

Determinants of Sweet Potatoes (*Ipomoea batatas* L) Profitability in Rachuonyo South District, Kenya

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Abstract: *Sweet potato is a high yielding crop with a higher food value than many staple food crops. Its production in Kenya is concentrated in Rachuonyo South district. To promote growth of the sweet potato subsector and to reduce poverty situation among the sweet potato producers, the Kenya government formulated myriad food and agricultural policies. However, implementation of the policies in the sweet potato sub sector has faced challenges partly due to insufficient information on the profitability relations of sweet potatoes. The purpose of this study was therefore, to establish profit model of sweet potato production in the region. Population of the study was 166 commercial sweet potato farmers out of which 116 were selected using simple random sampling technique. Correlation analysis was conducted to determine the association between the study variables and to assess the existence of multicollinearity while Ordinary Least Square Technique was used to estimate the profitability model. The study revealed that: Duration of the farmer in sweet potato farming ($\beta = 0.267, p = 0.0145$), sales growth rate ($\beta = 0.305, p = 0.011$), market share ($\beta = 0.944, p = 0.000$), labour intensity ($\beta = 0.251, p = 0.000$) and total operating cost ($\beta = -0.258, p = 0.001$) all had significant influence on sweet potato profitability. It is recommended that leaning by experience be enhanced through training on production and post-harvest management techniques to minimize potential handling and storage related losses, increase sales growth rate and market shares, encourage use of manual labour and at the same time determine the optimal number of workers per unit area of land.*

Keywords: *Sweet potato, Profitability, Determinants, Rachuonyo south, Kenya.*

1. INTRODUCTION

Sweet potato is one of the high yielding crops with higher food value and total production per unit area than other staple food crops such as sorghum, maize and millet. It is the world's 7th most important food crop after wheat, rice, maize, barley and cassava (Nungo *et al*, 2007). On a worldwide scale, the economic importance of sweet potato among all food crops is exceeded only by cereals such as wheat, rice, maize and barley (Opiyo, 2011). Although the crop is grown in more than 100 countries around the globe, about 90% is produced in Asia with just below 5% in Africa (Woolfe, 1992). About one percent of the world's sweet potato output enters world trade with Canada, United Kingdom, France and Netherlands being the major importing countries (Singh *et al*, 2006). Sweet potato serves as a staple diet in many parts of Uganda, Nigeria, Rwanda, Tanzania, Angola, Burundi and Kenya (Carey, 1996 in Ateka, 2004). China is the world's largest producer with an annual harvest of 100 million tonnes. Uganda, Nigeria, Indonesia and Vietnam, which follow China in production each harvests about 2.5 million tonnes of Sweet potatoes annually (FAO, 2002). The existence and adaptation of sweet potato to tropical areas where per capita incomes are generally low and its nutritional value make it an important component in food production and consumption (Woolfe, 1992). It is increasingly becoming an important food security and famine relief crop during seasons of crop failure (CIP, 1998; Kibwage *et al*, 2009).

In Kenya, sweet potato is grown in continuous cycles with one planting season overlapping with another. Piecemeal harvesting of sweet potato tubers commonly extends the crop's season (Kapinga *et al*, 1995). The crop is mainly produced for its tuberous storage roots, which are generally steamed or boiled (Carey et al, 1997). The roots are a good source of energy, proteins, vitamins, ascorbic acid and folic acid in diets. Other important nutrients in the roots are calcium, phosphorous, sodium, iron and potassium (Woolfe, 1992). Young sweet potato leaves are also consumed as vegetables in some countries and are rich in vitamins, proteins and iron (Woolfe *ibid*). Generally, the storage roots of sweet potato and foliage are also important supplementary fodder in livestock production. Hence, sweet potato plays an important role in ensuring food security, especially during drought in large parts of Africa and is seen as an important ingredient in animal feed industries (CIP, 1998).

Despite the potential of sweet potatoes in helping to meet Kenya's food needs and reduce poverty levels through income generation, most of the population in Rachuonyo south district still live below a dollar a day, suggesting that sweet potato which is their main source of livelihood has given little impetus to the improvement in their wellbeing. According to the Rachuonyo South District development plan 2003 – 2009 in Kokech (2009), household income per capita in the region is between USD 70 – 75. This observation was further supported by the National Poverty Strategy Paper (NPSP) in Kokech (2009) which indicates that 59% of the population in Rachuonyo South district live below a dollar a day.

