

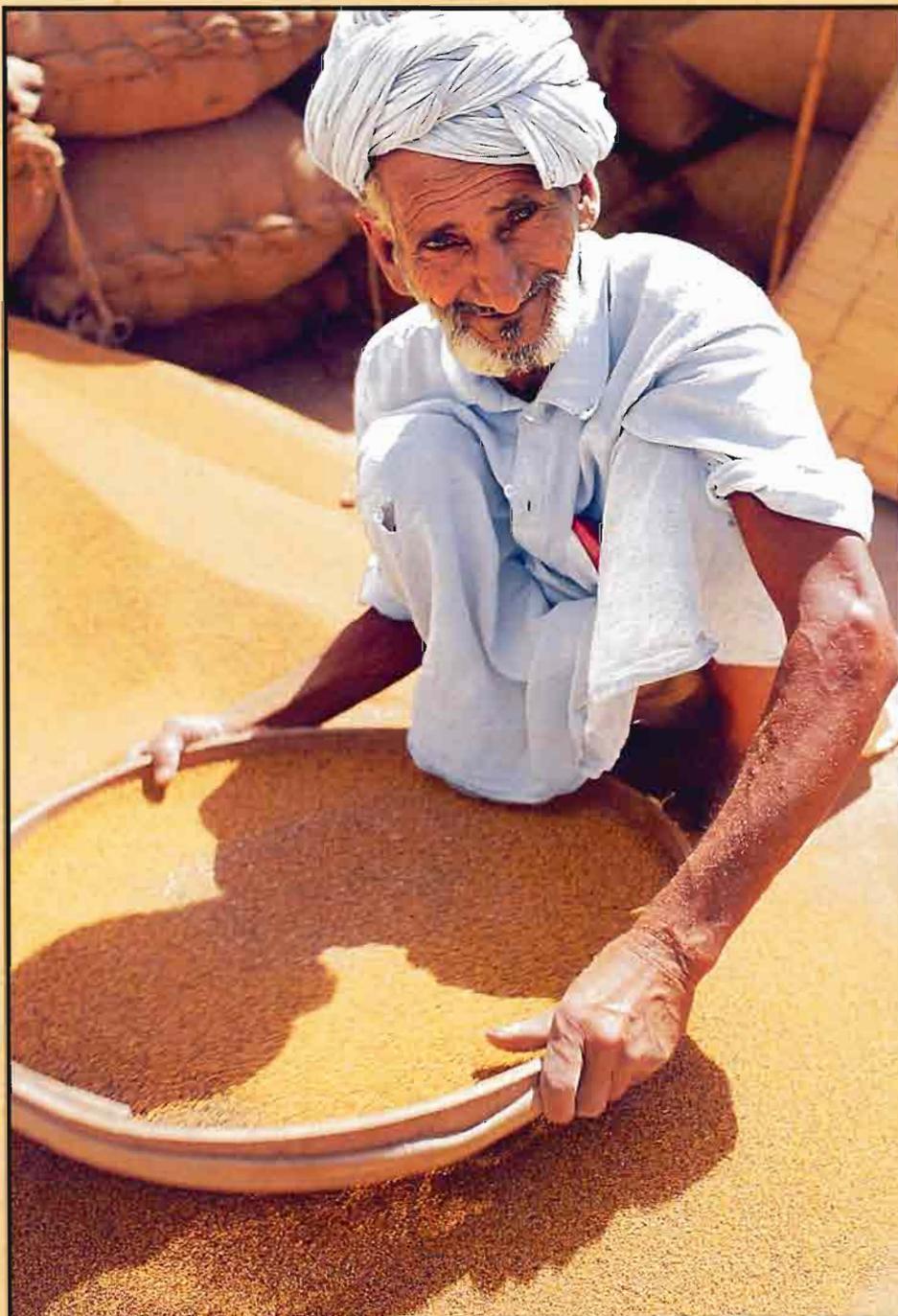


International Maize and Wheat Improvement Center

CIMMYT in 1994

Modern Maize and Wheat Varieties:

Vital to Sustainable Agriculture and Food Security



CIMMYT An international, non-profit, agricultural research and training center dedicated to helping the poor in low-income countries.

Focus Increasing the productivity of maize and wheat farmers in low-income countries; protecting the natural resources upon which agriculture is based. Work concentrates on maize and wheat, two crops vitally important to reducing poverty and to ensuring food security for the poor. These crops provide about one-quarter of the food (total calories) consumed in low-income countries, are critical to the diets of the poor and, for poor farmers, are an important source of income.

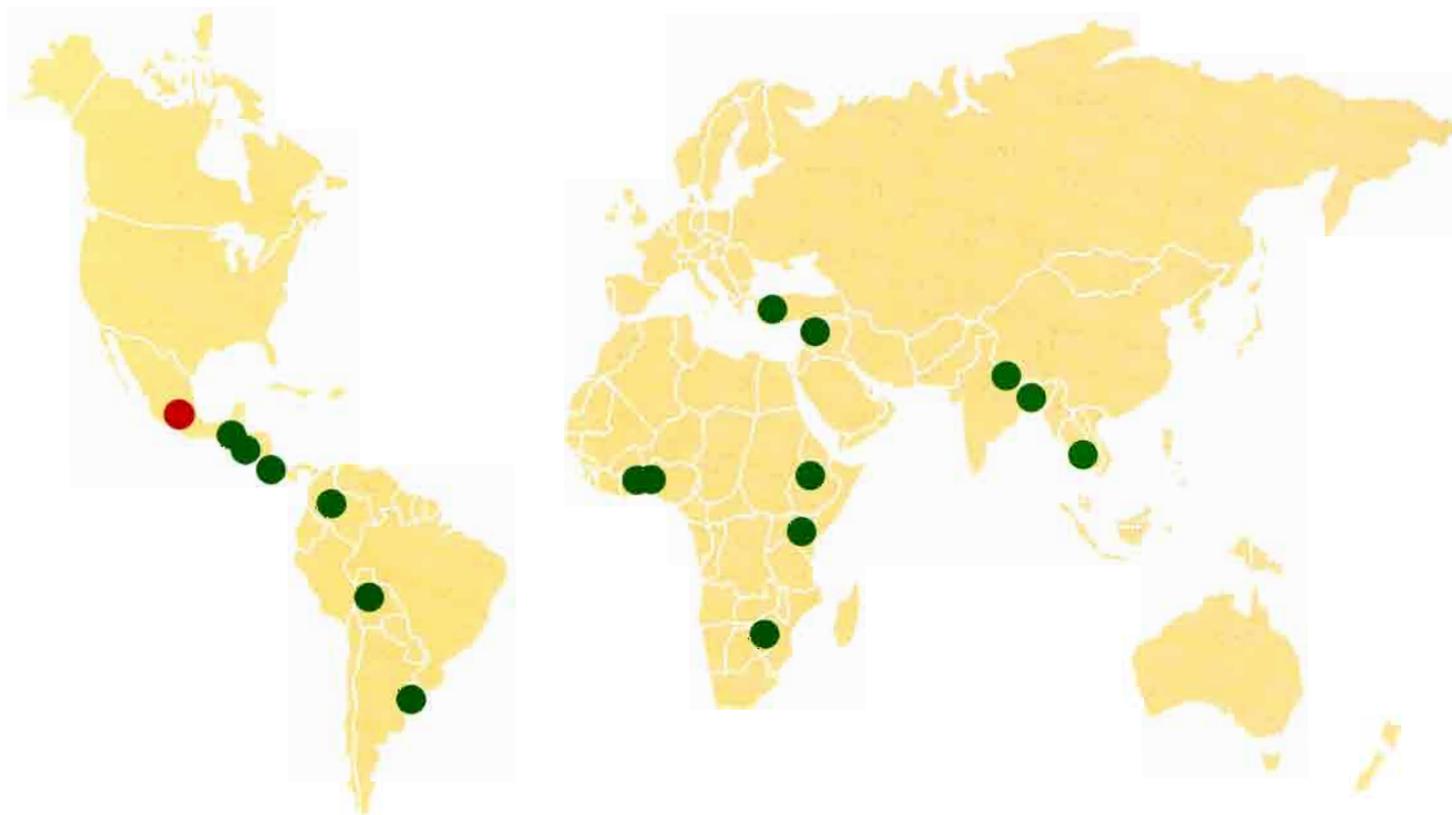
Activities Development and worldwide distribution of higher yielding maize and wheat with built-in genetic resistance to diseases, insects, and other yield-reducing stresses; • Conservation and distribution of maize and wheat genetic resources; • Strategic research on natural resource management in maize- and wheat-based cropping systems; • Creation and documentation of new knowledge about maize and wheat; • Development of more effective research methods; • Training of various types; • Consulting on technical issues.

Partners Staff work with colleagues in national agricultural research programs, universities, and other centers of excellence around the world, in the donor community, and in non-governmental organizations.

Impact 50 million hectares in low-income countries are now planted to CIMMYT-related wheat varieties (about 70% of the total wheat area in those countries, not counting China). • CIMMYT-related wheats moved onto 16 million hectares of farmland in low-income countries during the 1980s alone. • 13 million hectares in low-income countries are now planted to CIMMYT-related maize varieties (about 50% of the total nontemperate area devoted to improved varieties in those countries). • Nearly US\$ 4 billion in extra grain production each year can be traced to the higher genetic yield potential and built-in pest resistance of CIMMYT-related varieties. • More than 4,500 researchers are alumni of the Center’s training programs.

Location Headquarters are in Mexico, but activities and impact extend to over 100 countries via 16 regional offices (see addresses, back cover).

