



SOUTH AFRICA

and



CIMMYT

A growing partnership

Maize and wheat together represent about 94% of the total cereal area and about 95% of total cereal production in South Africa. CIMMYT has been a research partner with South Africa since the mid-1970s, dedicated to improving the productivity, profitability, and sustainability of maize and wheat cropping systems, with a focus on serving resource-poor farmers. In the past few years, as a member of the Consultative Group on International Agricultural Research, South Africa has contributed about US\$ 100,000 each year to CIMMYT's maize and wheat research agenda.

South African research institutes have received experimental maize and wheat seed from CIMMYT since the late 1970s. Such exchanges have accelerated notably in the last several years. Between 1990 and 2000, CIMMYT sent 58 maize trials and 40 seed shipments to research partners in South Africa. Every year, CIMMYT sends 8 wheat nurseries to South Africa. When the wheat disease Karnal bunt appeared in South Africa in December 2000, CIMMYT shipped resistant bread wheat and durum wheat seed to South Africa within four weeks. CIMMYT also supports two regional wheat nurseries in sub-Saharan Africa, in which South Africa collaborates.

Facts at a glance: maize and wheat in South Africa (averages, 1998-2000)

Indicator	Maize	Wheat
Area harvested (million ha)	3.7	0.8
Percentage of total farmland ^a	30.1	4.9
Percentage of total cereal area	77.2	16.3
Average yield (t/ha)	2.4	2.3
Total production (million t)	8.7	1.8
Percentage of total cereal production	79.3	16.1
Per capita consumption (kg/yr) ^a	227.7	75.9
Net exports (imports) (000 t) ^a	1,217.6	-622.0
Growth rate of production (%/yr) ^b	4.2	1.1
Growth rate of yield (%/yr) ^b	3.8	5.7

Source: FAO (FAOSTAT Online, April 2001).

^a 1996-1998.

^b 1990-2000.

Maize is South Africa's single most important cereal crop. Historically, South African maize research has focused on hybrid development for commercial farmers; this sector is dominated by private seed companies. As the country's research priorities shifted to meet the needs of resource-poor maize farmers, interaction with CIMMYT on adapted materials and research methods has grown. In 2001, South Africa will release two new maize varieties, developed in collaboration with CIMMYT, that are especially suited to poor farmers' conditions.

Over the last three years, more than 60 South African scientists from the public and private sector have visited CIMMYT's research station in Harare, Zimbabwe (the Center's largest regional office, focusing on Eastern and Southern Africa and on maize research in particular). These visits have led to requests and shipments of several hundred maize breeding stocks from CIMMYT to South African research centers.

New Maize Fights Drought

Through CIMMYT-led regional projects, such as the Southern African Drought and Low Soil Fertility (SADLF) Project,* farmers obtain new technologies that help them produce a better maize crop even in challenging marginal conditions. Under farmer-managed conditions where grain yields typically average only 1.3 tons per hectare, outstanding new maize from CIMMYT gives farmers 30-50% more grain per hectare than the best commercially available maize (see photo). For a resource-poor farmer who may sow only two hectares of maize, the new maize could add over half a ton to household grain stores each year—a significant contribution to food

security in isolated areas where one failed harvest means hunger. The new maize also yields on a par with commercial maize under favorable treatment (i.e., adequate water and fertilizer). This maize is more efficient at using available nitrogen and thus performs better when grown in infertile soils. CIMMYT's conventional breeding and biotechnology programs also focus on increasing host-plant resistance to maize insect pests.

Maize that incorporates greater resistance to drought, to low soil fertility, and to insects increases both total production and yield stability in the face of these crop stresses. South African research institutes have been testing insect-resistant maize varieties from CIMMYT for more than ten years, and they began testing drought- and low-nitrogen-tolerant varieties in the mid-1990s. One of the new maize varieties being released in South Africa in 2001 is noted for its tolerance of drought and low-nitrogen conditions.



Drought-tolerant maize for subsistence farmers: CIMMYT drought-tolerant maize (right) compared to the best local commercial maize (left) grown under drought stress.

* Supported by the Swiss Agency for Development and Cooperation (SDC) and the Rockefeller Foundation to meet priorities identified by the Southern African Center for Cooperation in Agricultural and Natural Resources Research and Training (SACCAR).

