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A Stochastic Frontier Approach to Technical Efficiency and Marketing of Orange Fleshed Sweet Potato (OFSP) at Farm Level: A Case Study of Kwazulu-Natal Province, South Africa

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ABSTRACT This paper examines the economic viability of orange-fleshed sweet potato (OFSP) in North KwaZulu-Natal, South Africa. The main objectives of the paper were to quantify the technical efficiency and marketing opportunities of OFSP farmers. Primary data was randomly collected from 32 selected OFSP farmers, 15 hawkers and three food processors. The stochastic frontier production function was used to analyze the data. The results indicated that the mean technical efficiency of OFSP farmers was twenty-one percent, suggesting that there is potential to increase production output by seventy-nine percent with the same input level. The paper found no solid evidence to substantiate that socio-economic factors influence the technical efficiency score. The findings of the paper also found that farmers only explored two marketing channels. The first channel was from the farmer straight to the consumer and the second channel from the farmer to the hawker and then to the consumer. It was then discovered that higher producer margins were attained from the latter channel. Main marketing challenges were found to be lack of transportation, lack of pricing decision and marketing skills. The paper recommends that there is a need for significant amount of investment towards the promotion of OFSP especially to consumers and retailers in order to increase awareness of the benefits attained from this variet

INTRODUCTION

There is a direct correlation between production efficiency and market participation (Rios et al. 2009). Masunda and Chiweshe (2015) argued that market performance positively contributes to improved technical efficiency. Hence, whenever farmers are faced with market related challenges, questions over their production and marketing efficiency are raised. Following the release of the domestically bred Orange Fleshed Sweet Potato (OFSP) varieties to farmers in Hluhluwe, South Africa, this paper seeks to establish the technical efficiency level of the farmers. This is done to assess the possibility of farmers transitioning from small-scale farming systems to commercial systems. Small-scale farming systems are typically characterized by limited resources and poor access to credit (Chepng'etich et al. 2015).

However, the role of these farmers on rural food security has proved to be significant (Domola 2003). Increasing technical efficiency in an already constrained resource system is the key towards increasing food security and poverty alleviation (Itam et al. 2015). The Agricultural Research Council (ARC) has developed and imported high yielding varieties of OFSP with improved nutritional properties, to support farmers with improved yields, in a land constrained by global climate change.

Low et al. (2006) argued that sweet potato is predominately grown in small plots by poorer farmers and hence, it is regarded as a poor men's crop. Andrade et al. (2009) and Domola (2003) suggested that sweet potato has contributed significantly to food security in most African rural communities. Its availability on the urban market could therefore help assist the urban poor, especially in the townships of South Africa. It is mainly cultivated in an intercropping system with maize, sorghum and other vegetables for food security and also to guard against crop failure (Low et al. 2006). Given the potential benefits derived from producing the crop, rural communities could supply urban markets, thereby raising rural incomes and improving the standards of living in rural communities.

There are various factors affecting the productivity and marketable yields of farm prod-

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ucts in South Africa and Africa in general. In a paper authored by Lewu and Assefa (2009), farmers perceived pests to be the major production constraint, followed by water stress, inaccessibility of production inputs, soil fertility, lack of money to hire tractors, insufficient labor and bad weather. The major marketing constraints faced by farmers were insufficient market places and lack of transport (from production points to markets). Other marketing constraints were lack of market infrastructure, poor infrastructure (such as roads), lack of market information or the inability to interpret such information when available and the lack of credit facilities (FAO 1991).

A recent study conducted in Swaziland on sweet potato production constraints, by Nsibande (2010) showed that insect and pest damage is a major production constraint to sweet potato production. It was also revealed that farmers lacked knowledge about the aspect of pest biology and management. The study recommended the improvement of weeding and ridging, crop rotation, the use of high yielding varieties and pest free planting material (Nsibande 2010). Low farm productivity in Africa has been mostly attributed to the use of traditional crop varieties, increasingly depleted soils, shrinking plots of land, scarce and unreliable water supply (Mkhabela 2005; Toenniessen et al. 2008).