- Headquarters
- Outreach Offices





In recent annual reports, we have focused on the major problems impeding global development (poverty, environmental degradation, rapid population growth), how they interrelate and reinforce one

A Message from the Director General: another, and the role of agricultural research in dealing with them. We identified poverty ***CIMMYT's work is*** alleviation as the main issue, and argued that research leading to new "productivity-enhancing, resource-conserving" ***wholly consistent with*** agricultural technologies is essential to long-term success in meeting the challenge.

the goals of sustainable agriculture and global food security. Last year, we described some of CIMMYT's innovative efforts to generate such technologies, emphasizing that, at its best, innovation in science translates new ideas into useful applications. ***Since*** then, the Consultative Group on International Agricultural

Research (CGIAR), which funds CIMMYT's work, has articulated a new vision for agricultural development in low-income countries that reflects those same principles. The CGIAR's mission has broadened in response to new realities and now emphasizes the promotion of "sustainable agriculture for food security in developing countries." We use this report to assert — largely in the words of our senior staff — that modern

maize and wheat varieties make vital contributions to sustainability and food security, and that they are in fact essential components of any viable, long-term solutions to these challenges (pages 2-7). A much more complete discussion of this theme is found in a 1994 CIMMYT publication, written by Derek Byerlee, entitled *Modern Varieties, Productivity, and Sustainability: Recent Experiences and Emerging Challenges*. **T**here were, of course, noteworthy changes for CIMMYT during 1994. The most significant of these was the departure of Don Winkelmann, Director General, to assume the Chair of the CGIAR's Technical Advisory Committee. Dr. Winkelmann provided strong leadership, especially evident during the recent period of financial constraint, ensuring a Center-wide focus on core products and the truly important. We thank him for his efforts throughout a distinguished career with CIMMYT (see page 24) and we wish him well in all his future activities. **W**e welcome four new trustees to our Board: Drs. Walter Falcon (USA), Francesco Salamini (Italy), Alvaro Umaña (Costa Rica); and Mr. Francisco Labastida Ochoa (Mexico, *ex officio*). And, after 17 years with CIMMYT, the last 7 as Director of our Economics Program, Derek Byerlee joined the World Bank in May as a Principal Economist. We wish Dr. Byerlee the best in his new endeavors and thank him for his leadership and innovative contributions to CIMMYT's research over the years. **F**inally, after an initial period of uncertainty, our financial circumstances in 1994 shifted in favorable directions (pages 18-19). Revitalization of the CGIAR, currency fluctuations, increased efficiency, and more aggressive fund raising all contributed to the improvement over 1993, as well as to a more positive outlook for 1995. As a result, we anticipate handing over to a new Director General a vital, financially sound research institution, well prepared to deal with the challenges that will no doubt arise as this millennium comes to a close.

Roger Rowe

Acting Director General



The midday sun of northwest Mexico casts sharp shadows as Jose Alberto Quiroz, his skill honed by 12 years as a field assistant, quickly and expertly prepares one wheat plant after another for crossing

Modern Maize and Wheat Varieties: with genetically different mates. The work is painstakingly done according to complex crossing plans drawn up by the head of CIMMYT's bread wheat breeding unit, Sanjaya Rajaram – plans that bring together genetically diverse wheats from all over the world to coax higher yields, more disease resistance, and better stress tolerance from the gene pool.

Across the field, Tony Fischer slips yet another wheat leaf into the small jaws of a hand-held device that gauges the stomatal conductance of the leaf. "This technique is still experimental," says Fischer, physiologist and Director of CIMMYT's Wheat Program. "If it works, we'll be able to more quickly identify plants that stay cooler during the heat of the day. That trait is related to higher photosynthetic activity," he notes, "and translates into better genetic yield potential." But why worry about yield potential? Can't the world already produce enough wheat? "Right now, yes," says Fischer, "but people forget it will take 10 to 15 years for the work we're doing here today to make a difference in farmers' fields. By then, we'll have to feed about a billion more people, probably on less land than we're using now. That's why we've got to keep pushing the yield barrier."

Delbert Hess, Director of the CIMMYT Maize Program, agrees. "All our efforts – both in maize and in wheat – are geared toward making resource-poor

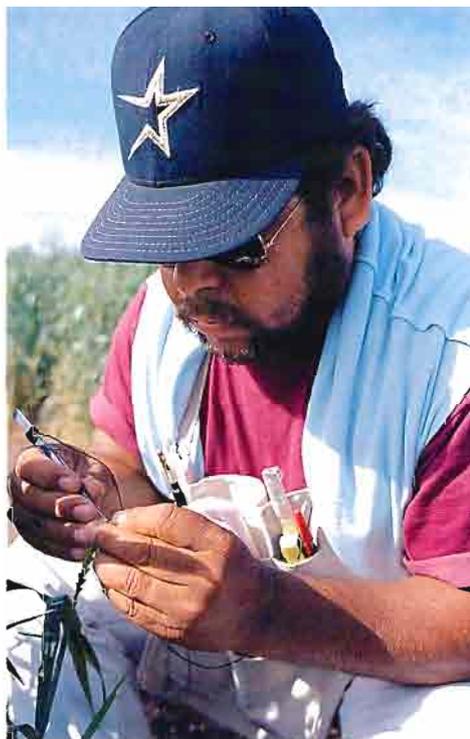
farmers more productive and protecting the environment," he says. "In the Maize Program, for example, we invest heavily in research aimed at producing improved varieties that naturally perform better in areas where production is limited by insects and diseases, or by such abiotic stresses as drought, low soil fertility, and acid soils. The result is higher and more stable farm-level productivity with fewer potentially harmful inputs."

Both Fischer and Hess know that productivity increases in developing country agriculture cannot

come at the expense of the environment. The research programs they lead reflect that conviction, as well as the firm belief that modern, genetically improved maize and wheat varieties are key ingredients to any recipe for sustainable cropping systems and food security for the poor.

"Simply put, they save land," says Larry Harrington, Manager of CIMMYT's Natural Resource Management Research Group. "Modern varieties have vastly increased productivity in

areas already being farmed, reducing the pressure to cultivate more marginal – and usually more fragile – environments." This is clearly true in many developing countries, where most of the dramatic increases in food production over the past 25 years have come from farming favorable areas more intensively. New, more productive rotations have been made possible by the advent of earlier maturing modern varieties. "South Asia's rice/wheat rotation is a good example," says Fischer. "That cropping system hardly existed in the region 30 years ago. Now it stretches across 13 million hectares of the best agricultural land in the region, providing food for some 150 million people."



T. Harris

“The issue is not just being able to provide more food for people,” adds Harrington. “In fact, it’s really about alleviating poverty.” Poverty accelerates environmental degradation, which in turn further impoverishes the already poor. As agricultural productivity goes up, however, jobs are created throughout the agricultural sector and beyond, and the real prices for basic commodities like wheat and maize — so important in the diets of the poor — tend to go down. Absolute poverty declines, reducing the pressure on the natural resource base. “These land-saving, poverty alleviating payoffs to modern varieties haven’t been sufficiently recognized in the sustainability debate so far,” notes Harrington.



true. “Resistance to maize streak virus in Africa is a good example,” says Dan Jeffers, CIMMYT maize pathologist. In the 1980s, CIMMYT teamed up with scientists at the International Institute of Tropical Agriculture in Nigeria to produce streak-resistant varieties that provide maize farmers with much more stable yields. “Before these new varieties came along, farmers

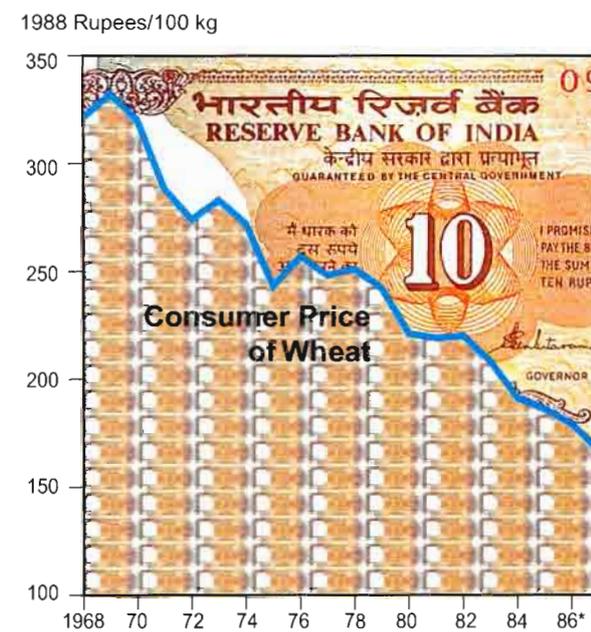
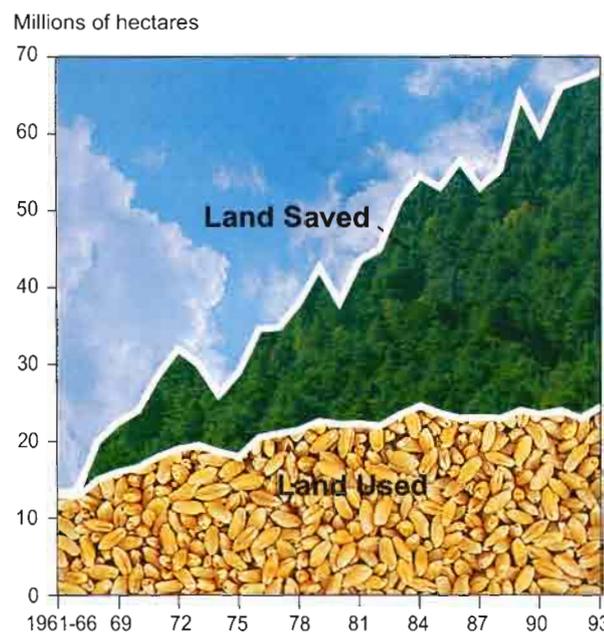
had no effective way to protect their fields from the virus,” says Jeffers.

Insect resistance presents a more difficult challenge to maize breeders (insects are not a widespread problem on wheat). Considerable progress has been made and insect resistant varieties are now being tested at key sites around the developing world, but much work remains to be done. “We’re giving a high priority to incorporating insect resistance in our elite varieties,” says Hess, “and trying to take advantage of all the scientific tools at our disposal — especially the promising new ones coming from biotechnology.”

But the most undervalued contributions of modern maize and wheat varieties arise from their built-in resistance to diseases. Conventional wisdom holds that traditional varieties or landraces are more resistant than modern cultivars. In reality, the opposite is generally

If Indian wheat farmers had to produce today’s harvest with varieties from the early 1960s, they would need to cultivate 40 million more hectares of farmland than they are now using. Modern varieties have also led to dramatic declines in the real price of wheat, benefitting poor consumers.

Saving Land and Lowering Wheat Prices with Modern Varieties in India



* Latest data available.

The strong, durable disease resistance of CIMMYT-related wheat varieties provides an effective substitute in poor countries for the expensive and potentially harmful fungicides that are widely used on the crop in industrialized nations. That superior resistance is reflected in greatly increased stability of yields in farmers' fields. However, durable resistance has been achieved only for some pathogens (fortunately, the most important ones) and, as the label implies, durable resistance must withstand the test of time. To help ensure that it does, researchers must continually incorporate new sources of resistance against evolving pathogens, providing farmers with a steady supply of improved varieties.



