A Common Ground for Maize Research
Regional Cooperation in the Middle East and North Africa
Photo on front cover:

Abdel Aziz Selmani (left), maize breeder in the Moroccan national program, making a postharvest visit to a cooperator in on-farm demonstrations.
Maize in the Middle East and North Africa can give the impression of being a very recent arrival, almost an interloper, in the ancient homeland of wheat. In places the crop has spread hardly more than 50 or 60 kilometers from the shores to which it was first brought several hundred years ago by merchants plying the trade routes of the Old World. This pattern prevails in northern Turkey, where irregular patches of maize extend along the Black Sea coastal plain and into the hills rising sharply above it, and in southern Morocco, where most of the country’s maize is squeezed into a narrow band along the Atlantic and at some points is grown in strips that lead like corridors down to the sea.

The impression is misleading, though, for the position of maize in the region is by no means precarious. In Egypt, where many maize fields border seas of sand, the crop occupies a greater land area than any other (a third of the total during the summer months) and ranks second in value of production at domestic prices. Even in those countries of the region where production of other cereals far exceeds that of maize, the crop is an increasingly important variable in the total equation of food production and consumption.

During recent years demand for this and other coarse grains used as animal feed has risen sharply with rapid expansion in commercial poultry and livestock operations, particularly the former. But because of unattractive prices and limited availability and use of improved varieties and production technologies, domestic production has lagged behind demand, forcing most governments to import ever larger quantities of maize, sorghum, and barley.
The growing deficit in coarse grains is a problem of regional scope—and so is the solution, according to Nabil Khaldi of the International Food Policy Research Institute. In a study of “evolving food gaps” in the region, he calls for changes in governments’ agricultural policies that will boost production of coarse grains, particularly in Turkey, Syria, Morocco, and the region’s other major food producers; these nations, after satisfying domestic markets, could export surplus grain to neighboring countries that derive more of their income from exportation of labor or oil than from agriculture. Policies leading to such a complementary trading arrangement, Khaldi suggests, “might . . . promote self-reliance in the region and help to alleviate the concerns of some Middle Eastern countries about food security.”

Maize researchers across the Middle East and North Africa are engaged in a vigorous exchange of germplasm, techniques, and ideas.

These policies might accomplish little, however, unless they include strong efforts to provide farmers with the technical means of raising production. Much still remains to be done in all countries of the region to develop well-adapted improved varieties resistant to various insect pests and diseases, to build effective institutions for producing and distributing seed, and to find better crop management practices.

Fortunately, maize yield constraints are not the only traits shared among the countries most likely to achieve rapid and marked improvement in production. Each of these countries also has a corps of maize researchers who are already making steady progress toward eliminating the constraints. Moreover, of late the work of these scientists has taken on a greater regional and international character than previously through their relations with a regional maize program, one of six around the world, set up by the International Maize and Wheat Improvement Center (CIMMYT) in 1979. Within the framework of this program, national maize researchers across the region have engaged in a vigorous exchange of germplasm, techniques, and ideas, both among themselves and with scientists outside the region.

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Maize production at the margin of cultivable land bordering Egypt’s vast Western Desert.

CIMMYT’s Maize Program, which develops and improves maize germplasm and delivers this and other research products or services to national maize scientists.

One purpose of this publication is to describe some of the accomplishments of those researchers in Egypt, Turkey, Morocco, Syria, and Portugal (the latter is, of course, just outside the region but has much to gain from and contribute to its maize research). In considering various national and regional activities, this publication also explains how they are supported by CIMMYT’s Maize Program, which develops and improves maize germplasm and delivers this and other research products or services to national maize scientists.

Maize statistics for countries participating in the Middle East/North Africa Regional Maize Program

<table>
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<th>Country</th>
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Maize production at the margin of cultivable land bordering Egypt’s vast Western Desert.
A Regional Strategy in Crop Research

The Middle East/North Africa program, staffed by a single maize specialist who draws upon the talents of many other CIMMYT scientists, is tailored to the unique requirements and circumstances of maize research in the region. Naturally, the approach taken in this program does not correspond in every respect to that of other CIMMYT regional programs around the world. Even so, this program shares with the others a common purpose: to reinforce the efforts of national researchers in improving the productivity of resources committed to maize production.

