

Cereal and Legume Systems

Africa has complex problems that plague agriculture and people's lives. We develop agricultural solutions with our partners to tackle hunger and poverty. Our award-winning research for development (R4D) is based on focused, authoritative thinking anchored on the development needs of sub-Saharan Africa. We work with partners in Africa and beyond to reduce producer and consumer risks, enhance crop quality and productivity, and generate wealth from agriculture. IITA is an international non-profit R4D organization created in 1967, governed by a Board of Trustees, and supported primarily by the CGIAR.



In Africa, cereals (maize, millet, sorghum) and legumes (soybean, groundnut, and cowpea) are important food crops. They provide cheap sources of energy and protein, and hence, are good substitutes or supplements to major food staples. They have the potential to become a food of the future. They can also contribute to agricultural productivity and help meet the needs of Africa's teeming population.

Sub-Saharan Africa (SSA) produces 95% of the world's cowpea on 90% of the total global planting area; it also accounts for 15% of world maize production.

However, production of cereals and legumes is unstable. The production systems in the SSA savanna regions—mostly maintained by small-scale farmers for subsistence—are plagued by decreasing productivity, underdeveloped markets, inadequate research and extension capacity, and policy and institutional constraints resulting in unsustainable farming practices and land degradation.

R4D goal

We lead the global research on cowpea and soybean and the regional (SSA) research on maize. Our research for development (R4D) program aims to make cereal and legume systems more productive through integrated farming systems, improved seeds or varieties, plant health and natural resource management approaches, novel agronomic practices, better

postharvest techniques, and the use of labor-saving machines. We develop and disseminate improved varieties, pest control and natural resource management approaches, and new production technologies to enhance and sustain productivity.

We work at improving the postharvest system to stimulate production through processing and marketing of quality crop products, and expand the development of new products that lead to greater commercialization.

R4D outputs and outcomes

We have developed high-yielding cowpea varieties that are early or medium maturing suitable for different production environments, with resistance to some major pests and diseases, well adapted to sole or intercropping, and with traits preferred by consumers. Some 87 IITA varieties have been released by national partners. Partly as a result of our work, total worldwide production has increased from 1.2 million to more than 7.5 million tons per year in about 12.7 million hectares.

We also produced high-yielding and improved soybean varieties with good qualities and resistance to frog-eye spot, bacterial pustule, bacterial blight, and rust. Total soybean production in Africa increased by 67% in 2005 after IITA started soybean improvement research in the 1970s. Seventeen IITA-developed adapted tropical varieties have been released by partners in West and Central Africa, expanding soybean growing to 21 African countries.

We target rust-resistant soybean lines and cowpea cultivars with drought tolerance and resistance to *Alectra*



and *Striga*; and improving and sustaining legume productivity in marginal environments.

To promote commercialization, we designed various soybean processing machines that have been widely adopted by both small-scale and medium-scale processors, and developed more than 100 new food products with good nutritive value and consumer acceptability, and for use in treating the sick and malnourished children.

We developed maize streak disease-resistant germplasm and screening methodology for national maize research programs for which we received the King Baudouin award for research. We developed several mildew-resistant and *Striga*-tolerant varieties that are extra early, early, intermediate, and late maturing for various ecosystems. We also developed biocontrol options using naturally occurring fungal pathogens for combating aflatoxins.

We produced varieties resistant to pink and sugarcane stem borers for stem borer-endemic areas, e.g., in Nigeria and Cameroon. We also designed effective and simple machines and tools to reduce processing time, labor, and production losses; and strengthened capacity building of national maize research systems.

We likewise produced maize breeding materials with aflatoxin resistance, higher yield, and tolerance

for drought. With the national programs, we helped to significantly improve maize production in West and Central Africa, notably Benin, Burkina Faso, Cameroon, Gambia, Ghana, Mali, Senegal, and Togo using improved and early-maturing varieties that yield twice as much as traditional varieties. Likewise, we developed extra early maize varieties that expanded production to the Sudan savannas sufficient to feed 40 million people annually equivalent to US\$1.2 billion.

Overall, for every dollar invested in maize research alone, there is a \$38 return on investment. Over 90% of the area cultivated to maize in West and Central Africa are now planted to IITA varieties. Between 1965 and 2000, the national programs released 186 varieties while the private sector released 86. Increased maize production from improved varieties was 2.6 million tons of grain in 1998, which provided 2200 kcal per person per day to about 9.3 million people for one year.

Conclusion

Through this program, we provide millions of small-scale farmers with the tools, technologies, and solutions that could help transform cereals and legumes into food security and cash crops, foreign exchange earners, and vehicles for economic development.