Implementation of Multiple Irish Aid-Funded Orange Flesh Sweet Potato Projects

Nicolai Petry, James P Wirth
GroundWork, Crans-près-Céligny, Switzerland

Ben Siddle, Mags Gaynor
Irish Aid, Department of Foreign Affairs and Trade, Limerick, Ireland

Child holding orange flesh sweet potato, Kazizi village, Sanga district, Niassa Province, Mozambique, 2013.

Biofortification: A key nutrition strategy

Over the past 15 years, biofortification has been a strategy to address multiple Millennium Development Goals (MDGs), such as eradicating extreme hunger and poverty, improving maternal health, and ensuring environmental sustainability.[1] With the MDGs being replaced by the Sustainable Development Goals (SDGs), biofortification will be a continuing strategy to reduce micronutrient deficiencies, and will be a key nutrition strategy of the new goals to improve nutrition through sustainable agriculture.[2]

Biofortification of sweet potatoes is a promising and sustainable agricultural approach to reduce vitamin A deficiency (VAD), particularly in remote areas where individuals have limited access to commercial markets and mainly rely on household-produced crops.[3,4] Due to its large genetic variability, its favorable growing characteristics, and the high consumption in remote areas, the orange flesh sweet potato (OFSP) is one of the major targeted crops of biofortification initiatives. OFSP have high concentrations of provitamin A and are the most advanced biofortified crop in terms of research studies demonstrating bioavailability, efficacy, and effectiveness.[5–7]

OFSP are now being introduced in many parts of Africa and South America, and the Sweet Potato for Profit Health Initiative, launched by the International Potato Institute in 2009, seeks to reach 10 million households by 2020. Since 2009, eight Sub-Saharan countries have released 31 OFSP varieties. As part of its broader support of biofortification and the Consultative Group on International Agricultural Research, Irish Aid has provided funding to five projects in Sub-Saharan Africa promoting and disseminating OFSP (**Table 1**). This report was undertaken to better understand the common accomplishments and challenges of these five projects in order to identify common factors for success.

> "OFSP are the most advanced biofortified crop in terms of bioavailability, efficacy, and effectiveness"

Results

The five projects aimed to improve nutrition and health in populations vulnerable to VAD by stimulating the production and consumption of OFSP and other micronutrient-rich foods. All projects used an integrated approach whereby production of OFSP was accompanied by behavior change communication (BCC) activities to increase uptake by farmers and to sensitize consumers to a new product.

TABLE 1: Overview of Ireland-funded OFSP projects.

Country location and project name	Project period	Geography and planned coverage
Ethiopia – Tigray	March 2011–April 2013	Implemented in 5 *woredas* (districts)
"Alleviation of Food Insecurity and Malnutrition in		in Tigray region
Tigray, Ethiopia, through Promotion of Potato and		> Estimated coverage = increase coverage
Sweet Potato"		from 3,000 to 8,000 households
Ethiopia – SNNPR	November 2012–October 2014	Implemented in 5 *woredas* in SNNPR
"Alleviation of Food Insecurity and Malnutrition in		> Estimated coverage = 1,500 households
SNNPR, Ethiopia, through Promotion of Potato and		
Sweet Potato"		
Malawi	October 2009–April 2014	Implemented in 15 districts
"Rooting out Hunger in Malawi with Nutritious		> Estimated coverage = 70,000 rural households
Orange-Fleshed Sweet Potato"		
Mozambique – Niassa province	2012–2015	Implemented in six districts in Niassa province
"Nutritious OFSP for Niassa: Combating Food		> Estimated coverage = 20,000 households
Insecurity & Vitamin A Deficiency through Effective		
Delivery of a Biofortified Crop"		
Mozambique – Tete province	December 2011–December 2014	Implemented in one district in Tete province
"Enhancing Agriculture for Better Nutrition		> Estimated coverage = 3000–5000 households
Outcomes for Children in Mozambique"		

Project timeframe represents contract duration between Ireland funding (either Hunger Unit or national embassy) and grantee.
Only the Mozambique-Niassa project received funding prior to the program.

