complete the work of the traditional agricultural university," says agronomist Alejandro Violic, CIMMYT's maize training officer. "At the university, many of our trainees have learned a little about everything. The emphasis of their education has been on theoretical, abstract agriculture, learned from books; they haven't had much direct experience of the farmer's agriculture. We teach them things they can't learn from books. We give them field experience, so they can apply the techniques of scientific research to the real problems of the farmer."

For most trainees, CIMMYT's insistence on the farmer's field as the starting point and the ultimate test of scientific research is a marked departure from the research attitudes they have absorbed from their universities. In many if not most developing countries, the training of agricultural professionals is modeled on the university system in the United States. There, however, the "pure science" of the university researcher is selected, adapted to the practical needs of the farmer, and finally communicated to the farmer, by a highly developed network of public and private institutions that does not exist to nearly the same degree in the developing world. Moreover, in many cases the developing countries send their best agriculture students directly to the United States or another developed country for university training.

Whether they have been trained at home or abroad, notes professor of education Burton E. Swanson of the University of Illinois, the newly accredited agricultural professionals "tend to continue working on theoretical problems, using their newly acquired tools, rather than focusing on the needs of local agricultural producers . . . Frequently, these theoretical research problems represent the frontiers of knowledge as defined by the scientific community of the industrialized nations—research problems which are probably far removed from the problems faced by the less-developed nations."

Inevitably, in many cases, the same alienation from the farmer and his concerns that afflicts the university-trained research scientist is found at all levels of national crop programs. In many countries, the policy makers and administrators responsible for the direction and implementation of national programs are imperfectly attuned to the day-to-day circumstances and yield-limiting problems of the farmer. The same problems of attitude and orientation severely limit the effectiveness of extension workers, whose vital function is to transmit directly to the farmer the benefits of improved agricultural science and policy.

Put into practice in the fields, the trainees' scientific abstractions take root in reality. The plant breeder learns to cross and select his high-yielding varieties for the specific agroclimatic constraints of particular growing areas.

At a training exercise for extension workers in one developing country, an observer reported, "a number of the participants confessed that they did not feel confident enough of their ability to demonstrate a single skill in their own technical field. The explanation was simple: they had been trained in a lecture system and had never performed the skill, or had done so only once or twice." Over a ten year period at the International Rice Research Institute (IRRI), several thousand extension workers were tested at the beginning of the training program on their ability to identify common rice diseases and pests, nutritional deficiencies, and standard agricultural chemicals. The average score was 25 percent. Production agronomists who train with the wheat program at CIMMYT are given a similar examination; they score 50% or less on arrival, and 75 to 95% at the end of the course.

From such indications, an IRRI official concluded, "The typical extension worker in most Southeast Asian countries lacks background knowledge of rice culture and has little or no first-hand paddy experience. Moreover, when he lacks the necessary diagnostic skills, he cannot identify the problems in the farmer's field, and thus cannot advise him on appropriate action." Adds a former training director at the International Center for Tropical Agriculture (CIAT): "Probably the greatest barrier to effective extension is the professional attitudes of young graduates and the degrading effect they associate with working at the farm level."

Thinking and doing

Some CIMMYT trainees will return to their national crop programs to become top-level researchers in plant breeding or production agronomy; some will take charge of experiment stations; others will work directly with farmers in the extension service. Eventually, some may even become their countries' agricultural policy makers and high-level administrators.

Whatever their future prospects, however, while they are at CIMMYT the trainees find their common ground in the maize and wheat fields at the center's El Batán headquarters and seven other stations at different altitudes in Mexico. Side by side with CIMMYT staff scientists and trainers, the trainees spend as much as 90 percent of their working hours with their feet—and often their hands and knees as well—in the soil. Crop production is the main standard for evaluating policy, research, and extension. "On this common ground, farmers, extension workers and researchers can meet, work together, and integrate their respective capabilities," says Ernest W. Sprague, director or CIMMYT's maize program. "In a truly integrated system of breeding, production research, and extension, one function feeds the others."