The researchers also noted other challenges such as crop losses from pests and diseases, inequitable land distribution patterns, inefficient and unfair markets and poor agricultural and transportation infrastructures. Virgin et al. (2007) agreed with the same notion by highlighting the difficulties that African farmers face to produce high quality products sufficient to successfully participate in modern markets. These difficulties include lack of infrastructure, management and husbandry problems, depletion of natural resources, weak markets and other socio-economic constraints. In addition to these challenges, farm production is also negatively affected by biological and environmental constraints, including the effects of global climate change.

The production of sweet potato in South Africa has been rather volatile and relatively smaller compared to production in other African countries. In 2011, South Africa contributed a insignificant 0.04 percent to the international sweet potato export market (FAO 2011). Annual sweet potato production reached 58,000 tons in 2012, marginally lower than the 5-year average of 59,000 tons and significantly down from 63,000 tons in 2011. This was mainly due to the high supply from the 2011 production levels propelling farmers to reduce area under cultivation, as prices were relatively unattractive. Although sweet potato can be produced anywhere in the country, the north of Kwa-Zulu-Natal province has the favorable climatic conditions which suit its production. Hluhluwe and E-Manguzi are rural districts situated north of KwaZulu-Natal Province, towards the Mozambique border, under Umhlabauyalingana Municipality. These are frost-free areas, making it suitable for the production of sweet potato all year round. Domola (2003) suggested that marketable yields of sweet potatoes in South Africa are greatly affected by diseases and viral infections. The researcher observed that the occurrence of diseases was relatively low as compared to viral infections. However, the provinces, which were mostly infected by viral infections, (between 9-10%) include Western Cape, Mpumalanga, Limpopo and KwaZulu-Natal. North West province showed little or no symptoms of viral disease infections. When analyzing the effect of these viral infections on storage root yields, it was proven that total yield on average reduced by twelve to twenty-two percent and marketable yield by twenty-one to thirty-eight percent. Reduction in marketable yield was mainly attributed to the cracking of storage roots.

A survey carried out in Tanzania showed that seventy percent of the sampled producers did not have access to adequate inputs and extension services for sweet potato production (Mmasa 2011). On the contrary, 19.3 percent of the farmers claimed to have received extension services from extension officers and the rest from other sources. These findings indicate that farmers lacked extension services from village extension officers. Hence, the paper suggested more government effort, NGOs and other civil society organizations to support the sweet potato industry (Mmasa 2011). Other production constraints affecting sweet potato include soil fertility, rats (which can destroy up to 10% of the crop), poor post-harvest handling practices that lead to rotting, broken roots and subsequent loss in monetary value.

Objectives of the Study

The main objectives of this analysis are thus, to quantify the technical efficiency and marketing opportunities of OFSP farmers in Kwazulu-Natal Province, South Africa.

RESEARCH METHODODOLOGY

Study Area and Sampling Procedure

The research was carried out in 2012 in Hluhluwe district of the KwaZulu-Natal Province, South Africa. The study area was selected because OFSP production is prominent and more than 50 people in that area are involved in OFSP cultivation.

Primary data was collected using a structured questionnaire from three villages situated in Hluhluwe. Multistage method was used to identify the three villages where 32 farmers were randomly selected from the three villages and from which 15 hawkers and three food processors were also randomly sampled to get a total of 60 respondents. The food processors were interviewed based on their market share in each processing sector. The processors approached were baby food manufacturers, a sweet potato dehydrating company and frozen vegetables producers.

Analytical Technique

The stochastic frontier production function model was used to analyze the data. This model is prominent in most literature on technical efficiency analysis (Aigner et al. 1977; Battese and Coeli 1995; Abdulai et al. 2013; Masunda and Chiweshe 2015). The Stochastic frontier is a useful tool to estimate technical efficiency and was later modified for other uses such as capacity and capacity utilization. The main advantage of the model is that it captures random variables, which are beyond the producer's control, so that the measure is more consistent with the potential output under "normal" working conditions. In these models, the impact of random shocks (as labor or capital performance) on the product can be separated from the impact of technical efficiency variation.