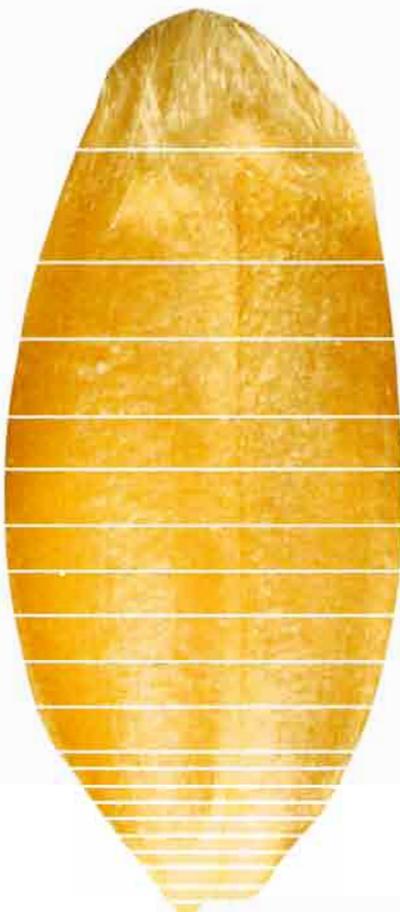
The ability of disease pathogens to evolve over time points to the importance of genetic diversity in farmers' fields, especially in wheat. A common claim is that the introduction of modern varieties sharply reduced on-farm diversity in developing country



wheat-producing regions. In truth, farm-level diversity was already limited, especially in favored production environments. "What actually happened in irrigated areas," says Bent Skovmand, head of the wheat genetic resources unit, "is that one or two dominant traditional varieties were replaced by a like number of modern wheats." Still, there was reason to be concerned about genetic diversity in farmers' fields, as it guards against devastating losses from, for example, mutating pathogens. CIMMYT wheat breeders and their colleagues in national programs responded by systematically broadening the genetic base of successive generations of the crop, pulling landraces

Genetic Diversity in Modern Wheats

While uniform in their appearance, modern wheat varieties contain a wealth of genetic diversity. For example, plant breeders drew on 49 landraces from 21 different countries to produce Kauz, a high-yielding, disease-resistant wheat variety now grown on large areas in the developing world.



- Italy (8)
- Russia (7)
- Brazil (4)
- Argentina (4)
- Kenya (3)
- India (3)
- Japan (2)
- Poland (2)
- Germany (2)
- Uruguay (2)
- USA (2)
- Morocco (1)
- Canada (1)
- Netherlands (1)
- Peru (1)
- Great Britain (1)
- Spain (1)
- Egypt(1)
- Australia (1)
- South Africa (1)
- France (1)

Total Landraces - 49



into the crossing program, mixing the spring- and winter-wheat gene pools, and seeking useful diversity in alien species.

During the 1980s, farm-level diversity in wheat widened considerably with the release and adoption of many more

genetically diverse varieties. The bread wheat crossing block draws together genetic material from all over the world, from all available gene pools, even from the original parental stock of bread wheat and alien species, in a concerted effort to continue broadening the genetic base of the crop.



Finally, modern maize and wheat varieties promote sustainability and food security for the poor by incorporating tolerance of such abiotic stresses as



drought, waterlogging, poor soil fertility, and acid soils. “For example, we’ve found an effective way to select maize varieties that out-perform traditional cultivars when a dry spell hits near flowering time,” says Gregory Edmeades, CIMMYT maize physiologist. “These new varieties provide about 30% more grain under mid-season drought than farmers would otherwise get.”

Varieties that perform better under such conditions are especially beneficial to small, resource-poor farmers tilling more marginal lands. In addition, modern varieties can promote the adoption of resource-conserving farming practices. Conservation tillage practices, for example, can lead to the build-up

of pest populations; these practices could be made more appealing to farmers by the availability of varieties with built-in resistance to the pests.

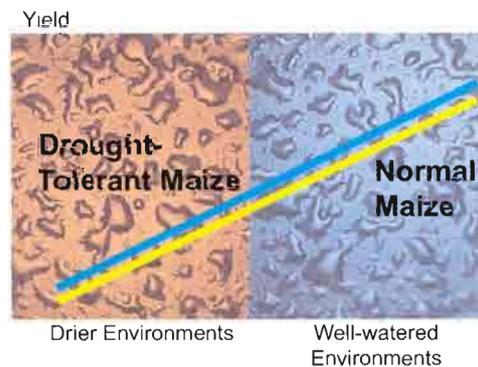


“Modern maize and wheat varieties have been a driving force in productivity gains in developing country agriculture for the last quarter century,” notes Roger Rowe, CIMMYT’s Director of Research. “They will no doubt continue as a vital source of productivity growth for the foreseeable future. But beyond that, modern varieties make critical – and often overlooked

– contributions to sustaining natural resources and ensuring food security for the poor.”

Higher genetic yield potential, stronger and more durable genetic resistance to insects and diseases, tolerance to a range of abiotic stresses, more efficient use of inputs – all contribute to protecting the

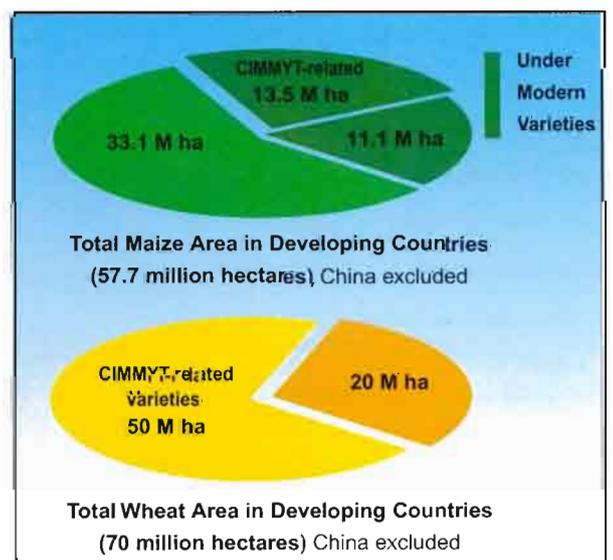
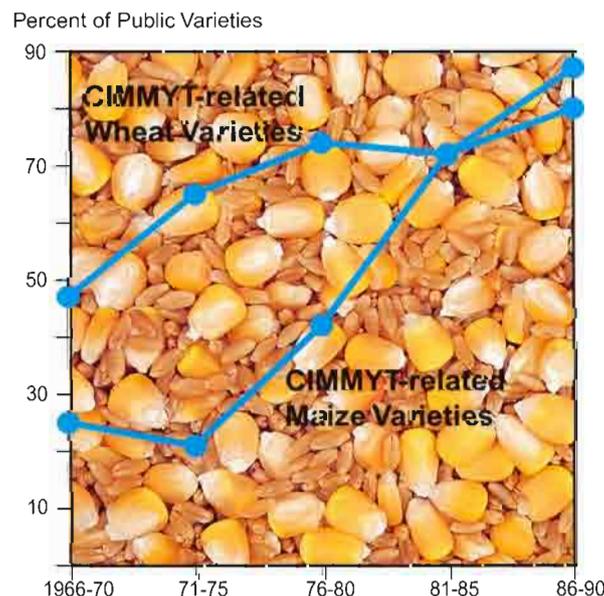
environment and to higher and more stable yields in farmers’ fields.



Drought-tolerant maize varieties yield better under a broad range of moisture conditions.

Collaborative Research Reaching Farmers' Fields

A high proportion of maize and wheat varieties developed and released by national programs in developing countries contain genetic material from CIMMYT. This collaboration has led to large areas being devoted to modern varieties.



“It’s a popular misconception that wheat researchers haven’t made much progress since the rapid gains of the Green Revolution during the 1960s,” says Tony Fischer, Director of the CIMMYT Wheat Program. “Remember that those gains – what some have referred to as a ‘quick technological fix’ – were based on about 20 years of research in Mexico. Since then, we’ve steadily added to the yield potential of wheat at an average rate of

Pushing Back the about 1% per year, and many farmers have replaced the initial Green Revolution varieties several times to take advantage of this steady improvement.”

Yield Barrier in Wheat: “We’ve redesigned the plant in important ways,” explains CIMMYT bread wheat breeder Sanjaya Rajaram, “opening up the canopy to allow more grain-bearing tillers to survive. We’ve made the crop

“We’ve redesigned the genetically more resistant to diseases and more efficient in the use of water and nutrients. All these improvements contribute to higher and more stable yields in farmers’ fields.”

plant in important Because of their inherent advantages, CIMMYT-related bread wheats have traveled far since the early 1960s. They now cover about 70% of all wheat land in developing countries, and they generally

ways,” explains outperform traditional varieties, even in more marginal environments. “So, in a very real sense,” notes Fischer, “now we’re competing against ourselves. Further increases in productivity are going to come from

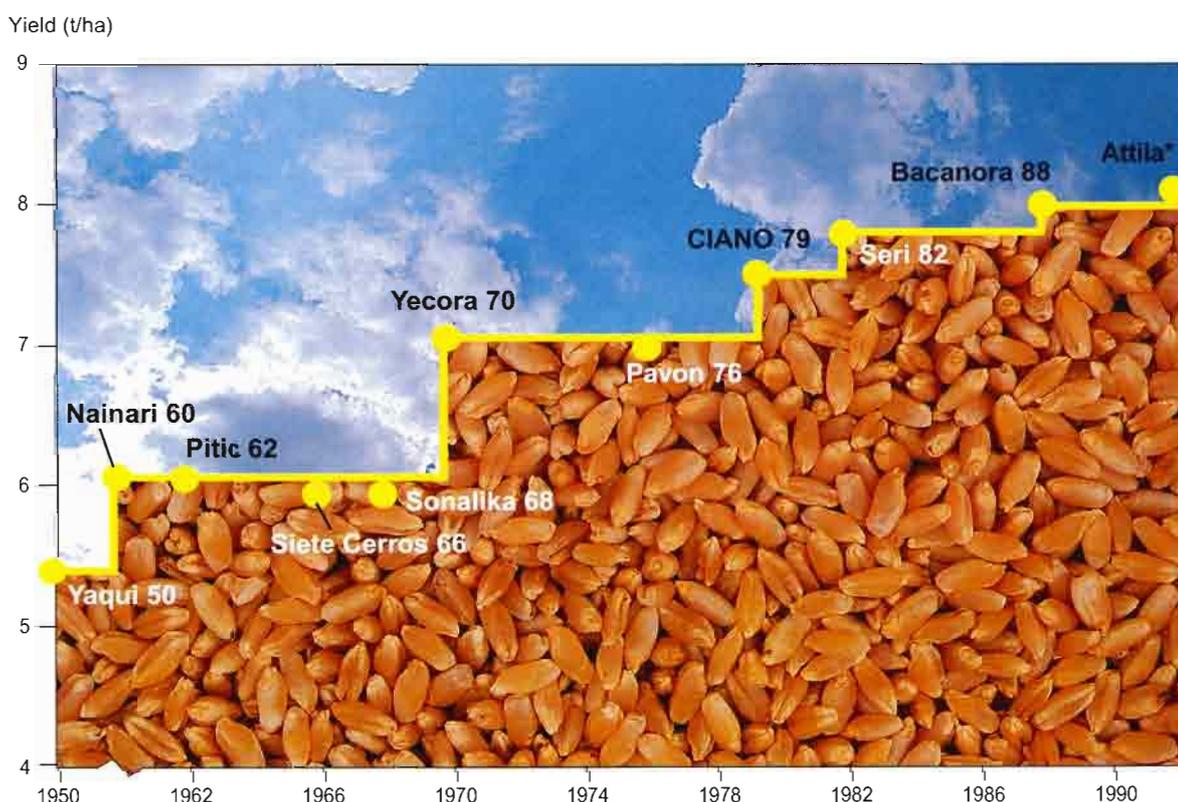
CIMMYT bread wheat replacing older improved varieties with newer ones, and of course by wider use of improved farming practices.” Success hinges on close partnerships with national agricultural research programs