Put into practice in the fields, the trainees' scientific abstractions take root in reality. The plant breeder learns to cross and select his high-yielding varieties for the specific agroclimatic constraints of particular growing areas. The production agronomist learns to select and adapt improved seeds and farming methods to local needs, and to demonstrate their value persuasively to farmers.

In-service training

The most intensive and extensive field experience belongs to the trainees in the in-service program, the largest and most important training effort at CIMMYT. Twice a year, the maize and wheat staffs each select from 25 to 40 young professionals from developing countries to come to Mexico for six to nine months. Each trainee has been nominated by the national crop program in his or her home country as one of its best young professionals, one who has already demonstrated exceptional capacity and motivation. Nevertheless, most trainees find the in-service program to be—as its designers intended it to be—a body-and mind-stretching experience.

In each group, a few of the trainees may specialize in plant protection or cereal technology, and therefore follow a custom-tailored schedule. Most of the trainees, however, enlist as either plant breeders or production agronomists.

For one wheat breeding trainee named Washington Achenga, the prospect of a six-months visit in Mexico promised nothing more than "a great adventure." In February, Achenga took his leave of the small town of Nakuru in Kenya, where he had lived all his life, and his job as a wheat breeder at a local government research station. He was 32 years old, on his first trip outside Kenya, his first ride in a jet plane. His journey took him, in only a few days, from Nairobi to Frankfurt, to London to New York, before depositing him in Mexico, alone, ten thousand miles from home, work, friends and family.

At CIMMYT's campus-like headquarters outside of Mexico City, he would have found familiar lecture halls, laboratories and dormitories, surrounded by neat experimental fields. But early in the morning of his first day in Mexico, Achenga was airborn again to Ciudad Obregón, in the Yaqui Valley near the northwestern coast, where CIMMYT has its sea-level wheat research program. The young Kenyan was assigned to bed and board with a local Mexican family. At dinner, he could neither recognize the foods he was served, nor pronounce their names nor enjoy their tastes. His hosts spoke no English, Achenga no Spanish. He suffered in silence.

Things were not much better the next day, his third in Mexico, when Achenga found himself soon after sunrise with his fellow trainees in the wheat fields. "Most of us had little or no experience in field work. Many of us had problems with language, and everything had to be translated." To make matters worse, the landscape, compared with Kenya's hills, was too flat. Obregón's winter sun was too hot. "This place is no good," Achenga thought. "I should go home."

During the next ten weeks at Obregón, however, difficulties with language and differences in experience dissolved in sweat. The trainees were immediately enlisted in CIMMYT's non-stop wheat-breeding program. Their first assignment was to inject each tiller of each plant in the fields with disease inoculum. Later the trainees eliminated the plants that were most diseased, leaving those that showed good inherent resistance. Rogue plants and weeds also had to be pulled by hand from the moist, sticky soil.

Then, working alongside the CIMMYT wheat staff, the breeding trainees selected from the maturing wheats the most promising plant types to be the parents of the next generation. Each plant selected as a female parent had to be delicately emasculated by hand to forestall self-fertilization; then its head had to be enclosed in a paper bag against

accidental cross-fertilization. At the propitious moment, the trainees gathered pollen from the selected male parents and introduced it into the bags, making thousands of planned crosses.

Day after day, week after week, the trainees lived with the plants from sunup to sundown. "The plants are talking to you," Norman Borlaug, director of the CIMMYT wheat program, assures trainees who question the value of keeping such close company with their crop, "but you have to use your eyes to hear what they are saying." On their rare days off from CIMMYT's fields, the trainees were sent to observe other fields on nearby farms and research stations. "I didn't come here to be a laborer," Achenga heard more than one of his fellow trainees whisper, as the rich Mexican soil piled up under their fingernails.

"One thing we want to teach them," says a former CIMMYT wheat training officer, "is that a lot of agricultural research isn't just fun. You have to go out in the field and do the same things over and over again. It isn't a matter of sitting back and having something happen." Another thing: "They will probably never have to do all these jobs again when they get home. They will be directing the work of others. But if we do the work for them here, they'll never know how it should be done." Adds Norman Borlaug, "These hardship conditions are the everyday conditions of farmers in many developing countries. Our work must fit their situation."