Stochastic Frontier Production Model

In STATA statistical package, frontier functions are designed to fit stochastic production or cost frontier model with the default being the production frontier model. Technical inefficiency of individual OFSP farmers is estimated through the stochastic frontier production function, which is defined as:

$$y = f(X_a; \beta)\varepsilon \quad (1)$$

Where,

Y = The quantity of agricultural output (OFSP)

Xa = A vector of input quantities

β = A vector of parameters

ε = Stochastic disturbance term consisting of two independent elements u and v,

Where:

$$\varepsilon = U + V \quad (2)$$

V, accounts for factors outside the farmer's control such as environmental aspects and diseases. It is assumed to be identically and independently distributed as n ~ (0, σ 2v). A one-sided component—v≤0 reflects technical inefficiency relative to the stochastic frontier, f(xa, β) ε. V = 0 then represents a farm that lies on the frontier and V < 0 for the one whose output is below the frontier a^i n ~ (0, σ2u)^i, that is, the distribution of V is half normal. U captures the economic inefficiency.

The frontier of the farm is given by combining (1) and (2):

$$Y = f(x_a; \beta) * e(u + v) \quad (3)$$

The empirical stochastic frontier production function that was used to analyze the data is specified as follows:

$$\ln Yi = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + V_i - U \quad (4)$$

Where;

U = Captures inefficiency level caused by socioeconomic factors that affects productivity,

I = Is the observation of the Ith farmer,

Ln = The logarithm to base of "e",

Y = Yield of the OFSPV (kg),

X_1 = Number of days that the family labor works in the farm,

X_2 = Area allocated to OFSPV (m2),

X_3 = Number of cuttings used in the production of OFSPV (kg),

X_4 = Fertilizer used in the production of OFSPV (kg/m2),

X_5= Rate of irrigation for OFSP per week (Liter/week),

U_{ij} is specified as,

$$Ui = \alpha_0 + \alpha_1 d_1 + \alpha_1 Z_1 + \alpha_1 Z_2 + \alpha_1 Z_3 \quad (5)$$

Where:

Ui = Economic efficiency of the ith farmer,

d = Dummy variable for gender, where one is male and zero otherwise,

Z_1 = Sweet potato farming experience of the i^{th} farmer farming OFSPV (years),

Z_2 = Formal education of the i^{th} farmer (years),

Z_3 = Household size of the i^{th} farmer (number),

The Z variables are associated with technical inefficiency effects, which could include socioeconomic and farm management characteristics (Onumah and Acquah 2010).

RESULTS AND DISCUSSION

Descriptive Analysis of the Farmers

As can be seen from Table 1, the total population of the identified OFSP farmers comprised predominantly females at eighty-five percent and males constituting only fifteen percent. Fifty seven percent of the OFSP farmers fell into the age group 50-60 years while six percent fell over the age of 60. The findings obtained by Yusuf and Wuyah (2015) in Nigeria revealed that 36.67 percent of the respondents were between the ages of 40-49 years, whereas ten percent were above 60 years. Thus, the finding from this study is in conformity with findings from other similar studies.

The youth involved in OFSP farming constituted twenty percent of the total population. Although farming in this area (as in other cases of small scale farming system) is dominated by elderly people, the youth are actively involved and may serve as an indicator for sustainability in the farming of sweet potato for this area.

The average household size of people involved in OFSP farming consisted of 8 people ranging between, 3 to 18 people per household. This serves well for labor availability especially in a system where technology is not employed and family labor is the primary source of labor. Forty eight percent of the OFSP farmers received no formal education, fifteen percent went through primary education however, did not proceed to high school. Twenty eight percent proceeded to high school but received no tertiary education or training. Nine percent of the farmers went through Adult Basic Education and Training (ABET) system.

Production Factors

Looking at Table 2, gamma serves as an indicator of the orderly influences that were unexplained by the production function and the dominant sources of random error. From the results displayed in Table 2, the value of gamma is 0.026 signifying that 2.6 percent of the variation in yields was explained by inefficiency values (Table 2). Consequently, 97.4 percent variation in yields was explained by production factors. This indicates that the socio-economic factors that were expected to affect production efficiency of OFSP farmers are not really significant. These findings are in agreement with the results obtained by Abdulai et al. (2013). Although these factors are theoretically significant in explaining the variation in crop yields, especially in small-scale farming systems, further discussion on them is made. Given an efficiency score of 20.6 percent, the assumption that OFSP farmers are not technically efficient is accepted. Technical

Table 1: Socio-economic factors of the farmers

Sample size = 32					
Gender				*Male*	*Female*
				85%	15%
Age (Years)		*20-35*	*36-49*	*50-60*	*>60*
	20%	16%	57%	7%	
Educational Level	*None*	*ABET*	*Primary*	*Secondary*	*Tertiary*
	48%	9%	25%	18%	0%
Source of Income	*Off farm*	*Farming*	*Pension Grants*	*Child grant*	
	8%	19%	68%	5%	
Household Size	*Average*	*Range*			
	8	3-18			
Sweet Potato Farming Experience				*Family practice*	*Started with the project*
				56%	44%

efficiency is mostly explained by the mismanagement of the constrained available resources.

