A devastating combination of events, orchestrated by nature and by human beings, is forcing an estimated 14 million people into starvation in southern Africa.

Erratic rainfall and drought are recurring problems in southern Africa, which is why the Swiss Agency for Development and Cooperation and the Rockefeller Foundation funded the Southern African Drought and Low Soil Fertility Project (SADLF), involving CIMMYT and national agricultural research programs of the Southern Africa Development Community (SADC) region.

"The SADLF project was initiated in 1996, and now we’re seeing the first benefits," says Masa Iwanaga, CIMMYT’s director general. Stress-tolerant, open-pollinated varieties (ZM421, ZM521, and ZM621) from the project have been released in Malawi, South Africa, Tanzania, and Zimbabwe, and they are also being used in Angola and Mozambique. In trials grown from Ethiopia to South Africa in 1999, ZM521 produced an average 34% more grain than other improved varieties farmers currently grow.

Since 2000, CIMMYT and partners from national programs and NGOs have channeled more than 70 tons of seed of these varieties into community-based seed production in Angola, Malawi, Mozambique, South Africa, Tanzania, Zambia, and Zimbabwe. The varieties are spreading (see “Project Partners Affirm Impact”). More than 500 tons of commercial seed of these varieties has been produced so far—enough to plant 25,000–30,000 hectares.

The project is testing a newer generation of drought-tolerant, open-pollinated varieties whose productivity exceeds that of ZM421, ZM521, and ZM621 by 15%.

More than 2.5 million hectares are planted each year to hybrid maize in eastern and southern Africa (excluding South Africa). Most hybrid seed is produced by private companies and grown by smallholders. SADLF developed several hybrids that produce over 50% more grain at the 1 ton per hectare yield level—the typical yield in many farmers' fields—and continue to exceed the best check hybrids from private companies by an average of 1 ton per hectare, up to the 10 ton per hectare level (measured from 35 trials conducted across eastern and southern Africa in 2001).

The SADLF project’s goal—to provide smallholder farmers with more appropriate stress-tolerant maize varieties—relies on a system in which any breeding program in the SADC region (CIMMYT, national programs, private companies) can test its maize for qualities important to resource-poor farmers. These include tolerance to drought and poor soils (low nitrogen, acidic, low phosphorus) and resistance to diseases and insect pests. Maize is tested in researcher-managed regional trials as well as farmer-participatory on-farm trials (called “Mother-Baby” trials), which are a collaborative effort between national agricultural research and extension programs, NGOs, and farmers.

Ministries of agriculture, NGOs, and private seed companies use the trial results to provide farmers with better varieties. Because of the drought, thousands of tons of maize seed are currently being made
available to farmers by agencies such as World Vision, Catholic Relief Services, Africare, and CARE International. Marianne Bänziger, a maize physiologist based in Zimbabwe who leads the SADLF effort, points out that the trial results can help relief agencies make better decisions about which varieties to supply. “The right choice can result in a yield increase of 20–35% for recipient farmers,” she says.

“For drought relief in the Southern Province of Zambia, GTZ will support the purchase of only those varieties that have been previously tried and selected by farmers,” reports Ortwin Neuendorf of the GTZ/Small Scale Seeds Project, Zimbabwe.

Environmental Impact

“Maize varieties that yield better under stress will not be sustainable if they take a toll on the environment,” says Bänziger. As stress conditions increase, maize plants increasingly fail to produce a cob, but they still use nutrients and water. Stress-tolerant maize varieties are efficient: they put those resources into grain production, but the overall uptake of water and nitrogen remains virtually the same.

The environment may also benefit indirectly when farmers experience better harvests. With less fear of crop failure, farmers may be more inclined to invest in their maize crop and purchase fertilizer, or take other steps to improve soil fertility and conserve water. Because of the high risk of drought, many farmers plant more maize area than needed to be sure their families will not suffer hunger if rainfall is poor. Drought-tolerant maize varieties ensure improved food security on a smaller area. Farmers can allocate more land and labor to legumes and cash crops, thereby improving incomes and soil quality.