Finally, early in May, the trainees harvested their best wheats, judging by plant type. After threshing their initial selections, they selected again, for the best grain types to provide seeds for the next cycle of crossing and selection. Achenga's group finished its harvest of a winter season crop at Obregón just in time to plant a summer season crop at Toluca, on Mexico's central plateau. At Toluca, seeds already selected for their adaptation to climate and diseases at low altitude are tested again for their ability to yield well under conditions of high altitude.

Waiting for their summer crop to germinate and grow, the trainees moved to CIMMYT headquarters at El Batán for long days of classes, seminars, and demonstrations, with written assignments to do at night in the dormitories. Most of the time, the fields are the trainees' classrooms and the crops are their basic texts; but into the pauses between planting, weeding and fertilizing, selecting and harvesting, the training staff has woven an academic curriculum that includes concentrated courses in a whole catalogue of subjects: fertilizer and pesticides, plant physiology, genetics, the use of farm machinery, economics, entomology, communications, and others

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A major element in the curriculum is economics, especially for the production trainees. These trainees spend about 20 percent of their time at El Batán with CIMMYT's staff economists, in classes and on local farms, learning to analyze and to appreciate the complex interactions that condition the farmer's behavior. "The farmer considers a great many economic factors before he decides whether to adopt some new technology from the reserach station or to accept the recommendations of an extension worker," says Donald Winkelmann, leader of the economics program. "The researcher or the extension worker who hopes to help the farmer to increase his production needs to incorporate those same factors into his work."

Training production specialists

The trainees in plant breeding to their field work at the experiment stations. The object of training for the production specialist, however, is to learn how to transfer improved seeds from the experiment stations to farmers' fields, where their superior genetic endowment can be realized under actual agricultural conditions. Only the first step in the transfer process (see box) takes place under the controlled, nearly optimum conditions of the experiment station. These conditions are ideal for systematically screening both local and improved varieties in conjunction with alternative combinations of chemical inputs and management practices. "But the trainees have to learn that you can't extrapolate accurately from experiment stations to farms," says maize training officer Alejandro Violic. In most cases, he points out, the stations have the advantages of choice locations and good management. By the same token, however, the experiment station may be affected by pests and diseases that are insignificant on local farms.

To identify the particular combinations of seeds and agronomic factors that will work for the farmer, the production trainees learn to retest the most promising combinations from the experiment station on local farms chosen to represent the variety of typical growing conditions in the area From the results of the first on-farm trials, the trainee identifies the inputs and other treatments that have a significant effect on yield, and ranks them in order of importance. The trials are then replanted on a larger number of farms, perhaps three or four in each agroclimatic zone, in order to obtain more reliable data on the costs and benefits of the treatments at various levels. From these data the trainees learn to plan technological packages with several options for costs; for example, the minimum level package is similar to the practices of many traditional farmers; the intermediate package has moderate inputs; and the "complete technological package" involves higher inputs, higher costs, higher yields, and higher risks. The farmer is offered these choices. The intermediate and complete packages include a recommended high yielding variety and a range of proposals for fertilizers, herbicides, pesticides, and other elements which can confidently be recommended to local farmers.

Finally, the production trainee learns how to demonstrate his combinations of seed and agron-

Model of the strategy used by CIMMYT for maize training in

	Stage/Function	Test Location and Numbers		Traine
1	Research Agronomy	Experimental Station	1	R
2	Production Research	Farmers' Fields	3 - 6	R
3	Production Research	Farmers' Fields	3 - 6	R
4	Verification and Diffusion	Farmers' Fields	40 - 80	C F
5	Diffusion and Seed Increase	Farmers' Fields	40 - 80	

IN THE FIELD CASE STUDIES

FEED BACK

omic practices to the farmers. In cooperation with Mexican extension personnel in the state of Veracruz, maize production trainees lay out demostration trials in a standardized design that requires only one-tenth of a hectare and can be planted by a competent worker in less than half a day (see box). The plot is first divided into thirds. The first section is to be managed with the farmer's customary methods; the second with the "intermediate" or "minimum cost technology" that includes only the most efficient levels of the most effective treatments; and the third with the "complete technological package." Each third is further divided into halves, one to be seeded with the local variety used by the farmers, the other with the best improved variety for the area.