Table 2: Results from stochastic frontier production analysis

Variable	*Coefficient*	*Standard error*	*P-values*
	Production factors		
Constant	811	0.514	0.114
Family labour	0.814	0.277	0.003***
Area allocated	0.474	0.313	0.131**
Cuttings	0.193	0.112	0.084**
Fertilizer	-0.551	0.224	0.014***
Irrigation	-0.385	0.256	0.133
	Inefficiency factors		
Constant	11.607	20.196	0.565
Age	-8.606	12.894	0.504
Gender	-1.501	2.204	0.496
Farming experience	4.018	7.268	0.580
Formal Education	-2.040	2.480	0.411
Household size	-6.658	8.566	0.437
Sigma square	(σ^2)	0.0059	
Gamma	(γ)	0.26	

significant at 10% level * significant at 5% level.
$R^2 = 0.974$

As can be seen from Table 2, the production factor is highly significant at the five percent level and is positively related to the yield of OFSP. The coefficient of family labor is 0.81 suggesting that, for every one percent increase in man-days per week, there will be a 0.81 percent increase in yield of OFSP. The significance of labor to output is due to total dependence on family labor as there is no mechanical technology, which is employed.

The coefficients of the stochastic production frontier are positive, suggesting that there is a positive association between sweet potato production, and farm labor, irrigation, fertilizer and area allocated to the crop. This finding is justified by the fact that these inputs are important determinants in agricultural production. The positive values of the estimated coefficients, suggest that an increase in farm labor, fertilizer, irrigation and farm size will result to an increase in output of sweet potato in Hluhluwe. The findings concur with results obtained by Itam et al. (2015) who concluded that increasing farm size, cassava cuttings and capital would result in an increase in cassava output in Nigeria.

Area allocated to OFSP was found to be significantly associated with yield variation. The variable was also found to be significant at the ten percent level. This is in agreement with a priori expectation that as more land is cultivated, production output will increase. With every percentage increase in area allocated to OFSP, output per unit area will increase by 0.47 percent. It is therefore evident that there is an under allocation of land cultivated for OFSP production.

Irrigation also reflected a negative relationship with sweet potato output. However, this factor was significant at the ten percent level. Although sweet potato is a deep-rooted and drought tolerant crop, it still requires sufficient moisture during the growth phase in order to increase marketable yields. Water supply fluctuations can cause the development of small and misshapen roots (Niederwieser 2004). Manual irrigation can be the attributable to fluctuation in water supply, which then negatively affect yields (Adewumi and Adebayo 2006). Yusuf and Wuyah (2015) found similar studies when he revealed that educational status, farm size and farming experience had strong positive correlations with sweet potato output in Nigeria.

Technical Efficiency

Table 3 summarized the frequency distribution of technical efficiency measured against a one hundred percent technical efficiency score. The mean technical efficiency for the identified OFSP farmers in Hluhluwe was 20.6 percent. Thus, farmers had 20.6 percent capacity to transform the available resources into the maximum possible output. The technical efficiency scores ranged from 3.9 percent to a maximum of fifty-three percent and a mean technical efficiency of about eighty-nine percent. This is lower than ninety-nine percent, eighty-nine percent and sixty-one percent obtained by Itam (2015). Efforts need to be made to raise the 79.4 percent technical efficiency. The values of the estimated coef-

Table 3: Technical efficiency distribution

% Technical efficiency	*Number of farmers within range*	*%*
<20.6	10	31.25
	=20.6	0
0>20.6	22	69

Mean = 20.6% Minimum= 3.9% Maximum = 53.7%

ficients in the stochastic model have significant inferences on the technical efficiency of sweet potato farmers in Hluhluwe. These results are consistent with the results obtained Masunda and Chiweshe (2015).

