



**Annual Meeting
Agriculture and Health Research Platform
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**Brief
International Potato Center**

1 CIP Agriculture and Human Health Division

CIP has an institutionalized research program dedicated to agriculture and human health whose principal activities are to analyze linkages among production, ecosystems, and human health, enhance human health benefits from agricultural production, and mitigate human health risks from agricultural production.

2 Research Programs

2.1 Enhancing Human Health Benefits

Within CIP's Agriculture and Health Research Division, this program focuses on increasing the nutritional benefits of potatoes and sweet potatoes and related issues of food safety. The nutritional impact of high beta-carotene sweet potatoes has been of particular interest. More recently, research has focused on the development of potatoes with higher levels of iron and vitamin C.

2.2 Mitigating Human Health Risks

This program focuses on reducing the risks to human health caused by contaminants such as pesticides or contaminated irrigation water. As part of this program, the Tradeoff Analysis Model was developed to examine the agricultural impacts of pesticide use as compared with the human and environmental costs. Collaboration with the Crop Improvement Division on ways to reduce pesticide use is ongoing.

2.3 Promotion of Orange Fleshed Sweet Potatoes: Sub-Saharan Africa (SSA), India, Bangladesh and China

In eastern and central Africa, estimates of Vitamin A Deficiency (VAD) in the most vulnerable group (children under six years of age) range from 30% in Uganda to 71% in Mozambique, despite efforts to address the problem through a widespread distribution of capsules on a semi-annual basis.

In an attempt to address one of the major underlying causes of VAD, inadequate vitamin A intake, in a sustainable manner, the International Potato Centre (CIP), has been engaged in breeding and adaptive research programs, resulting in the release of several β -carotene (pro-vitamin A)- rich sweetpotato varieties commonly known as orange-

fleshed sweetpotatoes (OFSP). This work is an example of effective partnerships with regional networks e.g. the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the Southern Africa Roots and Tubers Research Network (SARRNET), the National Agricultural Research Institutes (NARIs) and farmers.

Relevance of sweetpotato to address current agricultural and health challenges

Sweetpotato is an important crop across a wide range of agro-ecological regions in eastern and central Africa. The area devoted to the crop is increasing throughout the region due to declining cereal yields, the cassava mosaic disease pandemic, the rapid spread of the banana wilt and lately the threat of cassava brown streak virus. Sweetpotato requires minimal inputs, making it attractive to households headed by women or households affected by HIV. The crop is particularly adapted to marginal areas of low or erratic rainfall, low soil fertility, tolerates high temperatures, is easy to propagate and maintain, and yields well even in adverse conditions. It is friendly to the environment, as chemical input is hardly used and protects soil from erosion, as it closes its canopy in a short time with a well developed root system. These characteristics make sweetpotato an ideal crop in mitigating famine disasters under difficult conditions, including war-ravaged areas. Moreover, its short cropping season, its flexible planting and harvesting schedules as well as its increasing commercial value further increase the significance of the sweetpotato.

OFSP is the first biofortified crop to combat micro-nutrient deficiencies in use at farmer level and serves as a model for the adoption of biofortified crop with a visible trait. Orange-fleshed sweetpotato as a staple food has an advantage over most vegetables in that it can supply significant amounts of vitamin A and energy simultaneously -- thus helping to address both VAD and undernutrition. Depending upon the colour intensity of the OFSP variety used and taking losses during cooking into account (approximately 20% through boiling), 1/4 to 1 cup of boiled and mashed sweetpotato meets the intake requirements of a young child.

Potential impacts of OFSP

By replacing white-fleshed with orange-fleshed varieties the VAD burden could be reduced by 15 to 22% in 17 SSA countries where sweetpotato is widely grown. Ex-ante analysis has determined that if OFSPs were adopted by one-in-six Ugandan households within 10 years of becoming available, the effort would achieve an estimated internal rate of return between 16 and 30 percent and yield a net present value between \$23 million and \$67 million.