These demonstration trials, which in actual practice climax in a field-day for local farmers at harvest time, are a dramatic and effective way to introduce new technology to the farmer. In 1973, the maize production trainees' first year in Veracruz, field-day yields from the demonstration plots grown with the farmers' seed and technology averaged from 2.0 to 2.5 tons per hectare. The trainees' improved seed and complete technological package yielded from 3.5 to 5.0 tons per hectare.

production research

Task	Training Program Objectives	
Direct [...]sponsibility	Screening new varieties based on relevant criteria at farmers level (yield, grain, end uses, etc.) Studies on planting dates. Testing new agricultural chemicals.	Testing agricultural machinery. Related laboratory studies.
Direct [...]sponsibility	Identify critical management factors, their order of importance and significant interactions. Testing agricultural chemicals against pests and weeds detected as problem by farmers. Preliminary investigations of new management methods e.g. minimum tillage.	Preliminary evaluations of breeding objectives. Economic analysis to detect factors of production with a higher impact on benefits and higher probability of acceptance by farmers.
Direct [...]sponsibility	Describe quantitatively the response to each critical management factor. Further investigation of significant interactions. Trials of promising varieties. Comparative trials of promising pesticide rates. Evaluation of breeding materials under different input levels.	Formulation of technological alternatives (packages) with different benefit levels and related risk. Demonstration to extension agents on formulation of technological alternatives and how to carry out stage IV. Partial budget analysis of agronomic data and range of relevant economic factors to be considered in future trials.
[...]servers and Direct [...]sponsibility	Verification trials of technological production packages. Assessing farmers reaction to new inputs and breeding materials. Observation of new factors limiting production.	Economic analysis of possible modification of production packages due to changes in relative prices. Sample survey of farmers to determine the agro-economic circumstances relevant to maize production.
[...]upervision	Verification of experimental results in production size plot (1 hectare or more). Experience with production size plot on farmers' fields. Assessing farmers' reaction to technological alternatives.	Increase of open pollinated variety seed for potential release in the area. Supervision and maintenance of varietal purity. Large scale economic study of the technological alternatives used.

Does training work?

One day, six to nine months after it began, the CIMMYT in-service training program is over. Filled with fellowship and high purpose, the trainees separate, return home, and take up their jobs in national crop improvement programs. After the sentiments of the moment fade, what remains? Can a few months of intensive training in Mexico redirect and motivate the lives of the trainees, and through them invigorate the national crop programs of developing countries?

While there are no certain answers to these questions, there is anecdotal and statistical evidence to suggest that CIMMYT trainees are making distinctive contributions to national programs in many countries around the world. In some countries —Zaire is a notable example— returning trainees have taken key positions in the agricultural sectors of government. In such strategic positions, former trainees can exert a beneficial influence on the policy and administration of national crop programs, creating a receptive climate for production-oriented research.

Most CIMMYT trainees return to their national crop programs as research directors, plant breeders, or production agronomists. During a visit to national maize programs in Central America in the fall of 1976, for example, the senior staff of CIMMYT's Central American Regional Maize Program found former trainees playing leading rôles in research and extension in every country. In Guatemala, CIMMYT graduates at ICTA, the national crop improvement institute, were organizing "technology transfer teams" to carry the results of experimentation research to small farmers in the highlands. In the lowlands of La Maquina, a young agronomist trained at CIMMYT had the year before selected from a CIMMYT seed nursery the best-yielding maize in the following round of international trials. And in El Salvador and Nicaragua, CIMMYT alumni at government research stations were collaborating across national borders to breed maize varieties resistant to stunt virus, an imminent threat to Central American food production. Such efforts by its former trainees, CIMMYT feels certain, must ultimately have an impact on maize production in the region.

