

How research, collaboration are contributing to food security in Africa

Professor of Plant Breeding Maryke Labuschagne is working with a group of more than 20 African PhD students and postdoctoral fellows to improve the nutritional status of poor rural communities on the continent. Labuschagne works within the University of the Free State's (UFS) Department of Plant Sciences and is also heading the NRF-SARChI chair in disease resistance and quality in field crops.



Prof Maryke Labuschagne; Dr Berhanu Ertiro, former PhD student; and Dr Peg Redinbaugh from the United States Department of Agriculture.

The group are from several countries on the continent, including Zimbabwe, Zambia, Uganda, Ghana, Ethiopia, Kenya, Lesotho, Eswatini, Tunisia, Ethiopia, and South Africa. She says through decades of research and collaboration, they have established a strong network of researchers on the continent.

“We collaborate mainly with the Consortium of International Agricultural Research Centres (CGIAR). These include the International Maize and Wheat Improvement Centre (CIMMYT) based in Zimbabwe, Kenya, an Ethiopia, and the International Institute of Tropical Agriculture (IITA) in Nigeria and Kenya, as well as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Kenya,” says Labuschagne

“Many of the research projects are funded by the Gates Foundation and other international sponsors,” says Labuschagne.



SUSTAINABLE FARMING

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All the research that has been done focuses on enhancing food security in Africa by increasing food production, especially under the increasingly adverse climatic conditions that prevail in Africa, and by improving the nutritional value of crops in a sustainable way.

Cowpea is indigenous to Africa and is widely grown by small-scale farmers. It is very high in protein content and minerals, but almost no genetic improvement of this crop has been done. Currently, two PhD students – one in Ghana (working with IITA in Nigeria) and one at the Agricultural Research Council in Pretoria – are researching the genetic variability of cowpea and improving its nutritional value.

“These students are determining levels of genetic variation for various characteristics to assist in future breeding efforts of this crop. A similar project is being done by a PhD student from Zambia who is working on Bambara groundnut – related to cowpea – which also has significant potential to contribute to food security,” says Labuschagne.



Nakai Matongera, PhD student; Prof Maryke Labuschagne; and Nyika Rwatirera, also a PhD student. Both students are working on maize bio-fortification.

“One PhD student from Zambia is working on the biofortification of cassava for provitamin A. To determine its reaction to stress conditions, he is also testing these provitamin A cassavas in various environmental conditions. “Vitamin A deficiency is rampant in Africa, causing blindness in severe cases. With genetic manipulation, the provitamin A is incorporated into the cassava,” explains Labuschagne.

A PhD student from Ethiopia and another from the Agricultural Research Council in Potchefstroom are working on sorghum yield and nutritional value. In the process, they will do genome-wide association studies to identify genes and groups of genes that determine yield and nutritional characteristics.

In order to improve maize production and nutritional value, a PhD student from Eswatini is looking at yield stability and iron and zinc variability in maize grown in this country.

Another five PhD students are working on maize, looking at various aspects of the genetic improvement of maize. “A student in Ethiopia is working exclusively on quality protein maize to determine the genetic potential of newly released hybrids under adverse production conditions, compared to normal maize,” elaborates Labuschagne.

A PhD student from Zimbabwe is working on maize, which is high in provitamin A, zinc, and high essential

amino acids, as a 'package' for farmers to grow.

Another angle on maize research is a study of the effect of a male sterility gene on production by small-scale maize farmers in Southern Africa. A PhD student in Zimbabwe (in collaboration with Agronomy at the UFS) is doing this study.

Pest resistance is the focus of another PhD study by a student in Zimbabwe. He is investigating the devastating fall armyworm, and how pest resistance can be genetically enhanced.



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Making a positive difference

The research by collaborative teams and students is leading to the release of new commercial varieties of cassava, maize, sorghum, and other crops with better nutritional value, resilience to adverse climatic and production conditions, and biotic constraints such as pests and diseases.

“One of the most rewarding things is to see former students taking up their places all over Africa to become significant role-players and decision-makers in agriculture and plant breeding, and in this way directly contributing to food security on the continent,” states Labuschagne.

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