The concept of regional maize and wheat programs was adopted by CIMMYT’s board of trustees in 1973 as a complement to various bilateral projects. Rapid expansion in the Center’s international testing networks and its growing interest in on-farm research and analysis of socioeconomic production constraints demanded another, more efficient way of organizing assistance to national research—one that would create sustained ties between the Center and its many clients. It was also hoped that in attaining this objective the Center could simultaneously advance regional cooperation in agricultural research by focusing the experience and skills of scientists throughout a particular region upon their common problems.

Similar problems and the possibilities for solving them through joint action were among the principal criteria used in designing regional crop programs, the first of which (for maize) was established in 1974. From the outset these programs constituted much more than formal institutional arrangements for supporting national research. Right away the regional crop specialists began also to develop close working relationships with their colleagues in the national programs. Although the starting point was often to identify and assist in meeting certain material needs impeding the progress of national researchers (and this continues to be an important activity of all the regional programs), by and large CIMMYT staff members soon found themselves much more deeply involved in the work of the scientists. The regional specialists frequently began to take part in research planning, becoming full participants in debates over problems and priorities.

Final decisions about research goals and means of reaching them have, of course, always been the responsibility of the national scientists themselves. The role of CIMMYT staff has been to encourage those researchers to view their work in a regional and international context, to help them search beyond the borders of their own countries for germplasm, methods and ideas, and to serve as a credible source of reliable, candid opinions about the use of those resources.

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Countries with which the CIMMYT Maize Program cooperates in the Middle East/North Africa region.
Germplasm Development

Many of the CIMMYT Maize Program's resources go directly into developing germplasm and distributing it to researchers around the world. Although this genetic material has been improved in many characteristics, it is still an intermediate research product that must undergo further work by national maize programs before it can be released to farmers or incorporated into a released variety. Improving the efficiency of this process receives high priority in every regional maize program.

One way in which the regional specialists go about this task is to monitor variety trials distributed through CIMMYT's international maize testing system and to work with national program staff in evaluating and deciding how to use the germplasm. At the request of national researchers, the Center can send any of three types of trials: International Progeny Testing Trials (IPTTs), Experimental Variety Trials (EVTs), and Elite Variety Trials (ELVTs). Depending upon the trial results, maize breeders may choose to introduce this superior germplasm into their breeding nurseries, test and release it as varieties, or derive inbred lines for hybrid development.

The regional specialists' support of maize breeding extends beyond work with germplasm distributed by CIMMYT. The ultimate aim of this regional assistance is to help national researchers develop varieties that will give farmers a better maize crop, using whatever genetic resources suit the purpose, whether they consist of local germplasm or introductions from the Center or other sources. Maize research in Turkey well illustrates the appropriateness of such a policy. This country, unlike most of those with which CIMMYT works around the world, is located in the temperate zone. Since the Center has far less maize germplasm that is adapted to that zone than to the tropics and subtropics, it can best serve the Turkish program by helping it take advantage of superior temperate germplasm from Europe and North America.

Egyptian farmer gathering maize leaves for forage. In Egypt, as in most other countries of the region, maize is a multipurpose crop.
Renaissance of maize improvement in Egypt

Egyptian maize researchers have what is perhaps the oldest and largest national maize improvement program in the Middle East/North Africa region and the most longstanding relationship with CIMMYT. These scientists have been particularly thorough in pursuing various options for molding germplasm from numerous sources into superior varieties and hybrids.

Their achievements are especially notable in light of a setback that occurred in the Egyptian maize program some 20 years ago. Ironically, the difficulty was a direct result of one of the program’s early technical achievements—the development of numerous high-yielding double-cross hybrids based on lines derived from local and exotic sources and on American inbreds. The hybrids were released in the early 1950s and rapidly distributed by an Egyptian seed company until they covered some 80,000 hectares of farmland. Not long after their introduction, a previously unobserved disease, which Egyptian farmers named Shallal (paralysis), began devastating fields that had been planted to the new hybrids. Infection reached 100 percent in some places, causing plants to wilt rapidly and sharply reducing yields.

This late wilt disease also had a paralytic effect on hybrid distribution. For farmers soon realized that the hybrids were more susceptible to this disease than their open-pollinated varieties.