In Tunisia in 1976, a program review panel of

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the Technical Advisory Committee—part of the Consultative Group on International Agricultural Research—found that fully 80 percent of the technical staff in the national cereal project had been to Mexico for in-service training. In all, the panel found 27 former CIMMYT trainees, most of them "in key positions in cereal research and extension." The panel's conclusion: "Perhaps CIMMYT's most impressive and easily measurable contribution to cereal production in Tunisia has been the development of a strong nucleus of well-trained and motivated scientists and technicians. All of the Tunisian personnel with whom the mission had discussions were unanimous as to the value of this contribution, and several rated it as CIMMYT's major achievement . . . The Panel considers the establishment of this cadre of trained people to be of the highest significance to the future of agriculture in Tunisia, particularly for the vital cereal sector."

In an ambitious attempt to measure the lasting effects of the wheat training program, a survey was made in 1973 of the 183 in-service wheat trainees who had returned to their home countries at least six months earlier. Of the 134 alumni who responded to the anonymous questionnaire, only 2 reported that they were even "slightly dissatisfied" with their CIMMYT experience. Four of the former wheat trainees were in graduate schools; of the rest, fully 91 percent were still working with wheat, most of them full-time. They included 76 breeders, 12 agronomists, 4 pathologists, 6 cereal technicians, 5 extension specialists, and 5 administrators in national wheat programs. During the year preceding the survey, the former trainees reported making a total of more than 22,000 genetic crosses, more than 1,200 experimental plantings at research stations, and almost 850 on-farm trials.

Supply and demand

CIMMYT's training programs, like those at the other international agricultural research centers, operate in the context of a growing demand. All over the world, the developing countries urgently need increased numbers of well-trained and motivated staff; the need is especially large for production specialists.

In one of its continuing efforts to multiply its own limited training capacity and increase the efficiency of the training process, CIMMYT is preparing selected trainees to establish training programs in their home countries. CIMMYT's maize program, for example, is currently testing an accelerated, intensive production-training course that can be given in any country by in-service-training graduates (see box, P. 13).

As recently as 12 years ago, when CIMMYT was established as a research center, the crucial importance of training as an element in increasing food production was partially eclipsed by the revolutionary achievements of a handful of plant breeders whose achievements seemed destined to spread around the world under their own momentum. Today, no one—certainly no one at CIMMYT—believes that there can be a Green Revolution without a well-trained army of green revolutionaries.

Innovative shortcourse

October: a team of CIMMYT senior staff lands in San Pedro Sula, the commercial center of Honduras' North-west Region, to begin a week of field trials. The new technology they are testing is not an improved maize variety, however, nor a new agronomic system, but an innovative training program. In just one week of intensive classroom and field work, they propose to teach a group of Honduran extension agents many of the basic lessons normally taught in CIMMYT's six-month in-service training program in Mexico.

The concentrated short course is not intended to supplant in-service training, but to extend its reach. There is an inherent limit to the numbers of candidates the in-service program in Mexico can accept without diluting the training and straining the capacity of CIMMYT's staff. Moreover, increasing costs limit the number of candidates any single national crop program can send to Mexico for six months. Relatively brief, in-country programs such as the one being tested in Honduras, therefore, offer a practical alternative to in-service training for the legions of extension workers needed in every developing country to link agricultural research to the small farmer.

In actual practice, CIMMYT's short training course is intended to be conducted by graduates of the in-service program. For the first tests of the course in Honduras, however, the Honduran trainers were joined by the CIMMYT team from Mexico: maize breeder Willy Villena and agronomist Roberto Soza, leaders of the Central American Regional Maize Program; agronomist Alejandro Violic, and economist Edgardo Moscardi.

Approximately 10 trainees are expected: on Monday morning, 40 appear for the first session. After brief formalities, the group turns quickly to a review of current maize yields in Honduras. The trainers then describe the system of maize improvement under development at CIMMYT and introduce some of the improved varieties that have resulted so far.

Finally, the Honduran trainers present the preliminary results they have already achieved with some of the improved materials in local farmers' fields.

"Under the present system," Dr. Soza comments after the first session, "the extension agents' only communication with the farmers is verbal. They simply pass along information from the Department of Natural Resources. They don't do any field work or demonstrations."

