



*Research to Nourish Africa*

## Agriculture and Health Research-for-Development at IITA

All of IITA's research-for-development initiatives on the linkages between agriculture and people's health are embedded in a single dedicated project 'Agriculture and Health' - one of the eight Medium Term Plan (MTP) Projects for the period 2008-2010. This is one of the few MTP projects currently in the entire CGIAR system with a sole focus on agriculture and health linkages. The objectives of the project are to:

- Improve nutrition quality by seeking ways of providing a higher diversity and density of micronutrients in human diets, as well as by reducing food toxins.
- Increase the knowledge on nutrition patterns and distribution of food and nutrients within social systems with respect to human nutrition across social strata and gender.
- Research ways to overcome labor force bottlenecks in farms and households affected by HIV/AIDS or malaria through appropriate technologies.

### **Focus areas**

#### **Biofortified crop cultivars to fight malnutrition in Africa**

This project, under the aegis of the HarvestPlus Challenge Program, attempts to address the problem of micronutrient malnutrition through the improvement of staple food crops, including cassava, cowpea, maize, plantain and banana, and yam, as sources of iron, zinc, and vitamin A that are recognized as the most limiting nutrients in Africa. For cassava and maize, full-fledged breeding programs have been initiated to develop high yielding locally adapted cultivars with improved concentration of iron, zinc, and  $\beta$ -carotene by using both adapted and exotic germplasm as sources of high micronutrient content. This work has already contributed to the identification of high yielding maize and cassava varieties with increased levels of iron, zinc and  $\beta$ -carotene. Work continues to document and measure the impact of biofortified crop varieties and policy environments on micronutrient deficiencies in the cassava-growing areas of West and Central Africa.

#### **Biocassava Plus: Improving Cassava for Nutrition, Health, and Sustainable Development**

Biocassava Plus aims to increase the nutrient quality of cassava. Transgenic biotechnologies will be utilized to increase the content of essential nutrients,

vitamins, and minerals; reduce levels of cyanogenic glycosides in cassava roots, and improve postharvest durability, and elevated resistance to cassava mosaic disease, making it resilient in extreme climatic events such as drought, and excessive rain.

### **Mycotoxins, human health and agricultural trade**

Our aim is to improve food quality, human health and livelihoods of smallholder farmers in sub-Saharan Africa by reducing mycotoxin contamination of maize and peanuts through dissemination and adoption of management approaches. Currently, IITA's research focuses on strategies to manage mycotoxins in maize, cassava, yam, cashew, sheanut and cocoa value chains. Technical, institutional and policy options for tackling the complex problem in commodity value chains are being explored. Breeding for resistance, biological control, awareness campaigns, development and dissemination of cost-effective management strategies, and information dissemination are few aspects in these efforts. We developed a simple and low-cost ELISA-based quantitative test for aflatoxins to foster monitoring of mycotoxins in Africa. We are also spearheading initiatives on aflatoxin resistance breeding and an Africa-wide aflatoxin biocontrol program in collaboration with USDA-ARS.

### **Agriculture, HIV/AIDS and malaria**

We examine diseases, such as HIV/AIDS and malaria, in order to understand the impact they have on agricultural productivity, food security, and livelihoods. Vulnerable populations such as women, children, and orphans are strongly emphasized in this program's research objectives. IITA contributes to the National programs on the control of HIV/AIDS by implementing in collaboration with these programs Farmer Welfare Schools (FWS). The FWS is inspired from farmer life school which is itself based on the farmer field school. It consists of the training of farmers through the non-formal education, "learning by doing" and "discovery-based learning" principles. The content of the training is under three main headings namely: Reducing vulnerability to HIV, promoting human good health, and preventing human diseases. Research efforts are also being directed towards controlling mosquito transmitted diseases with eco-friendly solutions either based on natural plant extracts, entomopathogens or viruses. Resistance of vectors towards conventional insecticides is being studied in the same program.

### **Climate change and food safety**

The occurrence of aflatoxin on crops is strongly influenced by weather during and after the growing season (including accumulation during storage). Thus, just as with climate and crop yields, aflatoxin contamination exhibits variability on a range of timescales. Climate change is likely to lead to an increase in hot and dry spells, which in turn will increase the risk of aflatoxin contamination. We plan to use expertise in human health and in climate and crop processes (in the University of

Leeds) to combine predictive quantitative modeling of aflatoxin on crops with blood-based biomarkers of aflatoxin exposure. Taking this novel holistic approach will enable assessment of the seasonal predictability of human exposure to aflatoxin. Quantifying this increase in risk, and assessing its impacts, would be a powerful tool for focusing intervention strategies and thereby enabling longer-term adaptation.

