

Potential Business Models and Financial Feasibility of Selected Medium-Scale Business Enterprises for Orange-fleshed Sweetpotato (OFSP) Value-added Products



Fig 1. Vacuum-packed OFSP puree requiring freezers and a cold chain (Model 2) (Credit: J. Low)



- Five potential and financially viable business models were examined for OFSP value-added products in the Kenyan context.
- These potential OFSP value-added products are cookies, cupcakes and mandazi (donuts), and OFSP purée for bakery products. However, the choice of products might differ in other regions based on market demand and cost of ingredients.
- The required minimum investment level varies between US\$ 31,000 and 43,000 depending on the business model selected.
- The payback period varies between 1 to 2.8 years and average Return on Investment (RoI) is more than 100%.

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What was the problem?

Africa is undergoing rapid urbanization, which impacts consumption behavior and dietary habits. Many of these effects are negative. There is an increase in high malnutrition, particularly among urban poor; Vitamin A deficiency also higher among urban poor than well-off households (Holdsworth and Landais, 2019). Food price fluctuation influences the quality of the African diet (Masters et al. 2018). The rapidly growing urban consumer market also increases demand for processed products in Kenya due to changes in food habits and life-style (Rischke et al. 2015; Demmler et al. 2018). Further, the presence of “supermarkets” leads to increases in the consumption of processed food. There also can be positive effects. Supermarkets handle large volumes which can mean lower prices and there is evidence that they contribute to improved diet diversity. Given these different effects, the net effect on nutritional outcomes and health is not straight-forward but merits further investigation (Rischke et al. 2015; pp-18). Some studies conclude that processed and highly processed food contribute to unhealthy diets. Therefore, there is need to introduce nutritionally rich products (Popkin, 2014; Demmler et al. 2018). So, if the processed products are affordable and are also nutritious, this would be a win-win for urban consumers. From the supply side, farmers’ participation in the supermarket channel is significantly associated with higher calorie and micronutrient consumption at household level apart from increasing income (Chege et al., 2015). Since Orange-fleshed Sweetpotato (OFSP) is rich in β -carotene and is well accepted by young children and further increases Vitamin

A intake in young children (Low et al., 2007), the use of this nutritious crop as an ingredient in processed products should be explored. If such products are financial viable, it creates significant market opportunities for orange-fleshed sweetpotato (OFSP) growers.

What objectives did we set?

We have identified potential business models for OFSP value-added products and measured the the financial viability of the selected business models for investors/ entrepreneurs to consider for producing OFSP value-added products.

What did we achieve during SASHA Phase 2?

We conducted the study using a “Financial Cost-Benefit Analysis (FCBA)” using real and hypothetical data on technical and financial operations, collected from key informants with expertise in this domain. Firstly, the study identified potential business models for various OFSP value-added products in the industry, based on the existing marketing system in Kenya. Secondly, the study determined financial viability for the identified potential business models by cal three financial indicators as i. Net Present Value (NPV), ii. Internal Rate of Return (IRR) and iii. Sensitivity Analysis. In addition, the study also estimated the payback period to measure the length of time required for an investment to recover its initial outlay and become profitable. The Return on Investment (RoI) determines the gain or loss generated from an investment relative to the amount of money invested. It is normally used

to compare the efficiency of the different investments under different scenarios. Five potential business models were considered, namely i. Model 1: Purée directly used in product, no storage >1 week; ii. Purée vacuum-packed & stored in freezers; iii. Buy the purée already made & use it to make products; iv. Model 4: Use OFSP purée with preservatives that stores for 3 months; v. Hot-fill machine + more expensive packaging (theoretical) with a 6-12-month shelf-life (Table 1).

The first business model focuses on processors who produce OFSP value added products (i.e., cookies, cupcakes and mandazi (local food)) using a smaller number of freezers and without vacuum packaging techniques. These processors are part of the bakery industry. In this case, the purée will be stored for a few days and used for producing OFSP value added products immediately. These products are then sold directly to consumers. Hence, it is categorized under a “Business to Consumers” (B2C) business model. The second business model focuses on OFSP purée production only where processors will be using vacuum packaging technologies but no preservatives for the purée. The purée is kept in a large number of freezers. In this model, consumption of electricity is greater than the first business model. Since OFSP purée will be sold to bakery industry, this model will be categorized under a

“Business to Business” (B2B) category. The third business model is similar to the first business model, but producers will not produce OFSP purée rather purchase from a processor making OFSP purée as a product. The fourth business model focuses on ingredients similar to the second business model but uses preservatives and vacuum package technologies and has no freezers. Finally, the 5th business model is similar to model 2, but has a different processing technology for the purée. The hot-fill machine (Fig. 2) included in this business model makes a purée with enhanced shelf-life (6-12 months) and special packaging, without using preservatives. The advantage of this model as compared to model 2 is that this model does not require freezers and high consumption of electricity. However, this model is a proposed business model, as it is not yet tested with OFSP in the Kenyan market. So, results from this model must be used with caution.