Forestalling Famine

The project brings together more than 30 core participants, 50 institutions, and 1,000 farmers in approximately 100 farming communities. Today the national maize breeding programs in Angola, Botswana, Malawi, Mozambique, South Africa, Tanzania, Zambia, and Zimbabwe, as well as the CIMMYT-Zimbabwe program, annually screen thousands of maize cultivars for drought tolerance. Through regional collaboration, the other SADC countries gain access to the best of these cultivars. As awareness of this successful breeding strategy has spread, several private seed companies recently initiated similar strategies.

“Our job is to give farmers an option where rainfall is erratic and socioeconomic factors restrict access to fertilizers,” says Iwanaga. “This project will not give up until farming families can access seed of varieties that will make them less vulnerable in the future.”

Agriculture without Choice

Every year, each of the nearly 150 million people in the SADC region consumes on average 91 kilograms of maize and earns only US$230 (excluding South Africa).

Throughout eastern and southern Africa, annual maize production averaged 16.2 million tons over the past 20 years, barely resulting in food self-sufficiency. During the same period, production levels fluctuated between 7.3 and 22.4 million tons—indicating just how variable and uncertain maize production can be. Nevertheless, farmers’ choice to grow

Project Partners Affirm Impact

The largest impact of SADLF on the Malawi Maize Program has been the release of... ZM421, ZM521, and ZM621. Demand is more than the supply of these varieties. At present all the breeder seed for these varieties has been sold to farmers, and farmers are still looking for more breeder and foundation seed.

—Gresham W. Nhane, Ministry of Agriculture, Malawi

Farmers have sold seed throughout the area and neighboring wards and districts. There is strong demand for the ZM521 variety that appears to be better adapted to drought than other varieties.... They reported that during the vegetative crop development stages, there was a serious drought that lasted over six weeks. Most varieties succumbed but with the little rain in February the
maize is economically rational, and substituting another crop for maize is not likely to increase food security.

Over 100 million people in the SADC region live in rural areas, in large households that farm 0.5–3.0 hectares. The average yield for maize region-wide is 1.2 tons per hectare, but in drought-affected years or on widespread, infertile areas, farmers obtain less. Farmers are trapped in low-input, low-risk, but low-productivity cropping systems because they are trying to deal with an unstable climate, declining soil fertility, rising population pressure, high input costs, and poor credit systems.

At the farm level, poor productivity limits incomes, nutrition, health, and education. At the national level, the impoverishment of agriculture is reflected in a poorly developed agricultural input sector, grain imports, food aid, unstable maize prices, and recurring hunger.

CIMMYT varieties picked up to such an extent that most people doubted that they were ever severely water stressed.

---

–Temba M. Musa, GTZ/Small Scale Seeds Project, reporting on Limpopo Province-Based Local Seed Provision Systems in the Northern Province, South Africa

The biggest impact will definitely be the adoption of the improved stress-tolerant varieties, which will improve food security and incomes of the resource-poor farmers in the country.

---

–Zubeda O. Mduruma, Maize Program Coordinator, Tanzania

The ZM421, 521, and 621 series of open-pollinated varieties have been released and multiplied throughout their area of adaptation, and farmers are today benefiting from this investment and harvesting more maize under the marginal growing conditions that are common to the region.

---

–Joseph D. DeVries, Associate Director, Food Security, Rockefeller Foundation

SADLF is a success story on grounds of...innovative approaches in farmer participatory research, combining traditional and modern knowledge. Results...will contribute to the stabilization of farmer income and food security.

---

–Thomas Zeller, Deputy Head of Division, East and Southern Africa Division, Swiss Agency for Development and Cooperation

Small-scale farmers should always have an opportunity of viewing and trying new and improved varieties. This project seems to be a perfect vehicle for that.

---

–Richard Ramugondo, Department of Agriculture of the Northern Province, South Africa

For more information:
Marianne Bänziger (cimmyt-zimbabwe@cgiar.org)

Top

Contents

August, 2004