The causal organism of the disease, Cephalosporium maydis, was identified in 1962, resistant inbred lines were found shortly afterwards, and by 1965 a late-wilt-resistant double-cross hybrid had been released. But this measure, though rapidly executed, did not lead to a resurgence of hybrid cultivation. The local seed industry, not having recovered from the blow it had been dealt by the failure of the susceptible hybrids, was unable to produce and market the new seed very widely. Besides, farmers had apparently become sceptical about hybrids in general, and was no doubt reinforced by the lower yield potential of the new resistant materials, in the absence of late wilt, compared with their susceptible predecessors.

Maize production and yields did increase dramatically within a few years but not as a result of improved germplasm. The revolution was brought about instead by the completion of the high dam at Aswan in 1965. Previously, most farmers had not sown maize until late July or early August, when flood waters from the Nile irrigated their fields. Those plantings were heavily damaged by various stem borers. Operation of the dam made irrigation water available throughout the summer, thus enabling farmers to plant maize much earlier and in large part avoid the insect problem. The resulting transformation of maize production demonstrated the farmers’ readiness to accept beneficial change, an attitude they would show again 15 years later in adopting a new generation of improved varieties and crop management practices.

By the late 1960s, the limitations of further intensive work on conventional hybrids had become obvious, given the lines then available and difficulties in the seed industry. Egyptian maize researchers therefore decided to curtail their work on conventional hybrids and to shift their emphasis to a more cautious program of developing superior open-pollinated varieties and variety-cross hybrids. Their breeding strategy eventually came to be based upon American Early Dent germplasm, into which they introduced exotic tropical germplasm.

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From 1969 to 1973, Egyptian scientists concentrated on the introduction of tropical germplasm into their program and on the formation of populations. By 1975 a few of the better populations had been selected and were being subjected to intensive recurrent selection. One of those populations was Composite Sids-1, from which Egyptian researchers developed a high-yielding, late-wilt-resistant variety. This variety, released in 1981 as Giza-2, has become the centerpiece of a series of national research and extension campaigns for increasing maize production (see page 6) and has proven to be extraordinarily popular. Partly as a result of its success, Egyptian farmers seem to have a new confidence in the results of agricultural research and are starting to adopt DC-202, one of the program’s newest, high-yielding double-cross hybrids with resistance to late wilt.
National Maize Production Campaigns in Egypt

Egyptian maize researchers, extension workers, and farmers have joined in an effective partnership over the past five years, through yearly, nationwide production campaigns, to raise the country’s average maize yield at a healthy annual rate of 4.9 percent.

The fairly smooth execution and successful outcome of the campaigns has been due in no small measure to an organizational innovation within the national maize research program. This was the creation during 1975-76 of an on-farm research unit responsible for coordinating joint activities between those who develop and those who disseminate new agricultural technology. The unit has helped make research more relevant and extension more effective by bringing to together in a program of training and field visits the assets of the two groups, namely the strong technical underpinning of research and extension’s fuller awareness of the realities of farmers’ cultivation and use of the maize crop.

Working together in their new relationship, researchers and extension workers developed a set of recommendations for planting and for the application of inputs in improved maize. This technological “package” was put to the test during 1980 in an initial pilot campaign conducted in cooperation with the National Academy of Science. Encouraged by the success of this first effort, the National Research Center and Egyptian Major Cereals Improvement Project (EMCIP) joined the campaign in 1981. By that time Giza-2, a high-yielding open-pollinated variety with resistance to late wilt, had been released. In subsequent years various national program hybrids, such as DC-202, were introduced and compared in on-farm demonstration plots with Giza-2 and hybrids being marketed by international seed companies.

Though approaches to this on-farm work varied among groups, the predominant tactic was to involve numerous farmers and a large portion (as much as 5 to 10 percent) of the land planted to maize in a particular area. Participating farmers planted improved varieties and adopted as many of the recommended practices as they considered appropriate. By its very scope and nature, this approach entailed certain difficulties. Foremost among these was that researchers and extension workers could exert little control over the management of the demonstrations and were spread rather thin in trying to visit all of them.

But, according to those who did much of the legwork, the sacrifice in uniformity was far outweighed by the rapid gains that were made. “Because we included whole villages in the demonstrations,” says Dr. Abdurrahman Ismail, assistant director of the maize program, “we were able to achieve quick impact rather than the gradual, cumulative effect that would have resulted from a smaller scale effort.” Mohamed Hamman, director of the Agricultural Directorate of the Quesna District in Egypt’s Monofea Governorate, points out another reason for the campaigns’ success: “The demonstrations brought into play the farmers’ own capacity for experimentation. Since they managed the demonstrations and decided which components of the technology package to adopt, farmers gained the opportunity to compare experiences with different combinations of varieties and practices; in that way they learned from one another.”