According to USAID in Andea (2012), sweet potato global market is growing every year, presenting opportunities for export and for subsistence farmers to improve their food security situation and boost income from the sales of surplus. The Government of Kenya has put efforts through the ministry of Agriculture by introducing new sweet potato varieties and training farmers on how to reduce post-harvest losses.

This resulted in increased national sweet potato output from 400 metric tonnes in 2010 to 690 metric tonnes in 2011, a 72% increase (Andea, 2012). This rise in output coupled with the high poverty level in the sweet potato producing region therefore, casts doubt on the contribution of sweet potato to the wellbeing of its producers.

For instance, do farmers make profits from such increased outputs? And what significantly affects profits from such outputs? In order to answer these questions, a comprehensive research on the sweet potatoes profitability is imperative. This observation is in line with Andea (2012) who asserted that sweet potato is an "orphaned" crop, i.e. one that has been given little research attention and promotion. It is on this basis that the study sought to determine the determinants of sweet potato profitability in Rachuonyo South District of Kenya.

2. METHODOLOGY

2.1. Model Specification

Ordinarily, the identity of gross margin to an individual firm is given as;

$$\Pi_i = \sum_{i=1}^n P_i Q_i - \sum_{i=1}^n (F_{ci} + V_{ci}) \quad (1)$$

Where:

Π_i = Gross margin (proxy for firm i 's profit)

P_i = Unit price charged by firm i

Q_i = Quantity sold by firm i

F_{ci} = Fixed cost incurred by firm i

V_{ci} = Variable cost incurred by firm i

From a *priori* economic theory and Tung *et al* (2010), a firm's profit may be influenced by the following explanatory variables:

SG = Sales growth rate (Firm i^{th} change in sales divided by previous season's total sales)

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AD = Extent of awareness creation by the sellers

AG = Duration of the firm in business/duration of experience in the sweet potato business

MS = Market share (percentage of total sales captured by i^{th} firm in the market)

LI = Labour intensity (Firm i^{th} total labour cost over total sales)

KI = Capital intensity (Firm i^{th} total capital cost over total sales)

BE= Barriers to entry into a market

PD = Extent of Product differentiation

TOC = Total Operating Cost

MCND = Market Conduct (used as a proxy for firm competition)

The functional model designed to study the causal behaviour of sweet potato profitability was hence, specified as below:

$$J_i = f(SG_i, AD_i, AG_i, MS_i, LI_i, KI_i, TOC_i, MCND_i, PD_i, BE_i, \mu_i) \quad (2)$$

Where “ f ” is the functional relationship and “ μ ” denotes the error term, which is assumed to satisfy the classical normality assumptions ($\mu_i \sim N(0, \delta^2)$).

A stochastic form of the profitability model (Equation 2) was later expressed as shown in Equation (3)

$$J_i = A SG_i^{\alpha_1} AD_i^{\alpha_2} AG_i^{\alpha_3} MS_i^{\alpha_4} LI_i^{\alpha_5} KI_i^{\alpha_6} TOC_i^{\alpha_7} MCND_i^{\alpha_8} PD_i^{\alpha_9} BE_i^{\alpha_{10}} e^{\mu_i} \quad (3)$$

In order to have a model that would be estimated using Ordinary Least Square technique (OLS), model 3 was log transformed and Equation (4) obtained:

$$\ln J_i = \alpha_0 + \alpha_1 \ln SG_i + \alpha_2 \ln AD_i + \alpha_3 \ln AG_i + \alpha_4 \ln MS_i + \alpha_5 \ln BE_i + \alpha_6 \ln PD_i + \alpha_7 \ln LI_i + \alpha_8 \ln KI_i + \alpha_9 \ln TOC_i + \alpha_{10} \ln MCND_i + \mu_i \quad (4)$$

Where: $\alpha_0 = \ln A$; $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8, \alpha_9, \alpha_{10}$ are parameters that represent partial elasticities of profits with respect to Sales growth (SG), extent of awareness creation (AD), duration in sweet potato farming (AG), market share (MS), barriers to entry into sweet potato farming (BE), extent of sweet potato differentiation (PD), labour intensity (LI), capital intensity (KI), total operating cost (TOC) and Market conduct (MCND) respectively. Each of the parameters measures percentage change in profits ascribed to a 1% change in the corresponding explanatory variable.