New Wheat Fights Disease

South African wheat breeders first learned about the new high-yielding wheats from CIMMYT in the early 1960s; the first CIMMYT-derived wheat variety was released in South Africa in 1967. In the early 1970s, a visit from CIMMYT wheat breeder and Nobel Laureate Norman E. Borlaug was instrumental in the South African government's decision to consolidate wheat breeding research in the Small Grains Centre, established in 1975.

In 1997, just over 70% of South Africa's wheat area was sown to spring bread wheats derived from CIMMYT varieties. About 46% of the spring wheat cultivars released in South Africa between 1980 and 1997 had at least one CIMMYT parent. Some of the winter and facultative wheats grown in South Africa are also related to CIMMYT wheats: about 11% of the wheat area is planted to these CIMMYT-related winter and facultative wheats.

CIMMYT wheat varieties provide significant sources of resistance to stem and leaf rust—two of the most devastating wheat diseases. A related disease, yellow (stripe) rust was first reported in South Africa in the late 1990s. Less than one week after the disease was identified in South Africa, complete wheat variety pedigrees and yellow rust resistance scores were received from CIMMYT, which helped researchers to identify potential sources of resistance from South African breeding programs and abroad. Fortunately, CIMMYT wheats offered outstanding sources of genetic resistance to the disease. South African breeders report that they have now controlled yellow rust in spring wheats and are improving yellow rust resistance in their winter wheats.

Networks

Under the auspices of the European Union, CIMMYT has coordinated the Maize and Wheat Improvement Research Network of SADC** (MWIRNET) since 1994. South Africa is a member of MWIRNET, and is represented on the Network Steering Committee. Through MWIRNET, South African researchers are integrated into SADC regional activities which include screening and exchange of improved varieties, along with participation in regional traveling workshops, consultancies, and conferences.

A special collaborative effort between MWIRNET and South Africa focused on improving local researchers' understanding of the production constraints and socioeconomic circumstances of poor, small-scale farmers.*** Participatory methods for working with farmers were emphasized, and research and training undertaken as part of the MWIRNET collaboration has enabled the needs of resource-poor farmers to be articulated more forcefully within South Africa's research and development agenda.

For example, MWIRNET reinforced researchers' skills in diagnosing the production constraints of poor farmers in KwaZulu Natal, Free State, Northern, and Eastern Cape Provinces. Maize and wheat varieties developed by South Africa and CIMMYT have been tested in farmers' fields to evaluate their potential for small-scale farming. Scientists from South Africa and CIMMYT have worked with farmers to develop maize and wheat varieties with better resistance to diseases and pests.

** Southern Africa Development Community.

*** This special collaboration was made possible through an additional grant from the European Union-South Africa Delegation-European Program for Reconstruction and Development (April 1999 to December 2000).

This and other work in the MWIRNET-South Africa collaboration has encouraged researchers and extension workers to engage more fully and directly with small-scale farmers and rural communities in South Africa. In turn, South Africa has much to offer the countries that participate in MWIRNET: the national research program and university system have a well-developed research and training infrastructure that is a valuable resource for the rest of southern Africa. To maintain the momentum in human resource development, future plans for MWIRNET-South Africa collaboration feature graduate-level training of research staff.



Mpumulanga farmers harvesting one of the new maize varieties, developed through collaboration between South Africa and CIMMYT, that will be released in South Africa in 2001.

Building Human Capacity

CIMMYT support to institution-building and human resource development in South Africa began in the 1960s. Between 1966 and 2000, more than 30 South African scientists have participated in CIMMYT's visiting scientist program, traveling to Mexico to focus on maize, wheat, and (more recently) biotechnology research. Over the same period, 12 younger researchers participated in CIMMYT's formal maize, wheat, and biotechnology courses. South Africa has recently sponsored a South African economist to conduct research at CIMMYT on the worldwide economic benefits of breeding for superior resistance to leaf rust. In 2001, two senior wheat researchers from South Africa traveled to CIMMYT in Mexico to investigate strategies for coping with Karnal bunt. CIMMYT has a great deal of experience and genetic resources to assist in breeding wheats that resist this quality-reducing disease.



CIMMYT.

INTERNATIONAL MAIZE AND
WHEAT IMPROVEMENT CENTER

Apdo. postal 6-641, 06600 Mexico, D.F., Mexico

www.cimmyt.org

May 2001