Whatever were the exact mechanisms of the success, the results have been rapid and widespread adoption of improved varieties. By 1984 they covered 27 percent of the total maize area, and yields increased in project areas by well over 100 percent during the first three years of the campaign.
The maize-growing niches of Morocco, Syria and Turkey

With perhaps a little less drama than is contained in the story of Egyptian maize research, but with equally favorable results, other national programs in the region are also moving quickly to meet farmers' requirements for well-adapted, superior germplasm. The maize improvement work in those programs has a somewhat different character than it does in Egypt, though, being more a matter of filling smaller maize-growing niches than of saturating a larger, more uniform area like the Nile Delta.

In Morocco, for example, where only about 5 percent of the maize is irrigated and the national average yield is under 1 ton per hectare, researchers are faced with the formidable task of developing first crop; this need has been met primarily by Gouta-82, which was introduced from Pakistan several years ago, subjected to several generations of adaptive selection, and then released for cultivation.

The much larger spaces that must now be filled with improved germplasm are the second-crop maize regions, which require early maturing varieties or hybrids. Fortunately, the maize program is well stocked with raw materials for meeting this need (in the form of three early maturing populations and several early inbred lines), and researchers are now using the superior families from them to form experimental varieties. Once these varieties have been distributed, says Tiessir Mansour, the program's principal maize breeder, "we should, with continued government support, be able to meet most of our seed requirements and reduce dependence on seed importation."

Turkish maize scientists also have a program that caters specifically to farmers who grow maize as a second crop, but those researchers must concern themselves with several other maize-growing environments besides. To meet the diverse germplasm needs of the country's farmers, the maize program has released and distributed in the last several years four open-pollinated varieties that are distinctly better than the local ones and, more recently, five hybrids, several of which are competitive with materials being distributed by international seed companies.

The challenge of the maize programs in Morocco, Syria, and Turkey is to supply farmers with well-adapted, superior germplasm for the numerous and diverse maize-growing niches in those countries.

varieties that will give farmers a reasonable yield from year to year in the country's predominantly arid, extremely harsh maize-growing regions. The program is already well along in replacing the past generation of hybrids being grown mainly under irrigation and is now considering various early maturing materials (including CIMMYT pools 29 and 30, some local germplasm, and a U.S. variety) that show promise for the more difficult low-rainfall areas.

The Syrian maize program occupies a similar position in that it has dealt adequately with one problem and is now turning to another that is even more demanding. The first challenge was to supply a full-season, high-yielding variety to the minority of Syrian farmers who grow maize as a principal maize breeder, "we should, with continued government support, be able to meet most of our seed requirements and reduce dependence on seed importation."

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Storage and drying are of particular concern to farmers who grow maize as a second crop, since the grain moisture of this maize is high at harvest. So that these farmers will have an alternative to selling soon after harvest or depending on large, central drying facilities, researchers at experiment stations in Syria (shown here) and Turkey are testing and demonstrating the simple, low-cost "ring crib," which consists of a cement-block floor and wire cylinder.
The balanced approach that led to the release of this improved germplasm—one in which both open-pollinated varieties and hybrids are emphasized—has been guided by the widely differing circumstances of Turkish farmers. An increasing number of them, particularly in the west and south, are commercial farmers and find it profitable to grow hybrids in fairly large, mechanized operations. Most, however, living along the Black Sea coast in the north, cultivate local open-pollinated varieties and in the hilly regions beyond the coastal plain rely heavily upon manual labor in their maize farming.

During the early years of maize research in the country, the requirements of the more commercialized farms were given precedence. In the 1950s some 30 U.S. hybrids were tested, and of that number, two were released and remained in commercial production for many years. Additional double-cross hybrids were developed during the late 1960s by Turkish maize breeders from local inbreds and some lines from the U.S. But efforts to disseminate these hybrids in the early 1970s were stymied by inadequate production and distribution of seed and by the subsistence nature of much of the country's maize farming.

