



Orange-fleshed Sweetpotato Purée for Bakery Applications in Kenya

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Introduction

In Asia, most sweetpotato is used in processed products or animal feed. In contrast, in sub-Saharan Africa (SSA), most sweetpotato is consumed boiled or steamed, which is very healthy [1]. However, processed products offer an opportunity to expand markets for farmers and reach the rapidly growing urban consumer market that often opts for convenience when purchasing food.

Given the current price of sweetpotato roots, the use of orange-fleshed sweetpotato (OFSP) flour as a substitute for wheat flour is not cost-effective in SSA but in many settings the use of OFSP in purée form (steamed and mashed roots) is economically advantageous. Considerable experience has been gained in Rwanda on the manufacture and marketing of bakery products in which 20-45% of wheat flour in baked products has been replaced by OFSP purée [2]. Baked products (bread, donuts, biscuits) made using OFSP purée are highly acceptable to consumers [2].

Aim of Approach

OFSP purée has the potential to be *the* breakthrough technology for the expanded use of OFSP in SSA. However, currently processors store and utilize the roots for purée as needed, or prepare the purée and freeze it for future use, without cooling. The major bottleneck to expanding use of purée is the inconvenience of having to prepare and store the purée. Hence, our current research is focused on developing shelf-storable purée at room temperature for at least 4 months that is of high quality. Developing this product is aligned with facilitating the development of an OFSP baked product value chain in Kenya, under the Scaling up Sweetpotato through Agriculture and Nutrition (SUSTAIN) project (2013-2018).

The goal is to develop a public-private sector partnership with at least one major agro-processor in Kenya to produce an economically-viable processed product with OFSP as a major ingredient. We intend to reach at least 100,000 urban and rural consumers.

Project Implementation

2014 (Phase 1) was the preparatory year. CIP identified the key product, OFSP bread, and the key private sector partner for marketing the bread,--Tuskys supermarket chain with 52 stores throughout Kenya. Using OFSP baked products improved by Euro-Ingredient Ltd (EIL), CIP assessed consumer acceptability in 4 Tuskys' stores. Those results convinced Tuskys to engage in the partnership. Then, in response to an advertisement, Organi Ltd was selected as the purée processor partner based in a major sweetpotato growing area. CIP identified and trained quality planting material multipliers.

Phase 2 (2015) was the start-up period. The factory for purée was established, a laboratory for carotenoid analysis was established, and farmers were engaged to start producing OFSP varieties. In April 2015, the partners signed a MOU to collaborate. Farmers initially were reluctant to switch to OFSP as the market for white-fleshed varieties was well-established. The first OFSP bread sales in Nairobi started in June 2015 in 6 stores. By December 2015, the CIP food scientist had developed a vacuum-packed purée that could store 4 months at 23°C using the preservatives benzoate, sorbate, and citric acid. But moving to from lab to factory production requires having good food safety standards in place and appropriate short term storage capability. However, by January 2016, roots from the second 2015 season began to come to the factory in significant amounts. During Phase 3 (January-June 2016), emphasis was placed on improving efficiency and lowering the cost of the product, which was based on peeling the roots prior to cooking.

In Phase 4 (July-September 2016) the major innovation was to improve root washing and use a stronger puréeing machine so that unpeeled roots could be used to make a high fiber, quality OFSP purée.