Vine supply and extension systems

An extensive and robust vine supply and extension system is crucial for the sustainable introduction of OFSP. Timely availability of high-quality planting material and conservation of vines for the next season must be guaranteed in order to meet the growing demand from farmers. Although sweet potatoes are less affected by soil and weather conditions than other staple crops, droughts and floods can nonetheless affect harvests. To assure constant vine supply, vine multipliers should have access to water and irrigation equipment so as to maintain supplies of vines during the dry periods. Training workshops on agricultural techniques and post-harvest technologies can help to improve the vine supply and extension systems.

The review of the projects revealed that the three following components of decentralized vine multiplication systems were indispensable for the successful OFSP projects: **1)** growing large quantities of OFSP vines for dissemination by trained decentralized vine multipliers; **2)** distributing vines to project farmers; and **3)** teaching project farmers in OFSP growing techniques (Malawi, Mozambique-Tete and Mozambique Niassa). Notably, all projects reviewed distributed OFSP vines for free using voucher systems in order to facilitate adoption of a new crop and to initially boost the production of OFSP.

Demand creation and promotion

BCC activities are important to raise awareness about essential nutrition actions, agronomic practices, and OFSP's role in VAD reduction. All of the projects used BCC activities to promote the production and consumption of OFSP, but depending on the situation in country, the strategic alignments of BBC activities differed. The focus of the Ethiopia-Tigray project, for example, was on the promotion of OFSP, since sweet potatoes were not historically consumed there, which is different to the project in Malawi, where less emphasis was on BCC activities, since sweet potatoes are a major staple food. The lead mother/care group model has been used in numerous projects in Mozambique as a way of spreading health/nutrition messages at the household and community level in a culturally appropriate manner and at low cost. BCC messages related to positive health behaviors and child care and feeding practices were included in the Ethiopia-Tigray and Mozambique-Tete projects.

Sustainability and considerations for future OFSP projects

The sustainability of the investigated projects was influenced most by the vine supply and extension system, the demand for OFSP and OFSP products, and familiarity and prior consump-

tion of sweet potatoes. Decentralized vine multiplication systems were found to be the most successful as they facilitated the production and dissemination of large quantities of OFSP vines. Moreover, decentralized systems supported by agricultural extension enabled farmers to learn OFSP growing techniques, conserve vines for the next season, and keep pace with the demand for OFSP vines.

"Projects created clear incentives for diffusion and adoption"

By facilitating contract production for local markets, women's organizations, and the production of value-added products (e.g. OFSP flour), projects created clear incentives for diffusion and adoption. While home consumption is often encouraged as part of BCC communications, a balance of home consumption and sales may provide a more sustainable approach for households by serving as both a food supply and an income source. Extensive nutritional education should also be provided to beneficiaries so that they know about the nutritional benefits of consuming OFSP. The development of markets for OFSP should take place shortly after project initiation and is essential to reach non-farming or rural households that are net buyers of food. This strategy stimulates households to produce surplus production and at the same time assure sufficient home consumption.

Frequent consumption is one of the main criteria for a successful introduction of a biofortified crop. Biofortified crops must be consumed on a routine basis (i.e., daily or at least multiple times a week) in order to have a significant nutritional impact. Biofortified crops that are similar to staples already consumed are more likely to be accepted by the consumers, facilitating program implementation and nutritional impact.[8]

"Biofortified crops must be consumed on a routine basis to have a significant nutritional impact"

Future research required

The nutritional impact of OFSP has only been observed in Mozambique. None of the projects provide information about the direct impact of OSFP consumption on the reduction of vitamin A deficiency. Program data, such as adoption rate, percentage of households growing OFSP, and home consumption, are only indirect measures which provide at best an approximation of OFSP impact. While not all implementing agencies will have the technical ability or resources to conduct impact surveys where

Vine vegetation 7 weeks after transplantation; Lussanhando village, Lichinga district, Niassa, Mozambique, 2014.

Children with newly harvested orange-flesh sweet potatoes, Lussanhando village, Lichinga district, Niassa, Mozambique, 2015.

vitamin A intake and status are measured, there is a need for additional evidence of the biological effectiveness of OFSP from other countries and agro-ecologic environments. Examining the nutrition impact on selected future projects is important to both improve the evidence base of OFSP (and of biofortification in general) and evaluate if the program is having the intended impact.

Correspondence: ***Nicolai Petry,***
GroundWork, 40b Les Landes, Crans-près-Céligny, Switzerland
Email: *nico@groundworkhealth.org*

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