For the business models 1 and 3, the study assumed that an investor would require 36 SQM area to run a business which is in an urban area of Nairobi, Kenya where the investor would be renting this place rather than investing in purchase of the land. In contrast, for the business models 2, 4 and 5, 100 SQM of area is required to run a business at optimal level and we assume it will be rented in a peri-urban area of Nairobi. Table 1 shows the total

Table 1:Types of potential business models and minimum required investment level

SN	Type of business model & Production Technology	Key Equipment	Final Product	Market	Area size required	Total Investment Required	Maximum Capacity of Puree requirement and production (Kg) per year
1	Model 1 (without storage): Freezers + no vacuum packaging	High Fibre Puree (HFP) machine (1.5 m long * 0.7 m width * 0.85 high), Steamer (this is a gas; 80-100 kg batch), Depositor (Cookies machine), baking equipment	final product (i.e., cookies, cupcakes and mandazi)	B2C	36 SQM	\$43,030	16,000*
2	Model 2 (Cold chain storage with no preservatives): No preservatives+ vacuum packaging +lots of freezers+ more electricity	High Fibre Puree (HFP) machine (1.5 m long * 0.7 m width * 0.85 high), Steamer (this is a gas; 80-100 kg batch), Vacuum machine with label printer	Ingredients (Puree) only	B2B	100 SQM	\$33,370	375,000**
3	Model 3 (OFSP bakery products without use of preservatives of OFSP puree): Buy vacuum packed OFSP puree without preservatives	Depositor (Cookies machine), baking equipment	final product (i.e., cookies, cupcakes and mandazi)	B2C	36 SQM	\$31,390	16,700*
4	Model 4 (Shelf-storable puree with preservatives): Use preservatives+ no freezers+ vacuum packages	High Fibre Puree (HFP) machine (1.5 m long * 0.7 m width * 0.85 high), Steamer (this is a gas; 80-100 kg batch), Vacuum machine with label printer, Ribbon mixer	Ingredients (Puree) only	B2B	100 SQM	\$34,170	375,000**
5	Model 5 (on-going business model) hot-fill machine: hot-fill machine+high level of packing+less freezers+less electricity	Hot fill machine, High Fibre Puree (HFP) machine (1.5 m long * 0.7 m width * 0.85 high), Steamer (this is a gas; 80-100 kg batch), Vacuum machine with label printer	Ingredients (Puree) only	B2B	100 SQM	\$37,170	375,000**

Source: Key Informant Interview (KII) with private players in year 2018-19; author's calculation

Note: * indicate that investors buy puree from puree producers which is a requirement for investors per year; ** indicate that investors produce puree at a maximum capacity per year.

estimated minimum required investment for each business model to run a business. At the current lending rate of 18% in Kenya, the cost and benefit of the project were discounted at 18% in the financial analysis for 14 years of the project life-cycle. A 14 year life-cycle was selected based on the estimated life span of the items used for the production. The study assumes that 3 months are required to establish the business if the investment is received in the initial year 0. After establishment, the business can operate at optimal level with limited resources. Though sales will start after the 3-month establishment period, 100% of production might not be sold in the market. Therefore, the study made assumptions to measure production and sales uptakes for potential commodities that the business can focus on under each business model. Under this scenario, the production activities will start after the completed of

three-month establishment period of the business with minimum capacity of the production level, i.e., 40% of the maximum capacity of the production. Sales will happen for only 30% of the maximum production capacity in the initial periods of the business. This will increase up to 96% of the maximum production capacity to be sold in the market, assuming 1% wastage in the production process.

The study estimated input costs (i.e., cost of purée and cost of other ingredients) for producing cupcakes, cookies and mandazi (Table 2). One of the major inputs is OFSP purée. The cost of OFSP purée per unit is estimated to be US\$ 0.36 per Kg in year 2014 (Magnaghi et al, 2015). However, due to inflation, this study has re-estimated the cost of production which is US\$ 0.40 per kg. Since, this business model focuses on cookies, cupcakes and mandazi, the cost

Table 2: Cost of production per unit for selected final OFSP products in year 2018 (prices for year 2018)