breeder Sanjaya and on a creative combination of disciplines – the skills of plant breeders, pathologists, physiologists, agronomists, biotechnologists, and others – to produce steady increments in the genetic yield

Rajaram. potential of wheat.

Breeders and pathologists, for example, have made remarkable progress against the major diseases of wheat. Losses to stem rust have been negligible since the early 1960s, and no major outbreaks of leaf rust have been reported for more than a decade. But constant attention to these and other important diseases of wheat is essential. “We’re always on the lookout for genes that can add to resistance, especially against leaf rust,” says pathologist Jesse Dubin, “and with new technologies making it easier to move things around, we’re able to look for resistance

Breeders have increased the yield potential of modern wheat varieties by about 50% since 1950. However, while progress has been steady during the past 20 years, recent gains have not been as dramatic as in the early years.



* Advanced line



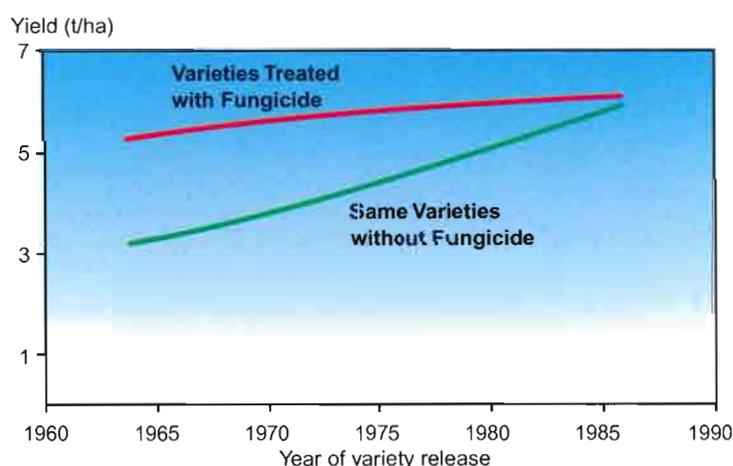
beyond the traditional gene pools, in the backgrounds of distant relatives and alien species.” In doing so, CIMMYT scientists are finding enough genetic diversity to keep building on the already powerful resistance of the Center’s materials.

Physiologists are focusing on specific features of the wheat plant that they think promote the greater photosynthetic activity of modern varieties, a trait directly linked to their higher genetic yield potential. Cooler canopy temperatures, higher leaf chlorophyll content, and greater stomatal conductance are all being measured in the field with a new generation of hand-held meters that give nearly instantaneous readings. If these measurement techniques work, and if the suspected linkages hold up, breeders will have a new and powerful set of tools at their disposal for selecting higher yielding plants.

Concerned with the more efficient use of inputs, agronomists are analyzing how wheat takes up and assimilates such soil nutrients as nitrogen and phosphorus. “Our most recent findings suggest that CIMMYT-related varieties actually produce more grain, with higher protein content, on lower rates of nitrogen fertilizer,” says Ken Sayre, CIMMYT wheat agronomist. “The plants are becoming more nitrogen-efficient over time, which is good news for farmers and for the environment.”

Finally, in the struggle against the yield barrier CIMMYT researchers are going back to one of the wheat plant’s original parents (goat grass) to look for additional genetic diversity. The Center is producing new “synthetic” wheats (combinations of goat grass and elite durum wheats) that are serving as a bridge for moving additional yield-enhancing traits from that distant relative to modern bread wheats. Says wide crosses specialist Abdul Mujeeb-Kazi, “The new synthetics are placing at our fingertips an exciting range of genes, not only for disease resistance, but also for such traits as drought tolerance and higher rates of photosynthesis that could make for greater yields.”

“We’re pulling out all the stops,” says Fischer. “Higher yield potential in wheat, coupled with better yield stability, is good for developing country farmers, good for the poor in urban areas, and good for the environment. We’re using all available techniques to keep yield potential moving upward.”



The built-in disease resistance of newer wheat varieties enables them to realize more of their genetic yield potential, without environmentally dangerous fungicides.

Colombian researchers are excited about their recently released maize variety, ICA-Sikuani V-110. Named after an indigenous tribe that thrives in the country's savannas, Sikuani was developed using acid-tolerant maize resulting from more than a decade of research by CIMMYT breeder Shivaji Pandey, in

Acid-tolerant Maize:

collaboration with national programs worldwide and the Centro Internacional de

Agricultura Tropical (CIAT). "I'm a rice man by study and background," says Dario Leal Monsalve, Regional

A good fit for sustainable

Coordinator for the Colombian Agricultural Research Corporation (CORPOICA),

"but the impact of Sikuani will be much greater than that of acid-tolerant rice, because maize has more diverse

systems being developed

uses and because Colombians are maize consumers by tradition."

Together with pasture grasses, green manures, and other acid-tolerant grain crops, acid-tolerant maize

for South America's acid

fits well in sustainable systems being developed for South America's acid savannas,

hillsides and forest margins. "Our varieties will provide a third more grain than conventional varieties on acid

savannas, hillsides, and

soils and superior yields on normal soils," says

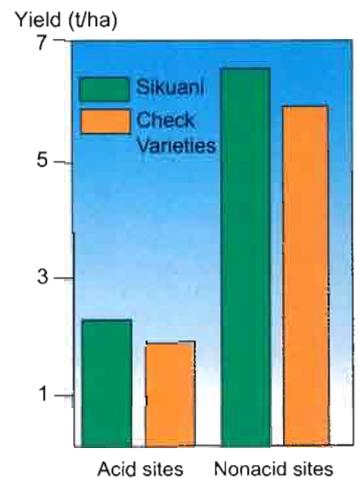
Pandey. "They also require fewer chemicals, and so are more profitable for

forest margins.

farmers and less damaging to the environment."

Results of long-term studies by CIAT and Colombian researchers on the effects of intensifying production on fragile savannas have so far been favorable, according to José Ignacio Sanz, of CIAT's Lowland Tropical Program.

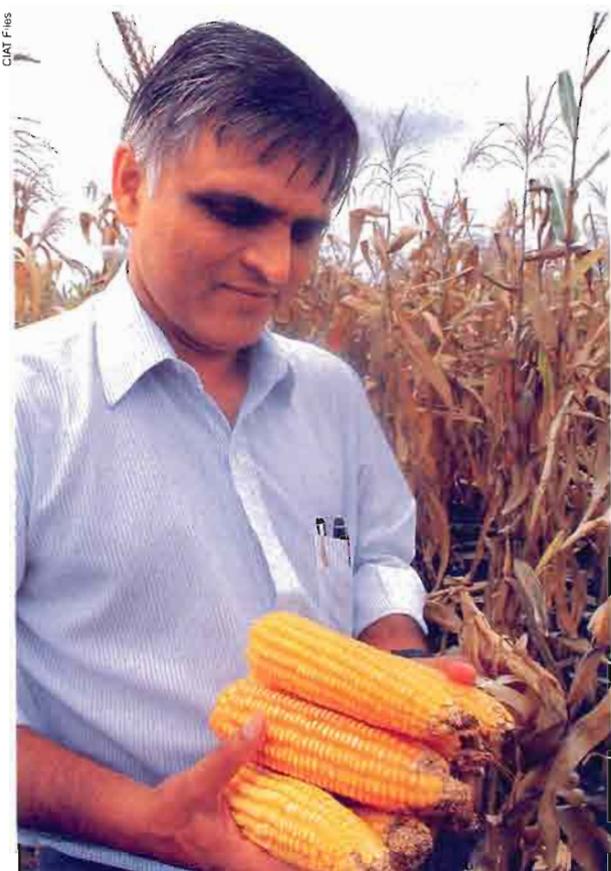
"We have six-year trends in data," says Sanz, "showing that you can maintain or increase animal production while freeing land for farming, and still improve soil quality." Opening up the savannas this way would lessen pressure from poor farmers to raze the margins of precious tropical forests. "Acid-tolerant crops such as maize also open the potential for reforesting degraded forest margins in the Amazon," says Carlos E. Lascano, of the CIAT Tropical Forages Program. "Farmers can plant a crop to make use of land while trees grow big



The new maize variety Sikuani performs better even under nonacid soil conditions.

enough to be safe from cattle and other animals." Sanz says that some 75 million hectares of level, well-drained savanna is available for immediate agropastoral use throughout Bolivia, Brazil, Colombia, Guyana, Surinam, and Venezuela.

Intensive use of savannas would provide more and cheaper food for South America's city dwellers — three-quarters of the continent's populace — but would involve mostly larger landholders. What of the small-scale farmers in South America and elsewhere? "Millions of poor people farm on acidic hillsides, and many others are caretakers of pasture lands owned by wealthy absentee landlords," says Pandey. "They grow a hectare or two behind their houses for family consumption, and would benefit greatly from acid-tolerant maize." Pandey also mentions large tracts of acid lands in the humid belt of West Africa, in parts of Central Africa, and in Southeast Asia where subsistence farmers grow maize on acid soils. CIMMYT researchers in Africa and Asia are testing Pandey's materials, and a variety called Antasena derived from this work has been used by small-scale farmers in Indonesia since 1993.