2.2. Validity and Reliability of Data Collection Instruments

To enhance validity of the research instruments, a team of four experts in the area of agricultural economics were given the instruments for scrutiny and any amendment in the contents were done in accordance with the research objective. A reconnaissance survey was also done in the month of May, 2012. During this period, five (5) questionnaires were administered to farmers. The collected data were used to test for internal consistency of the instruments and reliability of the measurement scale. This was done by computing Cronbach's Alpha coefficients that were presented in Table 1. The choice of five respondents was informed by Umbach (2005), who proposed the use of 5-10 people in questionnaire pretesting.

Table 1. Illustrates that Cronbach's alpha coefficients for unstandardized items of the constructs range from 0.735 to 0.857 and the Cronbach's alpha based on standardized items range from 0.763 to 0.857. Generally, Cronbach's alpha coefficients of the unstandardized items describe the extent to which all items in a test measure the same concept or construct while the Cronbach's alpha based on standardized items, measures reliability of the scale.

According to Mohsen and Dennick (2011), there are varying reports on the acceptable value of the Cronbach's alpha ranging from 0.70 to 0.95. However, higher values are indicative of more reliable instruments. The computed coefficients in Table 1 also fall within the range values. This is a likely indication that the data collection instrument was relatively reliable.

Table1. Reliability statistics on various composite variables

Variable constructs	α	No. of Items
Barriers to entry into the market:		
Cronbach's alpha based on unstandardized items	0.830	4
Cronbach's Alpha Based on Standardized Items	0.831	
Product Differentiation:		
Cronbach's alpha based on unstandardized items	0.735	5
Cronbach's Alpha Based on Standardized Items	0.763	
Market conduct:		
Cronbach's alpha based on unstandardized items	0.857	7
Cronbach's Alpha Based on Standardized Items	0.857	
Market concentration:		
Cronbach's alpha based on unstandardized items	0.779	4
Cronbach's Alpha Based on Standardized Items	0.826	

Source: Computed from survey data, 2013

2.3. Data Sources and Data Collection Methods

Both primary and secondary data were collected on aspects of sweet potato related activities in the area. Primary data were collected using closed and open-ended questionnaires as well as interview schedules. Some aspects of sweet potato market that could not be directly quantified were captured on a five point likert scale. The likert scale measures attitudes or opinions by asking people to respond to a series of statements about a topic, in terms of the extent to which they agree with them, and so tapping into the cognitive and affective components of attitude (McLeod, 2008; Likert, 1932). Direct observation helped in cross-checking the respondent answers. Secondary information was obtained from the farmers' records, annual district agriculture reports, statistical abstracts, periodicals, journals, economic reviews and market reports.

2.4. Sampling Procedure

The sampling frame was a list of 166 farmers registered by the department of Social services in Rachuonyo south district as commercial sweet potato growers (ROSPOGO, 2012). From the sampling frame, the most conservative sample size for the sweet potato farmers was determined at 95% confidence level using Kothari's (2010) formula given as:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 (N - 1) + z^2 \cdot p \cdot q} \tag{5}$$

Where: n = sample size

z = standard variate at a given confidence level

p = sample proportion of successes, q = 1-p,

N = Size of population,

e = acceptable error (precision)

Hence, the most conservative number of farmers to be interviewed was:

$$n = \frac{1.96^2 (0.5)(0.5)(166)}{0.05^2 (166 - 1) + 1.96^2 (0.5)(0.5)} = 116.1238 \approx 116$$

2.4.1 Response Rate

The response rate was 87.07%. This was considered appropriate as it conforms to the views of Jonson and Owens (2003) who asserted that in most instances, a response rate of 20% is too low while 80% is a de facto standard.

2.5. Data Processing, Analysis and Presentation

After data collection, the questionnaires were checked for completeness, cleaned and coded to represent responses to specific questions. This was done to suit Statistical Package for Social Sciences (SPSS) that was used in the analysis. Where appropriate, percentages were used to compare frequencies and to express qualitative information in numerical format. Ordinary least square technique (OLS) was used to estimate various parameters associated with the study variables, and t-tests conducted at 95% level of significance to determine the significance of parameters estimated. Correlation analysis was undertaken to establish the association between the hypothesized determinants and sweet potato profitability. One way ANOVA was also used to test if there were significant differences in the profitability of sweet potatoes in the region. The findings were then presented in tables.