The response of maize researchers during 1973-74 was to redirect their attention toward open-pollinated varieties, chiefly because production and distribution of the seed of those varieties could be managed more easily than hybrids at every step from experiment stations to farmers' fields. At about the same time, these researchers began to engage in technical cooperation with CIMMYT and inaugurated the Turkish National Maize Project, which was distinguished from previous arrangements by more complete nationwide coordination of maize research and by the new emphasis on open-pollinated varieties and population improvement.

During the 10 years following those developments, the program has been improving three maize populations for yield and disease resistance. From this germplasm national researchers have developed such composite varieties as Ada, Sapanca, and Karadeniz Yildizi (Black Sea Star), which have already been distributed in somewhat modest quantities of several hundred tons and will, it is hoped, be passed on rapidly from farmer to farmer across the country. At this experiment station (near Homs) and two others in Syria, early maturing maize varieties and hybrids are being developed for cultivation as a second crop.
Plant breeders Nurretin Kartal (right) and Dr. Mostafa Kaya of the Adapazari station in western Turkey comparing the tassels of a male sterile plant with those of a male fertile plant.

Farmers along the Black Sea coast of Turkey are finding that Karadeniz Yıldızı (Black Sea Star) is quite superior to local varieties.

northern Turkey, where this mechanism of seed dissemination is believed to be important.

After having made considerable headway in developing composites, the Turkish program renewed its hybrid work in 1980 and within four years had more than matched the achievements of earlier efforts by developing a whole new generation of hybrids for the commercial sector of Turkish maize farming and for other farmers who are prepared to buy seed annually. The challenge now is to put together the seed production/distribution puzzle, so that the new hybrids can be more widely distributed to farmers than previous ones. Turkish government officials have recently shown a strong interest in the national program hybrids, and several possibilities (such as large state farms and local private seed companies that could contract with farmers) are being explored for producing and distributing seed.
On-Farm Research

The most adept manipulation of maize germplasm is no guarantee that the resulting varieties or hybrids will be adopted by farmers and make a noticeable difference in their production and income. That this material must first be channeled through a well-organized on-farm research program and combined with appropriate crop production practices is certainly one of the lessons of Egypt’s national maize production campaigns, which were preceded and accompanied by massive on-farm testing. This lesson is becoming a basic precept in other national programs across the region as well, virtually all of which (at least among those closely connected with CIMMYT’s regional activities) are conducting on-farm variety trials and developing on-farm research programs.

An even more important development is that national scientists in the region are exploring the numerous ways in which on-farm research can do more than give a superficial reading of farmers’ reactions to improved varieties. Many are learning that this type of research can also help them better understand the problems and needs of farmers and can serve as an instrument for developing technology that meets those needs. Trying to bring about such improvements, according to Dr. Silas Pego, who is conducting on-farm research in northern Portugal, can be an education in itself: “You have to become as careful an observer as the farmers are, which isn’t easy when you consider that their knowledge of the maize crop is incredible. I grew up in this region and once prided myself on really knowing it well. But through our on-farm research project, I’m learning how much I didn’t know and am getting a chance to remedy my ignorance.”

National scientists in the region are exploring ways in which on-farm research can serve as an instrument for developing technologies that meet farmers’ needs.

On-farm trials like this one have been a pivotal component of Egypt’s national maize production campaigns and are now an integral part of the country’s maize research program.
The starting point for this more inquisitive approach to agricultural research is frequently agroeconomic surveys, which provide valuable information about farmers' circumstances that can be used by agricultural researchers and policy makers to orient both experiment station and on-farm research. In Egypt, for example, a series of surveys was conducted in 1976, 1977, and 1979 by the Ministry of Agriculture, Ford Foundation, Zagazig University, and CIMMYT. The surveyors raised several questions about farmers' fertilizer application, tillage practices, and cultivation of the maize crop both for forage and grain, some of which became subjects for later experimentation. The results of that research formed in large part the basis for crop management recommendations included in the national maize campaigns. Upon completion of another farm survey being conducted in 1985, researchers will have a clearer picture of the campaigns' "anatomy," having gained more information about farmers' adoption of recommended planting practices and improved varieties.

Information of the sort provided by this survey should interest other maize researchers in the region, since it touches upon problems with tillage and planting methods that are of almost universal concern in the Middle East and North Africa. Finding acceptable alternatives to current practices is particularly urgent in Morocco, where poor stand establishment greatly reduces yields in the low-rainfall areas. New methods might also be of service to Syrian maize farmers, who in some regions could probably save 7 to 10 days in land preparation time, permitting earlier planting and the possible use of full-season varieties, which give greater yields than early ones.