Marketing and Market Challenges

This part of the analysis illustrates and explains marketing opportunities for OFSP. The analysis was based on retailers' knowledge and preferences, the hawkers experience with the consumers and suppliers. It was also based on the processing opportunities, which could be explored and supply chain opportunities in government institutions in this case schools and hospitals.

The main challenges identified at farm level were mainly resource constraints and management of available resources. In terms of market access, farmers perceived access to transport to be the main constraint. This could however be attributed to poor road structures from farms to nearest markets and the distance between markets and farms. Most OFSP producing farms are situated at least 20 km from the nearest town where business is possible. Commercial white-fleshed sweet potato (WFSP) farmers are able to deliver their produce to hawkers making it convenient for hawkers to buy from them. This offsets the need for hawkers to travel to small-scale OFSP farmers. For OFSP farmers to reach consumers and hawkers, they utilize public transport, which is expensive and inconvenient for the heavy goods.

The other marketing constraints were poor quality produce in winter. This is mainly due to irregular irrigation patterns, as farmers have no proper irrigation systems. The lack of such systems serves as a barrier for farmers to produce all year round in spite of the advantage of good climatic conditions of the area, which allows all year production. In summer, yields are consistently good due to summer rainfall.

Marketing Channels Used by Farmers

At the period of data collection, farmers were only using two forms of marketing channels. Farmers would produce to sell straight to consumers and with this channel farmers sold OFSP at R10/kg. Alternatively, farmers would sell to hawkers in bulk weight of 25kg for R100 (R4/Kg). Thus, the most margins are received utilizing the first channel. However, the second channel is more efficient as stocks are sold in high volumes, offsetting large stocks on the farm, which could potentially deteriorate due to a lack of suitable storage facilities.

Ten hawkers that are situated at the E-Manguzi shopping center were interviewed. Out of the 10 hawkers, eight (80 percent) were knowledgeable about OFSP but lacked the in-depth knowledge or the differential attributes between OFSP and white-fleshed variety. The remaining two hawkers were not knowledgeable about OFSP thus, they preferred to buy and sell the white-fleshed variety. All hawkers procured their sweet potato from commercial white-fleshed sweet potato farmers while the OFSP are procured from farmers located in Kwasa, Isambane and Owethusonke.

When asked about market uptake of sweet potatoes, hawkers explained that compared to other vegetables, sweet potato gives higher returns. This is due to its relatively longer shelf period. Hawkers procure sweet potato at a rate of R100/25Kg (R4/Kg). They then sell at R10/Kg making a profit margin of R6/kg or R150/25Kg. There seems to be higher uptake of OFSP, as hawkers highlighted that OFSP sells three times more than the white variety. However, the price is uniform across all varieties.

The challenge is normally on the supply side where hawkers can only source the product only when available at farms in Hluhluwe region. Due to the higher rate of market uptake, OFSP is seldom available and they always settle for white varieties due to its consistent supply.

Potential Channels Farmers Can Explore

Retailers

Two main supermarkets situated in E-Manguzi shopping complex were interviewed. The manager of one supermarket had no adequate information regarding OFSP, and the variety was completely unknown to the perishable vegetable section manager of the store. The only variety available to the retailer was the white-fleshed variety, also common in the village. The manager was informed and presented with the OFSP information brochure. Thereafter, the manager showed interest in running a trial on consumer demand and perception of OFSP. The buyer re-

sponsible for procuring OFSP variety for the supermarket was contacted for the purpose of understanding the procurement channels of retailers.

The buyer expressed concern over the lack of reliable supply and flagged it as the major reason why the shop had stopped procuring OFSP. The supply was inconsistent and could not meet consumer demand. The other retailer was well informed about the variety having attended a farmers' day workshop hosted by ARC. However, the procurement process is also complex and structured in such a way that trials are authorized the headquarters. The main challenge the retailer encountered with sweet potato was the problem of market uptake. The rate was at 5kg/week. This may be because of the large number of sweet potato hawkers situated right at the front of the shop.