3. RESULTS AND DISCUSSIONS

3.1. Association between Sweet Potato Profitability and its Determinants

Table 2 shows that there is a strong significant positive correlation ($r = 0.681$ at $p = 0.000 < 0.01$) between profitability of sweet potato and the farmer's market share as well as profitability and the extent of sweet potato differentiation ($r = 0.555$ at $p = 0.000 < 0.01$). Weak significant positive correlations were also established between the profitability and market conduct ($r = 0.369$ at $p = 0.000 < 0.01$) and between profitability and barriers to entry into sweet potato farming activities ($r = 0.215$ at $p = 0.015 > 0.05$).

Table2. Association between sweet potato profitability and its determinants

		π	MCND	PD	MS	BE
π	Pearson Correlation	1				
	Sig. (1-tailed)					
	N	101				
MCND	Pearson Correlation	.369**	1			
	Sig. (1-tailed)	.000				
	N	101	101			
PD	Pearson Correlation	.555**	.370**	1		
	Sig. (1-tailed)	.000	.000			
	N	101	101	101		
MS	Pearson Correlation	.681**	.254**	.401**	1	
	Sig. (1-tailed)	.000	.005	.000		
	N	101	101	101	101	
BE	Pearson Correlation	.215*	.032	.252**	.278**	1
	Sig. (1-tailed)	.015	.375	.005	.002	
	N	101	101	101	101	101

N/B: Profit level(π), Market conduct (MCND), Sweet potato differentiation (PD), Market share (MS) Barriers to entry (BE)

Source: Computed from Survey data (2013)

3.1.1. Discussion of the Correlation Results

Ordinarily, maximizing a firm's market share is analogous to maximizing its profits and this has become a dogma in microeconomic theory. A cross-sectional study of profit impact of market strategies (PIMS) by Buzzel, Gale and Ralph (1975) revealed a positive association between market share and profitability. However, this would not necessarily be the case if the market shares were increased by incurring costs that would eat into the profits. The findings of this study on profitability and market share ($r = 0.681$ at $p = 0.000 < 0.01$) thus, conform to the belief in the economic theory.

Braakmann and Wagner (2009) observed that new competitors may have a negative impact on sales and profits in a product market in an unpredictable manner. A single-product firm is therefore highly susceptible to adverse shocks that hit their market. A multiproduct firm can substantially reduce this vulnerability, particularly if the risks on the various product markets are randomly distributed. A study by Braakmann and Wagner (2009) on product differentiation and profitability in German manufacturing firms showed an inverse relationship between the degree of product diversification and profitability. However, an investigation into the interactive effect of product differentiation and cost variability on profit revealed a positive association between profitability and product differentiation (Hun-chang and Joseph, 1996). From economic theory, greater product differentiation reduces the intensity of price competition thereby generating higher firm and industry profit. The strong significant positive correlation ($r = 0.555$ at $p = 0.000 < 0.01$) between sweet potato differentiation and profitability is therefore in conformity to the economic theory and the results of Hun-chang and Joseph (1996).

Economists expect high profits to attract entry, which is particularly important if a highly profitable firm has a dominant position and holds a large market share. In light of the mechanisms by which markets adjust, the absence of barriers to entry is fundamental for economic welfare. It is therefore, necessary that a situation of considerable market power with high profits attracts entry by competitors and that by this intensification of the competitive pressure, the profits adjust to a "normal" level (Heger and Kraft, 2008). The current study has revealed a positive association between the sweet potato profitability and barriers to entry into the sweet potato farming ($r = 0.215$ at $p = 0.015 < 0.05$).

This result is in agreement with the findings of Baumol *et al* (1982), who found that market performance depends, in an essential way, on the importance of potential entry. It is, however, worth noting that potential entry is an unobservable variable and this raises difficulties in econometric analysis. Normally, the effects of entry are identified by the realized entry of challengers. In order to evade the econometric problem, the study used survey-based data where the perception of how strong their own competitive position was threatened by a likely entry of competitors into their main markets was captured.