Turkish maize scientists are rapidly nearing the point of being able to spell out clearly for farmers what some of those improved practices might be. In the southern and western parts of the country, researchers at the Antalya and Adapazari stations are finding that no-tillage methods show promise for the large-scale, mechanized operations in their regions, while in the north several alternatives suitable for small-scale farmers are being investigated.

On-farm research is receiving particular emphasis in northern Turkey. This work was begun in 1983 with a farm survey devised by national researchers and CIMMYT.

A fundamental assumption in maize programs across the region is that research must be based on an accurate perception of farmers' circumstances: Syrian maize breeder Tiessir Mansour (left) visiting an on-farm trial.
Part of the value of on-farm work is that it brings the farmers' wisdom and experience into the process of technology development: Belaid Sall, director of the Moroccan maize program, during a farm visit.

staff members, in which the region was divided into two distinct recommendation domains (the coastal plain and the hilly region adjacent to it). In the first domain, it was found that stand establishment was poor because of farmers' tillage and planting practices and that they had to compensate for this deficiency with extremely high seeding rates. These in turn required a heavy expenditure of labor for thinning and formed a barrier to the adoption of high-value (hybrid) seed. The survey brought to light the same connection between poor stands and poor seedbeds in the hilly area.

On the basis of those findings, researchers designed a set of experiments in which alternative tillage and planting methods were compared with the farmers'. For the coastal domain, the best option appeared to be line planting with locally manufactured seeders, though their use is made difficult by the wetness of this area's heavy clay soils at planting time. But in experiments that show the proper relation between on-farm and on-station work, researchers at the Samsun station developed ways of forming beds and ridges with various types of equipment that would leave the soil in a much better, dryer condition at planting time.

In trials conducted in the hilly region, where the average maize field is no larger than a half hectare and is situated on steep slopes subject to erosion, farmers showed a keen interest in a no-tillage system in which weeds are shaved off with a hoe and maize is planted by means of a sharp stick.
Logistical Support

In addition to assisting with the acquisition and development of germplasm and other research products, CIMMYT regional maize specialists help obtain various types of equipment or supplies (ranging from tillage implements to the staples used to put tags on plants in breeding work) that national researchers may have difficulty purchasing as a result of budgetary limitations or lack of foreign currency. The provision of equipment is not necessarily limited to items that are used directly in field and laboratory research, but may include such things as cameras, photocopy machines, slide projectors, and microcomputers, which can help scientists conduct their work more efficiently. There are obvious limits to how much equipment the regional specialists can provide directly, so they often cooperate with other organizations working within the region to obtain additional funding for logistical support of national programs.

Staff Development

The most valuable resource national programs possess, and one in which CIMMYT makes a heavy investment, is, of course, the researchers themselves. The Center offers various opportunities for professional development at its headquarters in Mexico and in the countries where regional specialists are working.

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Among the principal opportunities are CIMMYT’s six-month in-service courses. These include a production agronomy research course, which covers different aspects of maize husbandry and provides direct experience in on-farm experimentation, and a maize improvement course, which focuses upon the principles and field techniques of maize breeding. Many national staff receive training in experiment station management, which is fundamental to the smooth functioning of any research program. A smaller, but still considerable, number of people spend anywhere from a week to a year in Mexico as visiting scientists working on a research problem of mutual interest to their national programs and CIMMYT and becoming familiar with research at Center headquarters.
Candidates for these training programs generally are not chosen by an anonymous process. They are frequently well known as colleagues to the regional maize specialists and are carefully selected by government officials and national program researchers. All of the candidates selected perform an important task in the national program to which they will return with new skills and insights upon completing their training or visit. The hope of Center staff is that these scientists will take home, not only the knowledge and skills they have acquired, but a strong motivation to share them with other workers in research and extension.

CIMMYT staff hope that trainees will take home, not only the knowledge and skills they have acquired, but a strong motivation to share them with other researchers.

Many national researchers who have attended in-service courses in Mexico and have themselves become trainers within their own programs receive further instruction through various types of in-country training activities organized by the regional specialists. Sometimes these are short courses, such as one on use and maintenance of maize harvesting equipment conducted for Turkish scientists in 1984 by employees of the equipment manufacturer and the regional maize specialist. Other training events (the Egyptian Maize Field Seminar, for example, which also took place in 1984) include researchers from several countries and thus further the cause of regional cooperation by providing these scientists with opportunities to exchange ideas and research results.