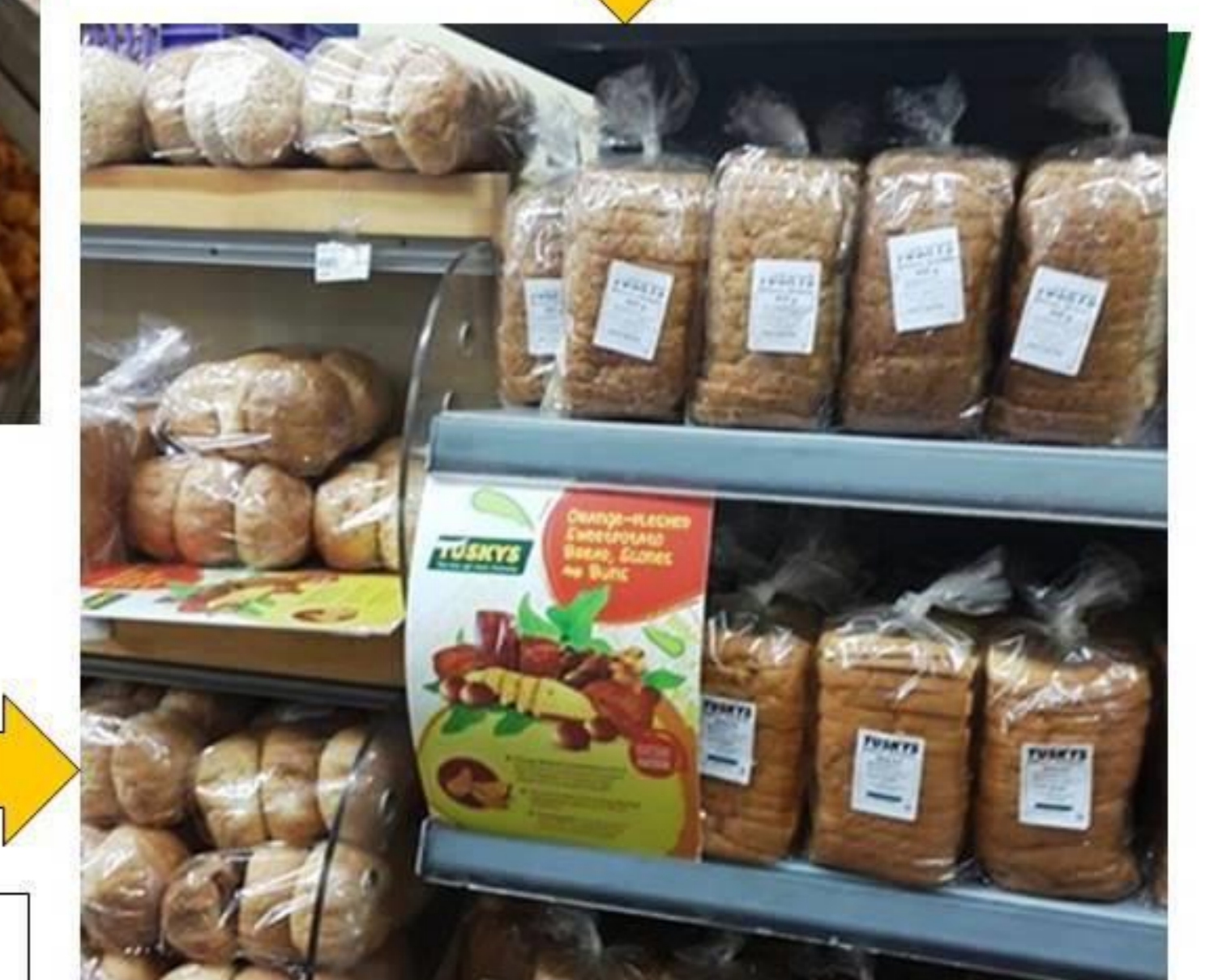
OFSP Farmers Homa Bay, Nyanza Province



Organi Limited Purée Processor, Ringa, Nyanza Province



Euro-Ingredient Ltd Product Development and Equipment Support



Tuskys Supermarket use purée to bake bread and buns in Nairobi

Figure 1. OFSP purée-bread value chain

Evidence and Implications

By July 1st 2016, the major technical bottlenecks in the value chain had been resolved through innovation and improved management. Since June 2015, Organi Ltd has produced 71,958 kgs of purée over 15 months. As of 1st September 2016, Tuskys is selling more than 3,000 loaves of OFSP bread per day in 18 stores. Lab analysis has found that OFSP purée bread is a good source of pro-vitamin A (beta-carotene) providing 50 Retinol Activity Equivalents (RAE) per 30g slice. A child needs 400 RAEs of vitamin A per day.

Table 1 shows that it took the introduction of the purée made from boiled, *unpeeled* roots to make the purée production profitable (net profit margin of 18%) and get the production cost per kilogram of purée truly lower than the cost of wheat flour (61 Ksh per kg). The next steps are: 1) to move to using shelf-storable purée, once the construction of the storage facility is complete and 2) to purchase an additional boiler which will permit production to expand to utilize 35,000 kgs of roots per month.

Clearly, getting a new processed product off the ground requires good partnerships and innovation to resolve bottlenecks encountered along the way, which requires facilitation and subsidization of unexpected costs. A recent survey showed that the OFSP bread is widely accepted by Tuskys' customers, even at 55 Ksh per loaf compared to 50 Ksh per loaf for the 100% wheat flour bread. Hence, prospects are excellent for use of this technology to expand to other SSA settings.

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Table 1. Change in Profit Margins and Unit Costs Since January 2016 and Desired Target

Description	Raw Roots Used per Month	Net Profit Margin per month	Per Kg Production Cost (Ksh)
Phase 3: January-June 2016	15,000	-13%	75
Phase 4: July-September 2016	10,530	18%	53
Next Phase: Additional Boiler	35,000	42%	36

Net profit margin is (revenue-costs (operating, cost of product, etc.))/revenue * 100

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