Market conduct is normally measured by focusing on the competitive behavior of market participants. The study revealed that sweet potato market conduct had a positive association with profitability ($r = 0.369$ at $p = 0.000 < 0.01$). This conforms to the findings of Stephan and Stapin (2008), who used Markov chain analysis, dynamic panel GMM estimation, and regression technique to a panel of approximately 3,000 Ukrainian companies and revealed a positive relationship between persistence of firm profitability and competition in the industry. It is worth noting that correlation coefficients between the independent variables were weak, i.e. less than 0.50 suggesting absence of multicollinearity.

In order to establish the relationship and magnitude of effects of the explanatory variables on profitability, regression analysis was used. Other important market dimensions which include capital intensity, labour intensity, operational costs, sales growth rate and duration in sweet potato business were also considered in the regression analysis.

3.2. Estimation of Sweet Potato Profitability Model

The model was expressed in natural log form, so the coefficients were obtained indirectly.

Table 3 shows ANOVA results of the farmers' profitability model. The data test revealed that $F(10, 90) = 25.750$ at $p < 0.01$. We can therefore, reject the hypothesis that none of the independent variables is a significant predictor of profitability.

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Table3.10. ANOVA results of sweet potato profitability model

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	49.220	10	4.922	25.750	.000 ^a
	Residual	17.203	90	.191		
	Total	66.424	100			

Source: computed from survey data, 2013

The model summary in Table 4 shows that the proportion of variance in the profit that is explained by the independent variables is 71.2%. However, 74.1% variations in the profit could be explained by the variations in the independent variables. The value of Durbin-Watson is 1.891. Although SPSS that was used in analysis of the data does not provide the probability for accepting or rejecting the presence of serial correlation, the value of the Durbin-Watson statistic ranges from 0 to 4. As a general rule of thumb, the residuals are uncorrelated if the Durbin-Watson statistic is approximately 2. A value close to 0 indicates strong positive correlation, while a value of 4 indicates a strong negative correlation. The computed value is also close to 2, which indicates the absence of autocorrelation.

Table4. Summary of sweet potato farmers' profitability model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
	.861 ^a	.741	.712	.4372061	.741	25.750	10	90	.000	1.891

Source: Computed from survey data, 2013

Table 5 shows that duration of the farmer in sweet potato farming ($\beta = 0.267, p = 0.014 < 0.05$); Sales growth rate ($\beta = 0.305, p = 0.011 < 0.05$); Market share ($\beta = 0.944, p = 0.000 < 0.01$) and Labour intensity ($\beta = 0.251, p = 0.000 < 0.01$) had significant positive effects on the farmers' profitability. However, total operating cost ($\beta = -0.258, p = 0.001 < 0.01$) had significant negative effect on the farmers' profitability. It can also be noted that the variance of inflation factor (VIF) shown in Table 5 ranges from 1.186 and 2.513. In multiple regressions, the VIF is used as an indicator of multicollinearity. Various recommendations for acceptable levels of VIF have been published in the literature. A recommended maximum VIF value of 5 (c.f., Kennedy, 1992; Rogerson, 2001) and even 4 (c.f., Pan and Jackson, 2008) can be found in literature.

Table5. Estimated natural log regression coefficients for variables in profitability model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	15.845	1.158		13.684	.000		
AG	.267	.106	.161	2.518	.014	.706	1.416
AD	.013	.171	.006	.073	.942	.469	2.131
SG	.305	.118	.188	2.597	.011	.551	1.816
MCND	.235	.169	.094	1.390	.168	.632	1.581
PD	.231	.161	.122	1.437	.154	.398	2.513
MS	.944	.130	.597	7.235	.000	.422	2.369
LI	.251	.064	.266	3.944	.000	.631	1.586
KI	.038	.063	.043	.610	.543	.574	1.741
TOC	-.258	.071	-.243	-3.638	.000	.643	1.555
BE	.003	.132	.001	.025	.980	.843	1.186

N/B: Duration of the farmer in farming (AG), Extent of awareness creation (AD), Sales growth rate (SG), Composite measure of Market conduct (MCND), Extent of sweet potato differentiation (PD), Market share (MS), Labour intensity (LI), Capital intensity (KI), Total Operating Cost (TOC) and Barriers to entry into sweet potato farming (BE);

Source: Computed from survey data, 2013

3.2.1. Discussion of Results on Sweet Potato Profitability Model

From the results, it is clear that a 1% increase in the capital intensity would lead to an insignificant increase in profitability by 0.038%. Osborne *et al* (2013) observed that the relationship between profitability and capital varies over time and only those economic agents with surplus of capital relative to their targets exhibit strong negative relationship between capital and profitability. Brown and Brown (1998), who investigated the persistence of the effects of market structure in Russia on profitability of firms, concurred with the findings of Osbon *et al* (2013). They, however, observed that a strong negative effect is a likely indication that capital intensive firms face higher adjustment costs and thus remain less profitable.

