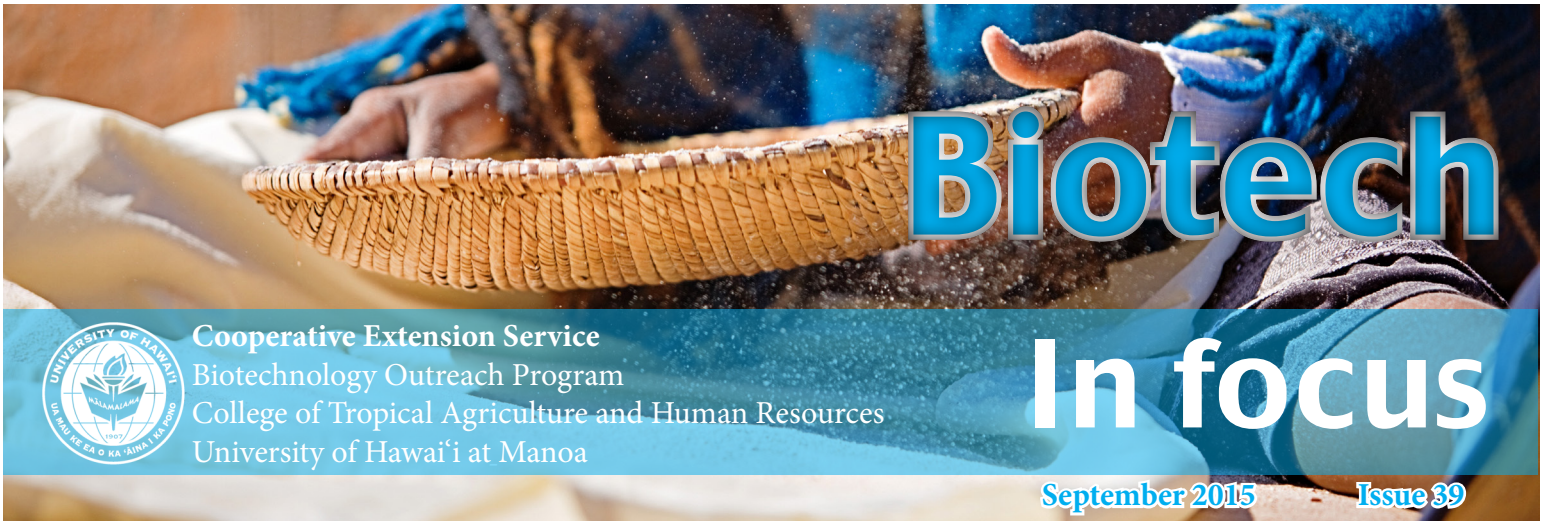

Cooperative Extension Service
Biotechnology Outreach Program
College of Tropical Agriculture and Human Resources
University of Hawai'i at Manoa

In focus

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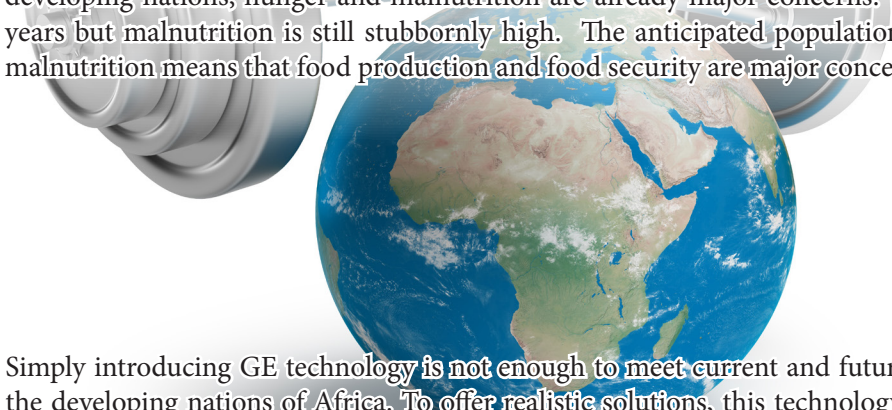
Can Genetic Engineering Help Feed Africa?

This week's Biotech in Focus came from a paper written by Cassie Ferguson, a University of Hawaii at Manoa student who recently enrolled in TPSS 416 (Introduction to Social, Ethical, and Political Issues Associated with Biotechnology). Designed for non-majors, this class is offered by the Department of Tropical Plant and Soil Sciences in UH Manoa's College of Tropical Agriculture and Human Resources.