Genetic engineering techniques are now adding an extra coat to the armor of tropical maize against hungry insects. The new protection is based on DNA from a common soil bacterium, *Bacillus thuringiensis* (Bt), that produces substances lethal to moth larvae known as stem borers and fall armyworms. As they feed on leaves, stems, and other plant parts, these insects typically reduce developing country maize harvests 20% or more. Combined with naturally occurring resistance in maize, the bacterial insecticide genes could make improved varieties the cornerstone for integrated pest management in developing countries, greatly reducing harvest losses, insecticide costs, and the harmful effects of pesticides on the environment. "We're trying to provide engineered resistance in two ways," explains David

Hoisington, Head of CIMMYT's Applied Biotechnology Laboratories (ABL). "The first is to acquire maize that has the insecticidal genes already inserted; the second is to acquire the bacterium genes themselves and use them to

Pest-proofing Tropical

transform tropical maize." On the first count, the ABL and CIMMYT Maize Program

Maize through Gene

temperate maize obtained from private companies. "If this maize withstands tropical

Transformation: Adding

standard crossing techniques, along with DNA markers for the inserted genes, to move the resistance genes into tropical maize lines more suited to the research needs of national programs."

to naturally occurring

In the second approach, a team headed by Natasha

resistance to make

Bohorova, of the CIMMYT Applied Genetic Engineering Laboratory (AGEL),

improved varieties the

has been busy for several years hunting down the right genes, identifying maize lines whose individual cells can easily be regenerated

cornerstone for

into whole plants, and perfecting transformation techniques. They are now using a "gene gun" to insert into tropical maize

integrated pest

two Bt genes prepared for this purpose by scientists from the

management in

University of Ottawa, Canada. The AGEL has also contracted the Center

developing countries.

for International Cooperation in Agricultural Research for Development (CIRAD), France, to develop a third transformable Bt gene whose insecticidal effects should complement those of the Ottawa genes. Says Bohorova: "Success with the pesticide genes will point the way for placing a range of other useful characteristics into tropical maize."



For years, public and private seed organizations in developing countries waged an undeclared war over who should provide improved maize seed to farmers. Recently, conflict has moved toward collaboration as these long-time antagonists have started forging new alliances. Many public organizations have now given up their traditional monopoly over maize seed production and distribution,

From Conflict toward Collaboration: Many public maize research and seed production organizations in opening the door to private seed companies and non-governmental organizations. “Most observers welcome growing activity by private seed companies, which often supply superior products to farmers rapidly and cost-effectively,” says Michael Morris, CIMMYT’s Regional Economist for Asia, “but some worry that private companies will naturally focus on lucrative markets, ignoring poor farmers — the majority of the rural population.”

organizations in developing countries are now opening the door to private seed New evidence suggests that these farmers may provide a profitable market for improved seed. For example, CIMMYT economists Melinda Smale and Paul Heisey documented smallholders’ growing use of improved seed in Malawi. “When the material meets farmers’ requirements, and seed production and distribution are efficient, demand can grow tremendously,” says Smale. “In Malawi, a key factor was private companies’ ability to build on the work of public sector maize breeders. It’s a good example of the experience and interests of public and private organizations converging — to everyone’s benefit.”

companies and NGOs. Malawi isn’t an isolated example. Every seed industry success story in small-scale agriculture reveals some combination of public sector breeding research and private sector seed production and marketing. “Public breeding institutions have had to reconsider research priorities because of funding cutbacks,” says Morris. “So if private companies successfully develop seed for commercial farmers, public institutions figure they shouldn’t invest scarce resources doing the same thing.” On the other hand, free access to breeding materials from public programs is actually the key to survival for many private companies. Studies in India, Mexico, and

Brazil show that private companies turn a profit more quickly when they can build on the research already done by public maize breeding programs. Farmers are better off for the collaboration, as well. By analyzing these success stories and identifying which factors were instrumental in bringing improved maize seed to farmers at reasonable prices, CIMMYT anticipates helping other developing countries achieve similar success.





A farmer's decision to use a new technology is often compared to what happens when a shopper buys a new product to try. "In reality farmers' decision making is far more complicated than that," says Larry Harrington, economist and head of CIMMYT's Natural Resources Management Research Group. "The risk of failure and the chances of being unhappy with new technologies are far greater. That's why understanding farmers' reasons for accepting or rejecting agricultural innovations is so crucial for designing and promoting useful new practices. This is especially true for practices that conserve soil, water, or other important agricultural resources; the cost is borne today, while payoffs may be years down the road."

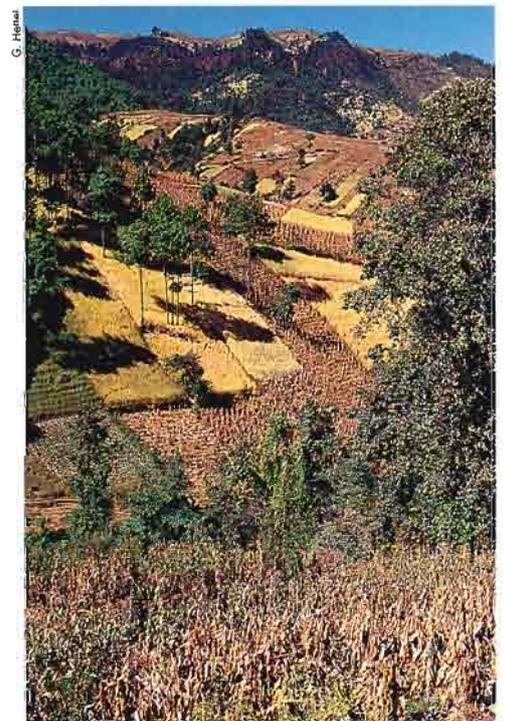
Farmers' decisions to use resource-conserving practices have come under closer scrutiny. A recent study identified several related reasons why farmers in the Guaymango community of El Salvador began using soil conservation practices, while farmers in two similar communities did not. For instance, soil conservation practices

Accelerating Agricultural Innovation: were linked with the use of improved varieties and other inputs targeted at raising maize production rapidly. Farmers' access to seed and other inputs was conditional on their willingness to stop burning crop residues and use them instead as mulch. "Because of the incentives to use both productivity and conservation practices together, farmers in Guaymango — unlike farmers in other areas — didn't take up practices that brought only short-term yield increases and ignore the ones that brought the longer term gains of soil conservation and improved soil fertility," says Gustavo Sain, CIMMYT economist. "No distinction was made between the two kinds of practices, and both were adopted at the same time."

Understanding farmers' reasons for accepting or rejecting agricultural innovations is crucial "Compatibility with the local farming system was probably the prime reason for the new practices' enduring success," notes Hector Barreto, CIMMYT/CIAT agronomist. "The better yielding maize was so productive that, together with the local sorghum variety, there was plenty of residue to feed cattle and use as mulch. Farmers didn't have to choose between feeding their cattle or improving their cropping system."

for designing and promoting environmentally sound farming practices. The Guaymango experience highlights the usefulness of adoption studies: they heighten awareness of farmers' needs and of the technical requirements of individual farming systems. They also alert

policy makers to instances where policies or institutional arrangements (such as the program for providing inputs in Guaymango) can encourage adoption. "For this reason," says Harrington, "CIMMYT sees sound research on adoption processes as the foundation for what we call 'targeted policy workshops,' during which researchers, extensionists, farmer groups, NGOs, and others debate productivity and sustainability problems, as well as possible solutions." By distilling farmers' knowledge and experience, adoption studies help create successful partnerships for speeding the adoption of productivity-enhancing, resource-conserving technologies.



Progress in Collaborative Rice/Wheat Research

South Asia's rice-wheat cropping system provides food



security for hundreds of millions of poor people in the

The Year in Review: Sustainability and productivity of the system have

Selected formally joined forces under the Consortium for

highlights of Sustainability of Rice/Wheat-based Cropping Systems for the Indo-Gangetic Plains. In November,

CIMMYT the national programs participating in the consortium

activities specified the “back-up research” needed from their international partners. In turn, other members of the group specified the contributions they could make. By matching research “demand” and “supply” among all its members, the consortium has

now essentially charted the course for its future work, identifying priority problems, interventions to deal with them, and areas where additional expertise is needed.

Wheat: A Profitable Option in Bangladesh

In 1980, the government of Bangladesh launched an ambitious campaign to increase rice and wheat production. As a result, Bangladesh now stands at the threshold of self-sufficiency in rice, and production of wheat has increased notably. Recently, however, some analysts have questioned the continued promotion of wheat production. A new CIMMYT /IFPRI study concludes that wheat production is profitable for farmers in certain environments and is also cost-efficient for the nation. Rather than abandon promotional efforts, the study recommends that Bangladeshi wheat researchers focus increasingly on specific areas

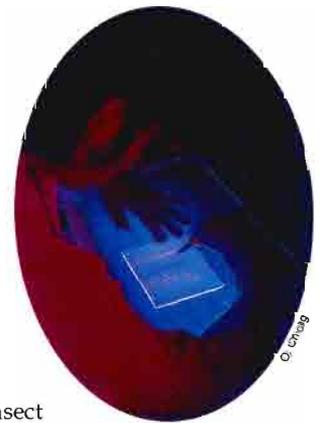
CIMMYT Files



where the crop is profitable (usually those not well-suited for irrigated winter rice) and where research can have the greatest impact.

Locating Loci Responsible for Insect Resistance

Researchers in the CIMMYT Applied Biotechnology Laboratories charged with tracking down the DNA segments for borer resistance in tropical maize have drawn near their quarry. Success will mean more efficient selection for insect resistance. Building on previous laboratory results from molecular geneticists, graduate student Susanne Groh is using highly inbred maize lines from crosses between resistant and susceptible parents to zero in on the causal regions of the chromosome. Biometrician Chiangjian Jiang is analyzing the mapping data using one of the most robust models available – the Composite Interval Mapping approach – which he has helped develop and refine with scientists from North Carolina State University



since 1993. Both efforts are funded by Eiselen-Stiftung, a private foundation in Germany that supports biotechnology research for developing countries.

Seeds of Hope: Restoring Maize Farming in Rwanda

Casualties in the Rwandan conflict include the country's maize harvest and, worse yet, the seed that farmers normally save for planting, endangering future food supplies and the fragile stability of this largely agricultural nation. To enable returning Rwandans to live off their land once again, CIMMYT is contributing maize seed of locally released improved varieties and overseeing its multiplication, as part of a crash



program coordinated by the Centro Internacional de Agricultura Tropical (CIAT). The seed came from our breeders' stores of improved highland maize adapted to

Rwandan conditions. By September 1995, some 200 tons of maize seed should be ready for farmers to plant.