A workshop held more recently in Turkey demonstrates particularly well how opportunities arise within the regional program for drawing on diverse resources to accomplish multiple purposes. This event was the culmination of efforts begun in 1984 to upgrade data processing capabilities throughout the region, so that research results could be obtained more quickly. As a first step, the regional maize specialist and senior Egyptian scientist Abdrabboh Ismail travelled to the United States in 1984 for a workshop held at Michigan State University (MSU) on MSTAT computer software. The software package was soon adopted by Egypt’s maize program, and shortly afterwards plans were laid for regionalizing the innovation. In December 1985, 25 persons from the national programs of Turkey, Egypt, Morocco, and Portugal gathered at Ankara for an MSTAT workshop sponsored by MSU, the Middle Anatolian Agricultural Research Institute of Turkey, and CIMMYT. The national programs participating were well served by expertise from outside the region (in the form of instruction from an MSU professor) and within the region (through the services of Dr. Ismail as assistant instructor and the involvement of Turkey’s national research program).

Regional cooperation and sharing of resources is also encouraged by less formal training events, such as visits by scientists from one country to their colleagues in another. These visits are often of a general nature, giving the visitor a broad acquaintance with the research aims of a national program. But they may also have a quite specific purpose, as when Egyptian entomologist Dr. William Awadallah visited Turkey to consult with scientists there about corn borer research or when Rena Farias, a Brazilian working with the germplasm bank of the Braga experiment station in northern Portugal, travelled to Morocco to collect maize germplasm in the Atlas Mountains.

As a supplement to the efforts of national programs, the regional maize specialist offers logistical support, frequently in the form of equipment like this land leveller at the Samsun station in Turkey.
Consultation With CIMMYT Staff Members

The frequent visits of regional maize specialists to various national programs serve many purposes. The maize specialists do much through their travels to create a sense of cohesiveness among national programs, since they bring with them, not only their own expertise, but the accumulated experience of numerous programs in coping with problems that are common across the entire region. This application of experience through close and continuous contact with national researchers is central to the regional maize specialists’ role, which is to assist in developing, documenting, and carrying out plans for on-station and on-farm research and to help procure whatever resources are needed to execute those plans.

This assistance may take several forms and is provided chiefly through one- to two-week visits (which in the Middle East and North Africa region occupy about 50 percent of the maize specialist’s time) and follow-up communication with national researchers. The typical visit (to Syria, for example) generally takes place during some critical time in the maize growing season and may include an informal research planning meeting with program director Zaher Arafe and maize breeder Tiessir Mansour, a visit to experimental plots at their research station near Damascus (the only one in the region devoted exclusively to maize research), a trip to other experiment stations and farmers’ fields in the Homs-Hama region or Ghab valley, discussions with agricultural administrators, and other activities that make up the day-to-day life of the program.

Through these and other activities, the maize specialists and national researchers build close working relationships and come closer to their principal goals. These are to develop effective mechanisms for setting research and production priorities and, with the scarce resources available, to build the infrastructure needed to conduct cost-effective research aimed at raising farmers’ productivity.

CIMMYT regional maize specialist Dr. Wayne Haag and maize team leader Murat Bengi examine entries in a variety trial at the Samsun station in northern Turkey.
Preparation of a cement floor for sun drying of crops at Turkey’s Mediterranean Region Agricultural Research Institute. The Turkish national maize program has made a heavy investment in the improvement of its research facilities.

In providing services to national programs, the maize specialists are primarily responsible for supporting research within their own disciplines. But since they are also concerned with the overall development of those programs, they must have a good knowledge of several disciplines, and an appreciation of the interdisciplinary scientists bring more detailed knowledge of a discipline other than the regional specialist’s own to bear upon special problems.

This assistance is especially important in the Middle East/North Africa region since it is staffed by a single specialist, whose background is in plant breeding. From the inception of this program, national researchers have had liberal access to the experience of scientists in practically all disciplines represented at CIMMYT. As previously mentioned, Center staff (economists Donald Winkelmann and Robert Tripp and agronomist Federico Kocher) have been closely involved in conducting economic surveys and developing on-farm research programs in Egypt and Turkey. CIMMYT entomologist John Mihm has visited experiment stations in Turkey on numerous occasions and helped provide specialized training in a project at the Antalya station for mass rearing of Sesamia and Ostrinia, artificial infestation of maize with these insect pests, and screening germplasm for resistance. Likewise, pathologists both from the Center and other institutions have been invited to the region to consult with national scientists about disease problems.