The reported cases of food poisoning (*konzo*) and occasional deaths and paralysis of people in rural communities of Eastern and Southern Africa that rely on cassava during drought suggests that droughts and high temperatures induce accumulation of higher levels of cyanide in some of the local farmers' varieties than under normal conditions. We plan to study the effect of climate variability (droughts) and change on the production of toxic cyanogens and mycotoxins in cassava foods and development of strategies to prevent public health disasters in rural communities in Eastern and Southern Africa.

### **Safe vegetables**

The project's goal is to increase vegetable farmers' income and improve vegetable food quality for consumers through the diffusion of environmentally-sound integrated pest management practices. High value vegetable crops in West Africa are subject to intensive pesticide applications. The excessive use and misuse of chemical pesticides have raised serious concerns about health and environmental hazards, and increasingly strict maximum residue limits will be enforced for export markets impeding trade for countries lacking the capacity of diffusing food quality best practices. These constraints for vegetables are being addressed by the development and diffusion of effective and sustainable alternative pesticides, including biopesticides, clean seeds, botanical extracts, pheromone trap for optimal spraying times and capacity building of farmers and agents from private and public sectors, and NGOs in economically and ecologically-sound best practices.

## **Initiatives and Networks**

### **HarvestPlus Challenge Program**

IITA is a collaborator with HarvestPlus, a global alliance of research institutions and implementing agencies that aims to reduce micronutrient malnutrition by biofortifying staple crops.

### **System-wide Program on Integrated Pest Management (SP-IPM) and food safety**

The newly revamped SP-IPM, hosted by IITA on behalf of participating CGIAR centers, recently identified six emerging R4D themes will be the main research thrusts through which the SP-IPM will endeavor to reduce rural and urban hunger,

poverty and environmental degradation. Food safety/biosafety is one these thrust areas in which participating CGIAR centers would develop ways to mitigate mycotoxin contamination and pesticide residues to improve human health.

#### **MycRed: EU's 7<sup>th</sup> Framework Program Project on Mycotoxin Reduction**

The European Union's 7<sup>th</sup> Framework Program recently approved the MycoRed project "Novel Integrated Strategies for Worldwide Mycotoxin Reduction in Food and Feed Chains". This large, multi-partner, 4-year collaborative project is led by the Institute of Science of Food Production (National Research Council, Italy) with inception date April 2009. IITA is a key partner in the project and will be involved in the following workpackages: Biocontrol to reduce mycotoxins in cropping systems, Modeling and development of a Decision Support System, Novel post-harvest and storage handling practices, and Information, education & dissemination.

#### **INSTAPA: EU's 7<sup>th</sup> Framework Program Project on Malnutrition in Developing Countries**

The European Union's 7<sup>th</sup> Framework Program recently approved the INSTAPA project "Novel Staple Food-Based Strategies to Improve Micronutrient Status for Better Health and Development in sub-Saharan Africa". This large, multi-partner, 5-year collaborative project is led by Wageningen University (the Netherlands). The project will contribute to improvement of the dietary quality of young children and their mothers living in resource poor areas of developing countries resulting in long-term health effects and a major step towards the Millennium Development Goals set for 2015.

#### **Agriculture and Health Research and Education Platform in Africa**

The Faculty of Medicine and Health of University of Leeds and IITA has initiated an Agriculture and Health Research and Education Platform to establish a long-term research and education partnership that would create significant synergisms between the two institutions. By using IITA as a preferred partner, Leeds expects significant benefits to accrue due to its enhanced capacity to mobilize/deliver its knowledge and technologies in sub-Saharan Africa. Three initial foci of interest were identified: (1) Human nutrition in relation to food, antifeedants, food safety and packaging, (2) Plant Biotechnology and advanced plant sciences including a range of enabling technologies and molecular approaches that can underpin progress in crop-based research, and (3) Climate change, its consequences on cropping systems and impact on ecosystems at the landscape level and human health.

Staff Contact: Ranajit Bandyopadhyay, Plant Pathologist, IITA, Ibadan.  
[r.bandyopadhyay@cgiar.org](mailto:r.bandyopadhyay@cgiar.org)