In contrast, a study by Berger (1995) on the relationship between capital and earnings in the banking sector revealed a positive effect of capital intensity on profitability. This was mainly because of low interest rates on unsecured purchased funds. Although Berger's (1995) study was not directly related to the current study, it points out that such positive relationships may occur under different market conditions. Generally sweet potato farming does not require large capital outlay. Thus, having surplus capital that could lead to strong significant negative effect as opined by Osborne *et al* (2013) was therefore rather difficult in the sweet potato industry, particularly at the farm level.

Conditions of entry and exit are important factors that determine existing firms' possibilities to exert market power (Heger and Craft, 2008). A study conducted through regression discontinuity approach by Snider and Williams (2011), on barriers to entry into the US airline industry showed that approximately half of the decline in fares was driven by the entry of low-cost carriers into the markets. This is a pointer to the significance of understanding entry barriers in existing markets. According to Bain (1956), entry barriers allow established firms in an industry to earn super normal profits. One would thus, expect significant positive effects of barriers to entry on profitability in a market with substantial market entry barriers. Kiandiko (2007), who studied the extent to which barriers to entry contributed to profitability in the air compressor industry in Kenya, concurs with this argument. The current study revealed that a 1% increase in the barriers to entry into the farming activities would insignificantly increase farm profits by 0.003%. The weak insignificant positive effects of the barriers to entry into the sweet potato farming suggest lack of substantial entry barriers into the sweet potato farming.

Generally, operating costs are expenses incurred in the process of running business operations that actually turn acquired products intended for sale into actual sales revenue. They include payments to workers and storage expenses among others. The study revealed that a 1% increase in the total operation costs would significantly reduce farm profitability by 0.258%. This finding is in agreement with Tung *et al* (2010), who looked at the re application of SCP paradigm in the international tourist hotel industry and established a negative relationship between profitability and operation costs. From economic theory, a firm that aims at increasing profitability should consider reducing costs, increasing turnover, increasing productivity, and increasing efficiency.

Establishing the number of workers is an important decision in the firm performance. Whereas the costs of increasing workers are easy to establish, the benefits are normally indirect and may not be immediately realized. Such benefits of increased number of workers include; improved efficiency of service delivery and increased output in a production process, particularly when labour exhibits increasing marginal productivity as well as attaining maximum output level. A study by Fisher *et al* (2006) shows that more labour at a store is associated with substantially higher sales. Some firm managers may employ insufficient store labour because they see it more as a cost than as a profit-driver. This kind of mixed view prompted the researcher to assess the effects of labour intensity on profitability at the sweet potato farming. The study showed that a 1% increase in labour intensity would have a 0.251% significant increase in the farm profitability. This finding is in line with the findings of Ton (2009), who surveyed the effects of labour on profitability at a retail market in Boston and established that increasing the amount of labour at a store is associated with an increase in profitability through its impact on conformance. He further observed that too much corporate emphasis on payroll management may motivate managers to operate with insufficient labour levels, which, in turn, degrades profitability. At the farm level, labour is largely required for the land preparation, planting and harvesting. All these are meant to generate more output for sale. In the short-run, labour exhibits increasing marginal productivity.

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Since sweet potato can be inter cropped with other staple food crops, a farmer may cover a large portion of his land with sweet potatoes and eventually get more output. This scenario, *ceteris paribus*, may yield more returns to the farmer.

According to Wernerfelt (1986), a positive association between market share and profitability has been demonstrated empirically in several cross-sectional studies. Increasing market share is comparable to increasing a firm's profit. However, Hamermesh (1978); Woo and Cooper (1981, 1982) showed that low market share firms can also be very profitable. Rumelt and Wensley cited in Wernerfelt (1986), argued that the price of getting market share, in comparison to the prices in perfect markets for investment goods, must be expected to adjust, so that one cannot make a long-term profit on investments in market share. This means that the high returns from having a high market share are counter balanced by a correspondingly high price paid earlier to get that market share. This kind of argument justified the need to investigate the effects of market shares on the profitability of sweet potato farming. The results showed that a 1% increase in a farmer's market share would significantly increase a farmer's profitability by 0.944%.