In Central Mozambique, significant improvements in vitamin A intake and serum retinol concentrations (a proxy for vitamin A status) were obtained from an action-research study of an OFSP-based integrated agriculture-nutrition-market intervention in a very resource poor setting. This study emphasized the importance of having all three components (agriculture, nutrition and market interventions) to ensure improvement in young child vitamin A intakes and sustained adoption of the new material. Since the poorest households typically obtained over 60% of their energy needs from food staples, this strategy is particularly suited to poor rural households that cannot access purchased fortified food products but could grow OFSP.

2.3.1 On-going projects with an OFSP component

The following projects in SSA have an OFSP component:

The **Reaching End Users Project** (REU) in Mozambique and Uganda is entering its final year of implementation. REU looks at going to scale using an integrated agriculture-nutrition-market development model. There are many partners in this work besides CIP including IFPRI, Helen Keller International, World Vision, the Natural Resources Institute, and Ugandan NGOs.

Traditional Foods Project: there is an increasing emphasis on value chain development. CIP is collaborating with Farm Concern, a Kenyan NGO, and The World Vegetable Center and Urban Harvest on the joint promotion of the health benefits of Traditional African Vegetables and Orange-fleshed Sweetpotato, with farmers being linked to traders and markets through the formation of Commercial Villages. Given that there is no promotion of improved nutritional practices at the community level, one key research question we will be asking is whether OFSP and the Traditional African Vegetables become a significant part of the young child diet in producing households, even when there is no direct promotion.

CIP is the convener of the CGIAR initiative **Urban Harvest** to direct and coordinate the collective knowledge and technologies of the CGIAR Centers towards strengthening urban and peri-urban agriculture (UPA). UPA is a priority area of health concern due to the concentration of biological and chemical contaminants in urban and peri-urban areas which can get into the food system through agriculture. At the same time, UPA offers the potential of enhancing the health status of urban families with limited access to micro-nutrients. In Nakuru (Kenya), we are working with an HIV-AIDS self help group, Badili Mawazo, in vegetable production and goat raising to assess impacts on livelihoods and household food security and nutritional status. Among the plantings are dual purpose varieties of OFSP which can provide both roots for human consumption and later, vines for livestock consumption.

In 2008 we started implementation of the ASARECA supported **DONATA** project (Dissemination of New Agricultural Technologies in Africa) with NARIs, NGOs and private sector at country level. The objective of this project is to enhance the up-take and adoption of OFSP technologies. Lessons from the scaling up process will be identified and documented. Scaling-out of any intervention is always a challenge, but in the case of OFSP the integrated nature of the intervention provides an additional challenge as nutrition/health interventions have typically been treated institutionally as separate initiatives from agricultural interventions.

2.3.2 Key areas of on-going and planned research around OFSP include:

1. Investigating the use of OFSP linked to a health intervention that will decrease vitamin A loss (for example, de-worming or targeting pregnant women receiving pre-natal care) and enhance the impact of an integrated OFSP-based intervention.
2. More in-depth understanding of adoption rates and nutritional impact achieved in programs where OFSP is one of many crops introduced and/or has distinct role in the food system.

3. Ex-ante studies of the potential scalability of different delivery systems for OFSP, identify potential bottlenecks and synergies with other components of the intervention.
4. Understanding capacity strengthening requirements for multi-sectoral partnerships to successfully support up-scaling of technologies.

3 Networks

The **Vitamin A for Africa (VITAA)** initiative has brought 40 partner agencies from the health, nutrition and agricultural sectors and 11 member countries and encourages dialogue between health and agriculture sector actors. One activity is to extend the impact of orange-fleshed sweet potatoes in seven partner countries: Ethiopia, Kenya, South Africa, Tanzania, Ghana, Mozambique and Uganda.

CIP is a collaborator with **HarvestPlus**, an international, interdisciplinary, research program that seeks to reduce micronutrient malnutrition by harnessing the powers of agriculture and nutrition research to breed nutrient dense staple foods.

Notes by Margaret McEwan, Jan Low and Donald Cole on behalf of CIP colleagues and collaborators – 12 January 2009