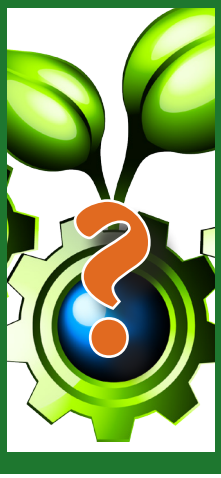
The human population is expected to increase dramatically in coming years, especially in developing countries. The Food and Agriculture Organization of the United Nations predicts that feeding Earth's people will require a 70% increase in global food production by 2050. While the populations of industrialized countries are predicted to remain largely unchanged, it is projected that the human populations of the 49 least-developed countries will double size. In many developing nations, hunger and malnutrition are already major concerns. We have seen a decline in hunger over the last twenty years but malnutrition is still stubbornly high. The anticipated population increase in addition to current hunger and levels of malnutrition means that food production and food security are major concerns.



Genetically engineered (GE) crops are among many possible tools that can help us meet current and future demands for food production. In this bulletin, we will focus on the role that GE crops might play in African countries, where more than half of the developing world's population growth is expected to take place.

Simply introducing GE technology is not enough to meet current and future food demands in the developing nations of Africa. To offer realistic solutions, this technology would need to be integrated with current agricultural practices. The process of integration requires that a number of questions and concerns be addressed, such as whether the GE crops used are safe for humans and the environment, whether the adoption of GE crops is locally sustainable, and whether Africa's developing countries have the resources required to investigate and assess GE crop use.

Currently, conventional (non-transgenic) crops are the focus of most agricultural research being conducted in African countries. However, cooperation between research institutions in industrialized nations and developing countries exists to promote the use of GE crops in Africa. A key question these partnerships must answer is which GE crops will have the greatest beneficial impact if they become part of African agriculture. Proponents of GE technology recommend that the plant varieties targeted for improvement through genetic modification should already be agricultural staples. Currently, the major staple crops grown in Africa's various regions include yams, maize, sorghum, rice, and cassava. It will also be important to target agronomic aspects such as disease, especially virus resistance, drought tolerance, low fertilizer requirements and other aspects relevant to agriculture in developing countries.



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Ania Wieczorek, PhD
Professor
Department of Tropical Plant and Soil Sciences
College of Tropical Agriculture and Human Resources
University of Hawai'i at Manoa
Honolulu, HI 96822
ania@hawaii.edu

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Collaborating to Enhance Food Security

Collaborations to engineer the genetic improvement of African crops are already underway. For example, the Swiss Federal Institute of Technology and scientists in the United States, the United Kingdom, Kenya, and Nigeria have reported success in laboratory tests to improve one staple crop, cassava, by making it resistant to the African cassava mosaic virus, which is widespread and can cause yield losses ranging from 20 to 95%. The development of a cassava variety resistant to African cassava mosaic virus would offer an efficient means to fight the virus, improve the economic outlook for cassava farmers, and enhance food security for people who rely on cassava as a drought-tolerant crop that can grow in poor soils.

Declining Production

Photo from: allourworldviews.files.wordpress.com

Another major disease problem is bacterial wilt that has devastated highland banana production in Uganda since 2001. The disease has spread to Kenya, Tanzania, Rwanda, Burundi and Democratic Republic of Congo. Bananas are a staple crop for 100 million people in sub-Saharan Africa that are grown by 50 million small farmers and consumed every day. In Uganda, the disease caused a production decline of 50% from 2001 to 2004 in a country where the average consumption is 220 kg per year.

Transgenic Banana

Agronomic approaches such as sanitation have not shown success. Transgenic banana resistant to this bacterial disease have been developed in Uganda by local scientists at the National Agricultural research Organization (NARO) and funded by the Gates Foundation. The transgenic banana has undergone the safety testing. The developers of these resistant plants plan to release the variety at no cost, however, Uganda needs regulations to release these new varieties. The release is being challenged by local groups funded by anti-GMO groups from outside Uganda. Banana, like cassava, is vegetatively propagated and do not involve multinational companies.

Education is Key

Such collaborative efforts may help address future threats to food security in Africa, but work to introduce GE staple crops into Africa's agricultural systems is at a very preliminary stage. Many factors stymie the integration of GE crops into African agriculture, as there is much controversy surrounding GE technology there. If the adoption of GE crops in Africa is to proceed in a way that the continent accepts and embraces, agricultural extension (outreach) and educational efforts must reach not only farmers, but the general public as well. Education is imperative so that people can understand the technology and make informed decisions, and extension is needed so that farmers can learn how to use new agricultural methods effectively.

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