Another area in which CIMMYT and national programs across the region have concentrated much effort is station development. Both have expended considerable resources improving research facilities and purchasing new equipment. John Stewart, head of CIMMYT’s experiment stations in Mexico, has visited Turkey on several occasions to help plan station development and
maintenance and to offer advice on the use of some of the new facilities and equipment. So as to maintain the momentum of this work, the regional specialist and national scientists almost always give attention to some aspect of experiment station development during visits to national programs.

Through this type of involvement in the national researchers’ complete program of activities and the participation of other CIMMYT staff members, the regional program accomplishes one of its most important objectives, which is to open a vital flow of information between national programs and the Center’s headquarters. This link helps ensure that CIMMYT’s work is in line with the priorities of national researchers and that its research products are meeting their needs.

In all of the regional maize programs, national and CIMMYT scientists are engaged in a joint search for ways in which national programs can be developed from within and without. These programs do not, of course, grow in isolation but in the context of relations with other groups whose decisions and actions can help or hinder national program development. Although CIMMYT’s influence and involvement in such matters are limited, the regional maize specialists do try to foster good relations between national programs and the various groups whose good will and cooperation can affect the pace of agricultural development.

In the Middle East and North Africa, one group with which there is much potential for cooperation is the international seed companies. With varying degrees of success, several are marketing maize hybrids in the countries with which CIMMYT works closely in the region. In Turkey, for example, these companies enjoy a distinct advantage because of their highly efficient system for producing and distributing seed. This is something the national program does not yet have, though its own hybrids are competitive with any of those now being marketed in the country by the private sector.

In Egypt a very different situation prevails. Not only can the national program offer farmers superior varieties and hybrids, but it has been provided with a means of disseminating that technology in the national maize production campaigns. The seed requirements of the campaigns have been amply...
met by two private seed companies. During 1984 the two companies together distributed 7,000 tons of seed of national program varieties and hybrids and in 1985 boosted this amount to just over 12,500 tons, enough to cover 42 percent of the country's maize production area with improved germplasm. Partly as a result of the success of the national campaigns, the largest international company operating in Egypt has stepped up its own research and extension efforts, so as to maintain or increase its share of the seed market. Among the ultimate beneficiaries of this fairly competitive situation are Egyptian farmers, who profit from a strong national maize program and intensified efforts by the private companies to put more attractive products on the market.

Regional maize specialists try to foster good relations between national research programs and the various groups whose good will and cooperation can affect the pace of agricultural development.

Even so, it is questionable whether such a competitive relationship is altogether desirable, one in which national programs and private companies vie with each other for the farmers' allegiance and for the most effective national maize researchers. Could not the private companies be left to compete largely with one another, and could there not be a more cooperative and complementary relationship between them and the national programs?

One answer is that there certainly might be such a relationship and that it could entail a shift of national resources away from the development of finished products in hybrid work and toward open-

The "inquisitive approach" to agricultural research: Dr. Abdrabboh Ismail, assistant director of the Egyptian maize program, taking notes on an on-farm variety trial.
pollinated variety development and on-farm research. How far this shift in resources should be carried is a question that can only be answered by another group whose influence on national maize programs is of great interest to CIMMYT—namely the government officials and agricultural policy makers who chart the course of national agricultural development.

The answer is theirs to provide because only they can make the decisions that will create a large enough pool of national agricultural researchers both to keep national programs adequately staffed and satisfy the needs of the private sector. Moreover, only they are in a position to set policy that keeps some aspects of agricultural development in the public sector and places others in the private sector and that opens the way for both the public and private sectors to perform efficiently the tasks for which each is best suited.

An important challenge of national researchers and of CIMMYT's maize specialist in the Middle East and North Africa region is to help define the scope of the national programs' work and to demonstrate the worth of government investment in that work. The elements of success in meeting the challenge are a sharp focus on farmers' circumstances, creativity in designing research that fits those circumstances, and an acute awareness of the interaction between farmers' needs, the direction of research, and the shape of agricultural policy.

Nathan Russell, science writer/editor

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Maize production in Morocco's Atlas Mountains.