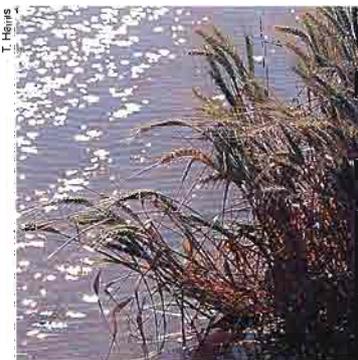


Soil Fertility in Southern Africa

To assist small-scale maize farmers on about 5.2 million hectares throughout southern Africa, CIMMYT agronomist Stephen Waddington helped organize a research network that will tackle their major obstacle — declining soil fertility. Supported by the Rockefeller Foundation and the CIMMYT regional office in Harare, the network blends the expertise of a multidisciplinary research team from Malawi and Zimbabwe with input from maize scientists of Kenya to define the problems, applies geographic information systems to map affected areas and improve the targeting of fertilizer recommendations, and documents technical and social constraints to improved soil management.

Submersible Plants Resist Drowning

In high rainfall areas or poorly drained irrigated systems where wheat is grown, it is not uncommon for farmers to lose 50% or more of their crop to waterlogging, which kills wheat plants by starving them of oxygen and nitrogen. CIMMYT agronomists and breeders have identified a group of hardy lines that yield reasonably well even if they spend part of their growth cycle up to their leaves in water. These wheat lines will feed directly into CIMMYT's efforts to generate high yielding, stable varieties for developing country wheat farmers on the 10-15 million hectares where flooding is a problem.



Reusable Beds for Irrigated Wheat

CIMMYT agronomists are perfecting a system for irrigated wheat that combines row planting with reduced tillage. Farmers adopting the system will grow wheat on raised beds that can be reused cycle after cycle, with crop residues left on



the soil surface. By reducing soil tillage and improving water use efficiency, this technology has the potential to make irrigated wheat systems more sustainable and less costly for farmers. Wheat producers on millions of hectares of irrigated wheat cropping systems in India, Pakistan, China, Turkey, and Mexico should benefit, especially because the practice safeguards two of their most important resources, soil and water, and does so while reducing production costs.

Zero-till Network Helps Mexican Maize Farmers Save Soil

Small- and medium-scale maize farmers in the Pacific-Central part of Mexico, faced more than ever with the need to reduce the costs and risks of production while conserving soil and water resources, have been getting a helping hand since 1992 from a

research network involving the Mexican National Institute of Forestry, Agriculture, and Livestock Research (INIFAP), CIMMYT, and the French Center for International Cooperation in Agricultural Research for Development (CIRAD). In a 1994 workshop organized by CIMMYT-CIRAD agronomist Eric Scopel, network participants determined the best way to analyze data from a 20-site experiment on residue management, fertilization methods, and reduced tillage. They also made preparations for applying computer models to maize production under conservation tillage, and agreed on coordinated activities and methods for 1995.

Rescuing Latin American Maize Races

An international panel of experts on maize genetic resource conservation praised the work of 13 national seed banks in Latin America and the Caribbean that have been cooperating since September,

1991, to regenerate endangered holdings of maize landraces. Coordinated by CIMMYT and financed by USAID and the US National Seed Storage Laboratory (NSSL-USDA), the



rescue effort has restored seed of more than 3,000 endangered accessions and partially regenerated nearly 3,000 more. In addition, the panel's report states that "...the project has laid the groundwork for future cooperative international activities related to the conservation and utilization of maize germplasm." Says Dr. Garrison Wilkes, biology professor at the University of Massachusetts at Boston and a member of the panel, "This group has achieved an outstanding level of cooperation." Wilkes believes one strong point of the project is that most participating germplasm bank directors are also plant breeders actively involved in crop improvement.



In 1994, external review panels assessed several of the Center's larger research

Reviews initiatives, as well as

the work of its research support and units. In general,

CIMMYT's efforts were

Recognition commended. Full

reports on the following are available upon request:

- The Economics Program's work on research resource allocation and research impacts was reviewed by a team of outside experts, led by Jock R. Anderson, 31 January to 4 February.
- CIMMYT's research support units were reviewed by John Axtell, 17-19 March.
- The Wheat Program's germplasm improvement research subprogram was evaluated by a panel of specialists in wheat breeding, also led by John Axtell, 20-25 March.
- The Center's collaborative project to regenerate maize accessions stored in national germplasm banks in Latin America and the Caribbean underwent its midterm evaluation, 18-20 April.
- The Applied Biotechnology project to develop transgenic tropical maize with enhanced resistance to insect pests was evaluated by the External Advisory Committee led by Tom Hodges, 11-13 July.
- The Maize Program's subtropical, midaltitude, and highland subprogram was

reviewed by a team led by Margaret Smith, 19-23 September.

After a visit to CIMMYT in August, **Ismail Serageldin**, Chairman of the CGIAR and Vice President for Environmentally Sustainable



Development, World Bank, observed that "the CGIAR and its Centers are uniquely placed to meet the challenges of alleviating poverty, increasing global agricultural productivity, and conserving the environment – all within a sustainable development framework. The dedication and track record of CIMMYT scientists are exemplary, and I have no doubt that by working together we can meet the above troika of challenges effectively and expeditiously."

Surinder K. Vasal (maize breeder) was elected a Fellow of the Crop Science Society of America (CSSA) for 1994.



George Varughese (the Associate Director of the Wheat Program) was elected a Life Member of the International Triticale Association, in



recognition of his long dedication and achievements in triticale research.

Eugene E. Saari (wheat pathologist) was elected a Fellow of the Canadian Phytopathological Society at the annual meeting in Edmonton, Alberta, Canada.



Identifying Production Problems in Tropical Maize: A Field Guide, written by **Renee Lafitte**, edited by **Michael Listman**, and designed by **Miguel Mellado**, received an Award of Excellence (publications category) from the American Society of Agronomy.

The most significant financial news from 1994 is that CIMMYT ended the year with a US\$2.4 million surplus. This money allowed us to replenish

Financial Highlights working capital depleted by over expenditures of roughly the same amount in 1993. The surplus resulted from the combined effects of several circumstances, including the decisions taken as part of CGIAR renewal, the recording of income that had not been credited previously to our books, the devaluation of the US dollar against certain donor currencies, savings and underspending by the Center throughout the year, and a heightened focus on fundraising. In general, CIMMYT spending declined in 1994 by about \$0.4 million in nominal terms from that of 1993.

Revitalizing the CGIAR

In the single most important event affecting CIMMYT's recent financial situation, CGIAR Chairman Ismail Serageldin announced at the System's midterm meeting in May that the World Bank would guarantee a \$40 million annual pledge for 1994 and 1995, as well as a one-time fund of up to \$20 million to match half the core money contributed by other donors during this period. Following recommendations by Mr. Serageldin as part of his plan to reorganize and revitalize the CGIAR, CIMMYT moved several complementary projects amounting to \$2.0 million into the core classification. In doing so, we followed our usual criteria for delineating core research: that which entails relatively little risk, provides relatively high returns, and for which CIMMYT is a cost-effective supplier. In this way, for example, UNDP-supported research to make tropical maize more resistant to insect pests through genetic transformation — once considered high-risk but now a proven technique — became part of core activities. Likewise, work to develop an

efficient protocol for transferring useful traits from rye to wheat using molecular markers, funded by the government of Denmark, became core by virtue of its high potential payoffs and relatively low risk. These changes attracted some \$1.2 million in new core funds from the World Bank.

Tallying New Income

In 1994, approximately \$1.0 million that had been counted as income in previous years by the CGIAR entered our books. Expenditures on two major projects were overestimated in prior years' budgets, with actual expenditures and income catching up in 1994, closing the revenue recognition gap with the CGIAR on those projects.

Currency Fluctuation Effects

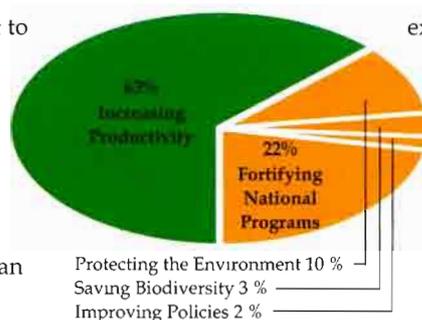
Due to the devaluation of the dollar relative to certain donor currencies during 1994, the value of donor payments made late in the year in other currencies increased by \$0.4 million. On the other hand, in December, 1994, the Mexican peso was allowed to float, resulting in an immediate devaluation of some 40%. Rather than benefiting from the latter circumstance, CIMMYT actually lost some \$0.4 million at year's end in accounts receivable denominated in pesos.

Efficient Operations, Active Fundraising

Along with reducing staff and activities, CIMMYT has pursued numerous other cost-cutting, efficiency-enhancing strategies as part of downsizing. The most obvious and profitable of these were already in place by

1994, and included reductions in the area of

experimental trials on CIMMYT-operated stations in Mexico and modernizing telecommunications to take advantage of new, more efficient technologies. Such efforts have saved the Center more than



Allocation of CIMMYT resources to research activities defined by the CGIAR.

Expenditures and funding, 1993-94 (US\$ millions).

	Expenditures		Funding	
	1993	1994	1993	1994
Core	26.3	25.6	23.0	27.2
Complementary	6.1	4.0	6.1	4.0
Interest and other income			0.8	0.8
Operating funds		2.4	2.5	
Total	32.4	32.0	32.4	32.0

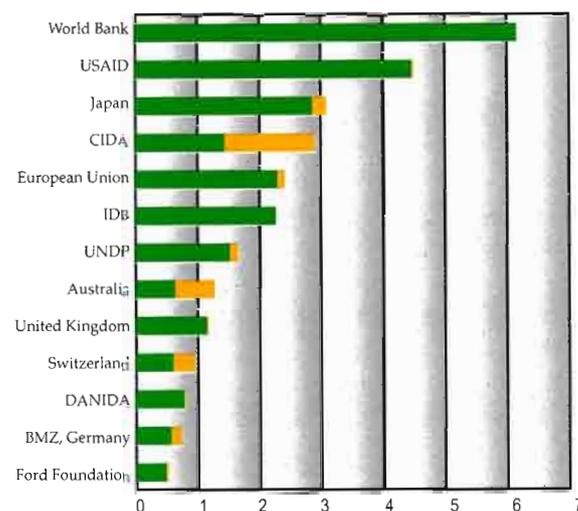
\$1.0 million during the past few years. We will remain vigilant about reducing costs, but expect that the financial health of the Center will henceforth depend more on expanded funding than on further increments in efficiency.