Dr. Soza's observation is verified early the next morning, when the trainees arrive to plant demonstration trials at a nearby experiment station. Step by step, the trainees are introduced to the basic techniques of the farmer: measuring seed, fertilizer and insecticide; laying out the field in straight, evenly spaced rows; drilling holes for planting with a long stick; and sowing the seed. At first, the trainers are far out in front of the trainees, teaching by example and doing most of the work in the process. By mid-afternoon, however, most of the trainees are catching on. When the day ends, they are still not likely to be mistaken for farmers, but they are no longer totally innocent of the farmer's everyday experience.

On Wednesday, the trainees are back in the classroom for a full day of lectures, illustrated with slides, on the major factors influencing maize yields in their particular part of Honduras. The development of the maize plant is studied in relation to soil preparation, the use of fertilizers, and disease and pest control. The final session of the afternoon introduces the trainees to the economic considerations that influence the farmer's acceptance of these technological factors.

Back in the fields the next day, the trainees harvest and weigh the results of two maize demonstration trials similar to the ones they planted on Tuesday. On Friday morning, back in San Pedro Sula, the data from these trials is used to show the trainees how to develop alternative technological packages—including seed, fertilizer, insecticides and herbicides, and agronomic practices—that they can recommend to farmers with confidence.

Next day, the CIMMYT team returns to Mexico. The one-week training course is over. Six months later, however, the after-effects of the experiment begin to show. Under the leadership of one of the Honduran graduates of CIMMYT's in service program, the trainees in the North-West Region have planted 50 more demonstration trials to verify and refine the recommendations developed during their training. In addition, the trainees have planted a total of 20 hectares of seed-increase plots in order to assure local farmers a plentiful supply of the variety—Hondureño planta baja—that had performed best in their trials.

Training categories

Participants in the in-service training program are the most easily recognized trainees at CIMMYT, and the in-service program is the largest and most dramatic training activity at the institute. In a very real sense, however, almost all visitors to CIMMYT, whether they come for only a few days or a year or two, are considered "trainees." Whatever their previous academic or professional experience, visitors are invited to CIMMYT from all over the world not only to contribute their specific skills to CIMMYT's efforts, but also to gain first-hand exposure to CIMMYT's special approaches to crop improvement. In general, visitor-trainees fall into several categories:

Predoctoral fellows

In CIMMYT's first eleven years, from 1966 through 1977, a total of 58 degree candidates from 19 different countries spent 12-to 18-month periods at the institute, working on their thesis research under the supervision of CIMMYT senior scientists. Seventy-five percent of these predoctoral trainees came from developing countries, and most planned to return to their homelands after completing their degree work.

In addition, CIMMYT sponsors degree training for some masters and Ph. D. candidates at universities in Mexico and elsewhere.

Postdoctoral fellows

CIMMYT invites promising young Ph.D.'s in crop research and production to spend from one to two postdoctoral years in Mexico as associate staff members. Collaborating with CIMMYT scientists, the postdoctoral fellows play active roles in all phases of research and training. In addition, they provide a pool of CIMMYT-trained and-acclimated candidates for positions on CIMMYT's staff. Since 1966, this program has attracted 46 young scientists from 23 countries, most of them in the developing world. Since 1974, CIMMYT's maize program has doubled the number of its postdoctoral fellows from 5 to ten per year. The wheat program included 6 postdoctoral fellows in 1976.

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Visiting scientists

During the past 11 years, 661 scientists from both developed and developing countries have come to Mexico to work with CIMMYT staff on specific research projects of mutual interest and practical importance. According to the particular project, these visits last from one week to several months.

Short-term visitors

In addition to scientists, CIMMYT frequently welcomes agricultural policy makers and administrators from developing countries, who come for a few days or weeks to observe CIMMYT's approach and methods.

In-country training

Increasingly, CIMMYT's training methods are being transplanted to developing countries to be integrated into national crop programs as part of a package that includes improved seeds and agricultural technology. Such training can be tailored to the special needs of the particular country, assuring a supply of trained personnel to bridge the gap between research and extension. Also, in-country training programs make more efficient use of scarce funds by eliminating the need for transporting and maintaining trainees away from home, while reducing the need for ever-increasing training facilities at CIMMYT.

Tony Wolff

CIMMYT HEADQUARTERS, EL BATAN

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