Schools

Two primary schools within a 20 km to 50 km radius from the farms were approached. The respondent of one primary school was the vice principal and had adequate information regarding OFSP. However, upon receiving the information, there was great interest to include OFSP as part of menu in the school-feeding program. This was also backed by the popularity of sweet potato in the village, now with added nutrients this should improve the nutritional balance of the meals provided. The respondent suggested that they could buy cuttings and harvest the OFSP in the schoolyard, this way they will have direct access to the crop in a cost effective manner. The only concern was that the school on its own does not hold the decision to add or remove food items from the menu of the feeding scheme. Therefore, the approach should be taken by the National Department of Education.

The same findings were obtained at the other primary school, where the only difference was that the principal of the school was well informed about OFSP. Furthermore, the principal showed interest in buying the OFSP cuttings to plant for the school children especially because the school serves as a drop-in center for children whose mothers are still schooling.

Processors

In order to get an in-depth understanding of the possible marketing opportunities for the OFSP farmers, two processing companies were approached and interviewed. The processors approached were baby food manufacturers and a sweet potato dehydrating company. The information obtained from these interviews was used to draw some of vital conclusions of this paper.

Hydration

One major hydrating company was interviewed with regards to dehydration opportunities for OFSP flour. The findings revealed that OFSP is not suitable for dehydration purposes as it contains high levels of sugar. The dehydration process takes place under high temperature, which caramelizes the sugar in the sweet potato and therefore turns the produce into a rather dark brown powder, which is not desirable for the niche market. The market can only accept a light brown color, which can be used in soup thickening and sauces mostly. The dehydration company also has its own suppliers, which they work closely with to ensure compliance to their legislation and to have them certified towards global gap accreditation. It should be noted that alternative drying practices such as hot air drying does deliver suitable OFSP flour for marketing. Hence, appropriate drying methods should be developed in order to produce quality OFSP flour.

Baby Food

Nestle baby food has already released a pureed yellow fleshed sweet potato for babies. Because of its high sugar content, children find it tastier and prefer it. Just like other companies, Nestle has its own suppliers and work closely with farmers to ensure compliance. The farmers are registered as a legal entity of any kind before they are selected to supply nestle. There could be a possibility for OFSP farmers to sell their produce to Nestle as the company is planning to diversify the color of sweet potato for babies' food.

CONCLUSION

The findings of the paper have shown that manual irrigation is practiced with family labor being the main source of labor. The paper has also shown that there are no technical implements (such as tractors and planters) employed on the farms, hence labor (family labor) forms the integral part of this farming system. The youth present at the farms constitute about twen-

ty percent of the population of farmers. This however, poses some challenges to other activities (such as school activities) because of the demands of farm work, which requires more time. The technical efficiency score was at an average of 20.6 percent with the frequency ranging from 3.9 percent to fifty-three percent. Efforts need to be made to raise the remaining 79.6 percent efficiency on average.

The results from the stochastic frontier show no significant link between inefficiency and socio-economic attributes of farmers. Thus, the technical inefficiency is mostly due to mismanagement of available resources. Fertilizer, family labor, and number of cuttings per square meter were found to be significant to variation in OFSP output. Any form of intervention strategies should be aimed at addressing the management of these production factors. There is no evidence of socio-economic factors negatively affecting efficiency scores. The results may be attributed to the fact that although the sample size had met the minimum requirements of cross-sectional data analysis, it may have been relatively smaller for the model to pick up the significance of these factors. In conclusion, taking the results of the paper and the reviewed literature, the study has concluded that it is commercially viable to produce OFSP as because of the existing good market for the variety, which is three times bigger than the white-fleshed variety in root form.

RECOMMENDATIONS

The success of this initiative rests on increased technical efficiency, information distribution and consistent supply of necessary inputs to OFSP farmers. There are microeconomic challenges, which constrain farmers to access commercial markets. However, when these challenges are addressed, farmers will be able to supply OFSP all year round, given the favorable environmental conditions in the study area for sweet potato production. Farmers are at an advantage of fetching higher margins during off-season considering that there is demand in the retail markets, which is restricted by poor supply. Success of OFSP project will assist in the reduction of rural poverty and malnutrition, improved rural incomes and improved rural livelihoods especially the livelihoods of rural women. The paper recommends that, there is a need for significant amount of investment towards the promotion of OFSP especially to consumers and retailers in order to increase awareness of the health and economic benefits attained from this variety. The government should also intervene in the form of input supply and/or subsidy as well as education and training to OFSP farmers to accelerate the management of farm inputs.

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