With this in mind, in 1994 we mobilized staff at all levels in an aggressive campaign to identify and pursue special project funding opportunities. As a result, some 37 new special projects representing \$2.5 million in additional funds were approved by donors or began operation in 1994. Roughly one-quarter of the Center's financing in 1994 came from 72 special projects (49 core, 23 complementary). Although we will continue seeking new special projects, in 1995 we will also begin looking for opportunities to obtain support for additional core research, thereby reducing the proportion of funding from the World Bank (now our number-one donor).

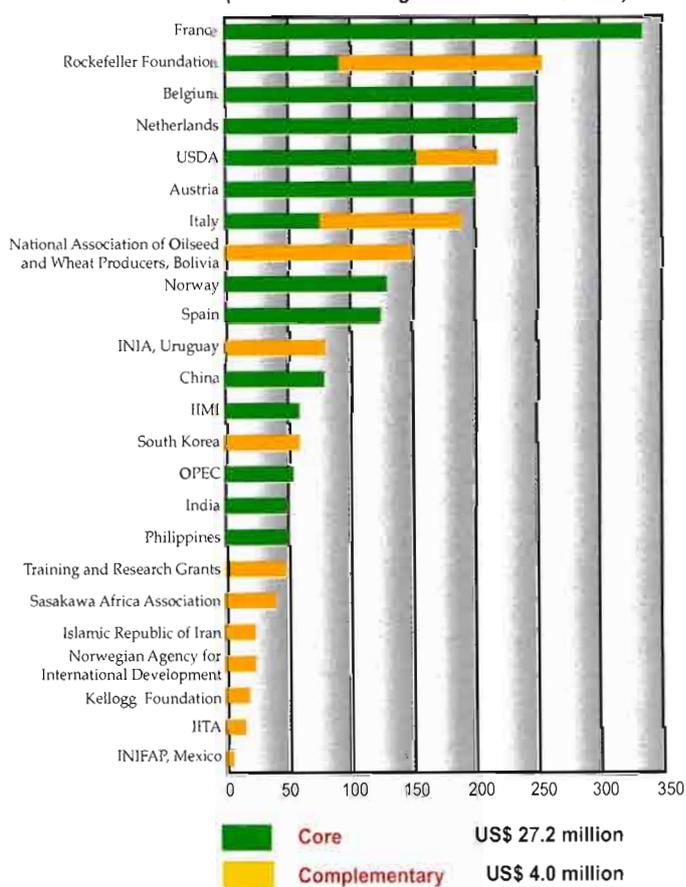
Improving Accountability

In line with CGIAR initiatives to give donors a clearer sense of how their money is being spent, during 1994 we laid the groundwork for a budgeting system whereby resources flow to discrete outputs through each of the various program cost centers, forming an integrated matrix. Organized along the lines of the major System activities identified by the CGIAR Technical Advisory Committee, the matrix framework is expected to improve transparency and add to the effectiveness of management, and will be implemented over the coming year.

Sources of Income from Grants (US\$ millions)



(Note: Scale changes below to US\$ 000s)



For more details about CIMMYT finances, see the Center's Audited Financial Statement, available from the publications office in Mexico.

Three new trustees were elected to CIMMYT's Board in April 1994:

Drs. Walter Falcon (USA), Francesco Salamini (Italy), and Alvaro Umaña (Costa Rica). In addition, Mr. Francisco

Labastida Ochoa assumed the leadership of the renamed Secretariat of Agriculture, Livestock and Rural Development, succeeding Mr. Carlos Hank González as an *ex officio* trustee.

Dr. Falcon, an agricultural economist, is Director of the Institute for International Studies at Stanford University, has worked extensively on issues related to agricultural economics and policy, particularly in Asia, and served

as the Chair of IRRI's Board of Trustees (1988-94). Mr. Labastida, an economist and planner, was Mexico's Secretary of Energy, Mines and Parastatal Industries (1983-87) and Governor of the State of Sinaloa (1987-93). Dr. Salamini, a maize breeder and geneticist, has led the Max Planck Institute for Plant Breeding Research in Cologne, Germany, since 1985. Prior to that, he headed the Maize Section of the Bergamo Institute of Cereal Research in Rome. At one time Costa Rica's Minister of Natural Resources, Energy and Mines (1986-90), Dr. Umaña holds a Ph.D. in environmental engineering, directs Natural Resource Management at the Central American Institute for Business

Administration (INCAE) in Costa Rica, and presides over the Center for Environmental Studies. A warm welcome to our new trustees.

In 1994 the Board began searching for a new Director General. Dr. Donald Winkelmann retired from CIMMYT at year's end to assume the leadership of the CGIAR's Technical Advisory Committee. A search committee was formed under Dr. van Vloten-Doting's chairmanship, and the appointment of the next Director General is expected in early June, 1995. Dr. Roger Rowe, Deputy Director General of Research, will serve as acting Director General until a new director is in place.

Trustees and

Principal Staff in 1994:

In 1994 the Board began

searching for a new

Director General.

Trustees (as of April 1995)

Louisa van Vloten-Doting, Chair, Board of Trustees and of the Executive and Finance Committee (The Netherlands), Ministry of Agriculture, Nature Management and Fisheries

Lloyd Evans, Chair, Program Committee (Australia), Commonwealth Scientific and Industrial Research Organization

V.L. Chopra (India), National Research Centre for Plant Biotechnology, Indian Agricultural Research Institute

Abderrazak Daaloul (Tunisia), Ministry of Agriculture

Walter Falcon (USA), Stanford University

R. Bruce Hunter (Canada), CIBA Seeds, USA

Francisco Labastida Ochoa (Mexico),¹ Secretary of Agriculture, Livestock and Rural Development

Ramón Martínez Parra (Mexico),¹ National Institute of Forestry, Agriculture, and Livestock Research

Carlos Morales Topete (Mexico),¹ National Institute of Forestry, Agriculture, and Livestock Research

Edgardo Moscardi (Argentina), Interamerican Institute for Cooperation in Agriculture (IICA) representative, Colombia

Boniface Ndimande (Zimbabwe), Ministry of Lands, Agriculture, and Water Development

Dolores Ramirez (The Philippines), Institute of Plant Breeding, University of the Philippines

Francesco Salamini (Italy), Max Planck Institute for Plant Breeding, Germany

Hirofumi Uchimiya (Japan), Institute of Molecular and Cellular Biosciences, University of Tokyo

Alvaro Umaña (Costa Rica), Natural Resource Management Program, Central American Institute for Business Administration (INCAE)

¹ *Ex officio* position

Office of the Director General

Donald L. Winkelmann, USA, Director General²
Roger Rowe, USA, Deputy Director General of Research
Claudio Cafati, Chile, Deputy Director General of Administration and Finance
Gregorio Martínez V., Mexico, Government and Public Affairs Officer
Norman E. Borlaug, USA, Consultant
Anne Starks Acosta, USA, Assistant to the Director General

General Administration

Kathleen Hart, USA, Financial Officer
José Ramírez S., Mexico, Administrative Officer²
Linda Ainsworth, USA, Head, Visitor and Conference Services
Hugo Alvarez V., Mexico, Purchasing Officer
Rosario Deaquino, Mexico, Supervisor of Projects and Budgets¹
Martha Duarte, Mexico, Supervisor of Accounting Operations¹
Salvador Frago, Mexico, Supervisor of Treasury and Fiscal Operations¹
Martha de la Fuente M., Mexico, Head, Human Resources
María Garay A., Mexico, Head, Food and Housing
Gilberto Hernández V., Mexico, Training Coordinator
Manuel Lopezlage, Colombia, Supervisor, Accounting Services²
Domingo Moreno, Mexico, Head, Telecommunications
Roberto Rodríguez, Mexico, Head, Workshop
Eduardo de la Rosa, Mexico, Head, Building Maintenance
Germán Tapia, Mexico, Supervisor of the Warehouse¹
Manuel Terrazas M., Mexico, Platinum Project Leader

Maize Program

Delbert Hess, USA, Director
Richard Wedderburn, Barbados, Associate Director
David Beck, USA, Breeder¹
Julien Berthaud, France, Geneticist²
Hugo Córdova, El Salvador, Breeder
Gregory Edmeades, New Zealand, Physiologist/Agronomist
Fernando González C., Mexico, Breeder²
Daniel Jeffers, USA, Pathologist
Renée Lafitte, USA, Physiologist/Agronomist²
John A. Mihm, USA, Entomologist
Yves Savidan, France, Cytogeneticist
Ganesan Srinivasan, India, Breeder, International Testing/Highland Maize
Suketoshi Taba, Japan, Breeder, Germplasm Bank
Surinder Vasal, India, Breeder, Lowland Tropical Germplasm
Willy Villena, Bolivia, Breeder and Training Officer²

Andean Region (staff based in Colombia)

Hernán Ceballos, Argentina, Breeder²
Shivaji Pandey, India, Breeder

Asia (staff based in Thailand)

Gonzalo Granados R., Mexico, Entomologist²
Carlos de León G., Mexico, Pathologist
James Lothrop, USA, Breeder

Eastern Africa (staff based in Kenya)

A.F.E. Palmer, UK, Agronomist
Joel K. Ransom, USA, Agronomist

Central America and the Caribbean

Héctor J. Barreto, Colombia, Agronomist/NRMR³ (based in Honduras)
Jorge Bolaños, Nicaragua, Agronomist/NRMR³ (based in Guatemala)

Southern Africa (staff based in Zimbabwe)

Batson Zambezi, Malawi, Breeder¹
David Jewell, Australia, Breeder

Kevin Pixley, USA, Breeder
Stephen Waddington, UK, Agronomist

Cooperative Program with IITA in West Africa

Alpha O. Diallo, Guinea, Breeder (based in Côte d'Ivoire)

Ghana

Roberto F. Soza, Chile, Agronomist

Associate Scientists

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Nurul Islam-Faridi, Bangladesh, Molecular Cytogeneticist²
Harish Kumar, India, Entomologist
Eric Scopel, France, Agronomist/NRMR^{1,3}