Ingredients	Quantity in recipe	Unit name	Cost/unit (Khs)	Total cost (ksh)	Total Cost (US\$)	% Share of inputs	Qty (Kg)	% of Total Weight
Cost of producing 828 cookies or/biscuits								
Wheat Flour	8	Kg	54	432.0	4.4	32.0	8.0	38.5
OFSP purée	10	Kg	40	400.0	4.0	29.7	10.0	48.1
Sugar	2	Kg	160	320.0	3.2	23.7	2.0	9.6
Baking powder	0.4	Kg	250	100.0	1.0	7.4	0.4	1.9
Eggs	8	no of eggs	12	96.0	1.0	7.1	0.4	1.9
Total cost of ingredients				1348.0	13.6	100.0	20.8	100.0
Cost per biscuit/or cookies excluding cost of cup and labeling				1.6	0.016			
Price range per pack (10 COOKIES -200 GRAM) in US\$					0.6-1.0			
Cost of producing 48 cupcakes								
Wheat Flour	1	Kg	54	54.0	0.5	11.0	1.0	29.2
OFSP purée	1	kg	40	40.0	0.4	8.2	1.0	29.2
Sugar	0.6	kg	160	96.0	1.0	19.6	0.6	17.5
Baking powder	0.05	kg	250	12.5	0.1	2.5	0.1	1.5
Water	0.15	kg	1	0.2	0.0	0.0	0.2	4.4
Egg	12	eggs	12	144.0	1.5	29.3	0.6	17.5
Vegetable oil	0.6	kg	240	144.0	1.5	29.3	0.0	0.9
Total cost of ingredients				490.7	4.9	100.0	3.4	100.0
Cost per cupcake				10.2	0.103			
Price range per cupcake during cash flow period in US\$					0.40-0.50			
Cost of producing 40 mandazi (40 gram per pc)								
Wheat Flour	2	Kg	54	108.0	1.1	56.1	2.0	62.1
OFSP purée	0.8	kg	40	32.0	0.3	16.6	0.8	24.8
Sugar	0.25	kg	160	40.0	0.4	20.8	0.3	7.8
Baking powder	0.05	kg	250	12.5	0.1	6.5	0.1	1.6
Water	0.12	kg	1	0.1	0.0	0.1	0.1	3.7
Total cost of ingredients				192.6	1.9	100.0	3.2	100.0
Cost per mandazi (small size)				4.82	0.049			
Price range per unit during cash flow period								

Source: authors' calculation; Exchange rate 1 US =99.2 Ksh as on November 2018

Table 3: Financial Feasibility Indicators for business models

Models	Scenarios	NPV	IRR	Discount Rate	Payback period (Years)	Return on Investment (RoI) per year (%)
1	Model 1 (without storage)	\$291,560	85%	18%	1.3	164
2	Model 2 (Cold chain storage with no preservatives)	\$247,018	90%	18%	1.4	198
3	Model 3 (OFSP bakery products without use of preservatives of OFSP purée)	\$262,342	90%	18%	1.3	203
4	Model 4 (Shelf-storable purée with preservatives)	\$265,404	77%	18%	2.8	252
5	Model 5 (proposed) hot-fill machine with packaging at 10 cents/kg	\$345,380	82%	18%	1.0	266

per cookie is estimated to be US\$ 0.016 which includes 48% of the cost incurred due to OFSP purée and remaining cost incurred for other ingredients (Table 2). Similarly, the cost of per cupcake and mandazi is estimated to be US\$ 0.103 and 0.049, respectively (Table 2). However, these costs do not include packaging, branding and labeling. Therefore, the study has made assumptions for estimating the costs per unit of final product and added a profit margin to determine the price of the product. The price needs to be competitive in the market to increase the sales volume and revenue in the long-run.

All five business models are shown to be financially viable in the long-run, with the level of average investment at 30,000 to 43,000 USD. However, the sensitivity of the business, net present values, internal rate of return, return on investment and payback period for the investment differ across the five business models. Therefore, it is important for investors to understand the market demand for the products and available funds, and the type of business model that is appropriate for their resource base and setting.

Where there any key challenges or lessons learned?

There are two significant risks involved in this business: 1) lack of consistent supply of sweetpotato roots and 2) market demand fluctuation for the product. If marketing strategies are well executed, the models 1, 3 and 5 can be more viable business models than the two other models. If there are fluctuations in the market demand for the purée

product, then it is ideal for investors to focus on fourth model where preservatives used for producing OFSP purée. Though the 2nd model is financially viable, it comes with the highest risk for those investing into this business.

What's next?

Firstly, there is a potential for explore more value-added products to enhance the financial viability of the business. Secondly, there is a scope to introduce lower cost technologies to reduce the cost of production further. Thirdly, economies of scale can be considered by increasing the volume of the business-scale. Fourthly, there is a scope to introduce a vertically integrated supply chain by linking seed and root producers with processors through contract farming or the equivalent, which will increase the consistency of quality root supply. Finally, there is a scope to explore the loan repayment options at various interest rates based on bank rates.

Partners • Euro ingredients Ltd. (EIL), Nairobi, Kenya

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