Pre- and Postdoctoral Fellows

Marianne Bänziger, Switzerland, Physiologist
Marc Barré, France, Geneticist²
Catherine Giauffret, France, Physiologist²
Daniel Grimanelli, France, Geneticist
Olivier Leblanc, France, Geneticist²
Scott McLean, USA, Breeder
Harold Mickelson, USA, Breeder
Luis Narro, Peru, Agronomist¹
Jean Marcel Ribaut, Switzerland, Geneticist/Physiologist
Martha Willcox, USA, Breeder

Visiting Scientists

Baldev Dhillon, India, Breeder²
Shihuang Zhang, China, Breeder²

Wheat Program

R.A. Fischer, Australia, Director
George Varughese, India, Associate Director
Osman S. Abdalla, Sudan, Durum Wheat Breeder
Edmundo Acevedo, Chile, Leader, Crop Management and Physiology²
Lukas Bertschinger, Switzerland, Virologist/Entomologist²
Leon Broers, The Netherlands, Pathologist/Breeder

H. Jesse Dubin, USA, Head, Crop Protection

Etienne Duveiller, Belgium, Pathologist

Paul Fox, Australia, Head, International Nurseries

Guillermo Fuentes D., Mexico, Pathologist

Lucy Gilchrist S., Chile, Pathologist/Trainer²

Maarten van Ginkel, The Netherlands, Bread Wheat Breeder

A. Mujeeb-Kazi, USA, Head, Wide Crosses

Iván Ortiz-Monasterio, Mexico, Agronomist

Roberto J. Peña, Mexico, Head, Industrial Quality

Wolfgang H. Pfeiffer, Germany, Head, Durum/Triticale

Sanjaya Rajaram, India, Head, Germplasm Improvement, and Head, Bread Wheat

Matthew P. Reynolds, UK, Physiologist

Kenneth D. Sayre, USA, Agronomist
Ravi P. Singh, India, Geneticist/Pathologist

Bent Skovmand, Denmark, Head, Germplasm Bank, and Head, Genetic Resources

Reynaldo L. Villareal, The Philippines, Head, Germplasm Improvement Training

Hugo Vivar, Ecuador, Head, ICARDA/CIMMYT Barley Program

Bolivia

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South Asia (staff based in Nepal)

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Eugene E. Saari, USA, Pathologist/Breeder

Southern Cone of South America

Man Mohan Kohli, India, Breeder (based in Uruguay)

¹ Appointed in 1994

² Left CIMMYT in 1994

³ Natural Resources Management Research Group

CIMMYT/ICARDA

Cooperative Program (staff based in Syria)

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Durum Wheat Breeder
Guillermo Ortiz F., Mexico, Bread
Wheat Breeder

Bangladesh

Craig A. Meisner, USA, Agronomist

CIMMYT/ICARDA/Turkey Winter Facultative Wheat Program (staff based in Turkey)

Hans-Joachim Braun, Germany,
Breeder
Alexei Morgunov, Russia, Breeder

Zimbabwe

Thomas S. Payne, USA, Team
Leader, Maize and Wheat
Improvement Research Network
for SADC

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Arne Hede, Denmark, Agronomist¹
Gunther Manske, Germany,
Agronomist¹
Masanori Inagaki, Japan,
Cytogeneticist
Gurdev Singh, India, Breeder²

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Premchand Bindraban, The
Netherlands, Wheat System
Analyst
Rolf Buddendiek, Germany,
Agronomist¹
Hong Ma, China, Pathologist
Heidi Mickelson, USA, Breeder
Henning Müller, Germany,
Agronomist¹

Visiting Scientist

James Quick, USA, Agronomist¹

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Robert Tripp, USA, Assistant
Director²
Larry Harrington, USA, Acting
Director, and Manager, Natural
Resources Management Research
Group (NRM)
Daniel Buckles, Canada,
Anthropologist/NRM³
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Miguel Angel López-Pereira,
Honduras, Economist²
Melinda Smale, USA, Economist¹

Central America and the Caribbean

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Economist/NRM³ (based in
Costa Rica)

Eastern and Southern Africa

Rashid Hassan, Sudan, Economist
(based in Kenya)
Wilfred M. Mwangi, Kenya,
Economist (based in Ethiopia)

South and Southeast Asia

Michael Morris, USA, Economist
(based in Thailand)

Associate Scientist

Olaf Erenstein, The Netherlands,
Economist/NRM^{1,3}

Predocctoral Fellow

Joseph Rusike, Zimbabwe,
Economist

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Mywish Maredia, India, Economist²

Applied Biotechnology Laboratories

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Laboratories
Natasha Bohorova, Bulgaria, Head,
Applied Genetic Engineering
Laboratory

Diego González-de-León, Mexico,
Head, Applied Molecular
Genetics Laboratory

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Sarah Fennell, UK, Cell Biologist¹
Darren Jarboe, USA, Project
Administrative Assistant²
Sue Jarboe, China, Biometrician²
Chiangjian Jiang, China,
Biometrician¹
Mireille Khairallah, Lebanon,
Molecular Geneticist
Manilal William, Sri Lanka,
Molecular Geneticist

Pre- and Postdoctoral Fellows

Martin Bohn, Germany, Quantitative
Geneticist²
Héctor Guillén, Mexico,
Agronomist¹
Susanne Groh, Germany,
Quantitative Geneticist¹

Visiting Scientists

Kumud Sarkar, India, Maize
Geneticist²
Sukhwinder Singh, India, Wheat
Molecular Cytogeneticist²

Biometrics

José Crossa, Uruguay, Head,
Biometrics

Computing Services

Jesús Vargas G., Mexico, Systems
and Operations Manager
Guillermo Ibarra B., Mexico, PC
Support and Integration Manager

Experiment Stations

Mark Bell, Australia, Agronomist/
Head of Stations²
Francisco Magallanes, Mexico, Field
Superintendent, El Batán
José A. Miranda, Mexico, Field
Superintendent, Toluca
Rodrigo Rascón, Mexico, Field
Superintendent, Cd. Obregón
Abelardo Salazar, Mexico, Field
Superintendent, Poza Rica

Alejandro López, Mexico, Field
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Supervisor of Scientific
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Corinne de Gracia, Mexico,
Supervisor of Library Services

General Laboratories

Jaime López C., Mexico, Supervisor,
Soils and Plant Nutrition
Laboratory

Seed Health

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Health²
Jesse Dubin, USA, Head, Seed
Health

Software Development

Ronald van Wachem, The
Netherlands, Software
Development Manager²
Rafael Herrera M., Mexico, Software
Development Manager
Carlos López, Mexico, Software
Systems Coordinator
Héctor Sánchez V., Mexico, Project
Leader, Wheat Systems

¹ Appointed in 1994

² Left CIMMYT in 1994

³ Natural Resources Management
Research Group

Primary financial support for CIMMYT's work comes from the Consultative Group on International Agricultural Research (CGIAR). This international consortium – now comprising 46 public and private, developed and developing country donors – was formed in 1971 with cosponsorship by the Food and Agriculture Organization of the United Nations, the World Bank, and the United Nations Development Programme.

Recently, the United Nations Environment Programme (CGIAR) joined the group of cosponsors, and developing country membership has broadened to include Colombia, Côte d'Ivoire, Egypt, Iran, and Kenya.

Through its financial backing of CIMMYT and 15 other international agricultural research centers (map), the CGIAR promotes sustainable agriculture for food security in developing countries. The consortium is currently undergoing an important transformation: toward more equitable North/South "ownership" of the system; toward a more equal partnership of all participants; and toward greater openness in establishing and carrying out a research agenda that reflects the needs and goals of the CGIAR's many partners in development.

"It is a moral outrage that in a world of plenty, one billion people continue to live in abject poverty. The challenge is to promote people-centered, sustainable development that helps feed the hungry, reduces poverty, and safeguards the environment."

Ismail Serageldin
Chairman, CGIAR



*Tribute
to Donald L.
Winkelmann,
Director General
1985-1994*



"Long-run solutions to environmental and population problems rest on reducing poverty. Alleviating poverty in the poorest countries requires improved productivity in agriculture, and sustainable increases in productivity require new technologies from agricultural research -- technologies that both raise productivity and conserve natural resources."

Don Winkelmann
Chairman, TAC

The Order of the Aztec Eagle – the highest distinction given by the government of Mexico to a foreigner – was bestowed on Donald L. Winkelmann, former Director General of CIMMYT, on November 23, 1994. The prestigious award was given to Dr. Winkelmann in recognition of his contributions to Mexico during his nearly 29 years of work in the country, 24 of which were with CIMMYT. **O**n December 31, 1994, Dr. Winkelmann retired from the Center to assume the Chair of the CGIAR’s Technical Advisory Committee (TAC). His CIMMYT sojourn spanned 15 years in the Economics Program and 9 years as Director General. The Center’s first economist, he arrived in 1970 to conduct and coordinate what became a landmark series of adoption studies on the new maize and wheat technologies emerging from CIMMYT’s research. From there, he went on to lead the development of methods to improve the relevance of research to farmers’ needs. Diagnostic procedures for interdisciplinary on-farm research were refined and disseminated to developing country scientists, contributing significantly to the organization of production-oriented research in many countries. He established CIMMYT’s Economics Program in 1980. **D**r. Winkelmann also oversaw the process of harnessing data on global trends for use in research resource allocation. He introduced the influential *Facts and Trends* publication series and helped define the concept of “mega-environments,” the major production environments for wheat and maize in developing countries. Needs analysis based on mega-environments was the cornerstone of the strategic planning process he led as Director General in 1988, and is now the foundation for priority-setting in CIMMYT. **T**he 1988 strategic plan and Dr. Winkelmann’s knowledge of CIMMYT’s strengths steered the Center through the financial adversity of the early 1990s. Guided by the principles of research impact and efficiency, Dr. Winkelmann focused financial support on those areas where CIMMYT’s direct contributions would be most strongly felt. He was an early and forceful advocate for developing meaningful research and training partnerships with national programs, for opening up new collaborative opportunities with the private sector, and for continually re-examining CIMMYT’s comparative advantage in research. He introduced periodic external reviews of CIMMYT activities, more systematic staff performance reviews, and launched the first global analysis of the impact of CIMMYT’s maize and wheat research. **D**r. Winkelmann’s legacy to CIMMYT is a wealth of analytical tools that have sharpened our focus and increased our effectiveness in serving the world’s poor. He goes to TAC with a clear vision, initially articulated at CIMMYT, of the contributions international agricultural research can make to alleviating the pivotal problems impeding global development – poverty, environmental degradation, and population growth. We know the challenges in his new role will be great and we share the CGIAR’s confidence in his leadership during these turbulent times. We take this opportunity to bid him and his wife Maki a warm “hasta luego y buena suerte!”



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