Many researchers believe that higher market share leads to more profits, but recent findings suggest that the relation between market share and profitability depends on competitive and strategic context (Ritz, 2008). The positive significant effects of the market shares on profitability of sweet potato farming could be ascribed to the farmers' efforts and attempts to form farmers' groups and societies aimed at enhancing their bargaining power on pricing of the sweet potatoes. Ordinarily, profit-maximizing firms wish to differentiate their products because it helps them to earn greater profits. Shum (2011), identified two important types of product differentiation; Horizontal differentiation, where people differ in their rankings of a group of products, even if they were all priced identically and vertical differentiation where products differ in quality, which is equally perceived by all people. Therefore, if all products had the same price, people would only buy the one with highest quality. Sweet potato is largely differentiated in terms of colour, size, taste and consumer preference. These factors together had insignificant changes in the profitability by 0.231%.

Market conduct refers to the actual behaviour of firms in a market and how the firms react to the conditions imposed by the market structure and interacts with rivals. Such behaviour include; advertising, research and development, competition or collusion among the existing firms, inter-firm-coordination and pricing behaviour (Ferguson, 1972; Nambiro *et al*, 2000). To capture the dimensions of sweet potato market conduct, questions were asked on research and development; inter firm coordination, collusion and pricing behaviour of sweet potato farmers. The study revealed that a 1% change in the competitive profit maximizing behaviour of farmers would have insignificant increase in profits by 0.235%.

Some farmers asserted that they rarely controlled the sweet potato market prices, since the prices were largely determined by the wholesalers who were their main buyers. Because the farmers wanted to minimize losses ascribed to lack of storage facilities, they could sell the outputs at meager prices. As a result, profits accruing to the farmers were low. To counteract the collusive behavior of wholesalers, the farmers embarked on forming organizations or societies through which they could bargain for better prices. However, this has had positive although insignificant effects on their profits.

A study by Mikael (2009), although focused on effects of scale of operation, local market conditions and conduct on the economic performance of supermarkets, revealed that profitability is a consequence of a complex network of relationships between various aspects of economic performance, scale of operation, local market conditions and market conduct. He however, revealed an indirect relationship between market conduct and profitability, where scale of operation and local market conditions were found working themselves into profitability, via conduct and various aspects of economic performance. The indirect relationship is a likely confirmation that the sweet potato market conduct could have a positive relationship with profitability.

Generally, one would expect that, other factors remaining constant, growth in the sales of a firm's product would lead to rise in the firm's profitability. The current study revealed that a 1% growth

in the sales of farmers would significantly increase their profitability by 0.305. These results concur with the views of House and Benefield (1995); Guang (2013). Hamilton (2013) also observed that the gains in profitability of Private Companies in USA were attributed to reduced overhead expenses or economies of scale achieved with increasing sales. Since the private firms continued to see top-line sales growth during the past years, they could cover their fixed costs faster.

Market awareness involves letting the existing potential customers know that information or service that exists is readily available. In the sweet potato industry, farmers could carry out awareness creation by simply calling or sending text messages to their existing customers on the availability of their products. This level of awareness creation is quite different from that conducted through advertising that has a lot of cost implications on a firm's profitability. The current study established the possible effects of this form of awareness creation by asking the respondents to provide, on a five point likert scale, the extent to which the awareness creation affected their sweet potato profitability. The outcome showed that a 1% increase in the extent of awareness creation by farmers would have an insignificant effect of 0.003% on their profits.

Studies have given mixed results on awareness creation. For instance, Kundu *et al* (2008) as well as Strickland and Weiss (1976) showed that advertising intensity had significant positive effects on price-cost margins. However, Jiang and Srinivasan (2012) examined pricing and persuasive advertising in a differentiated market and showed that when firms make endogenous advertising decisions in addition to pricing, a seemingly favourable exogenous shock to one firm alone may lead to a lower equilibrium profit for that firm and a higher profit for its competitor. Although the form of awareness creation assessed in this study was different from advertising analyzed by the different researchers, the findings seem to conform to what happens in the arena of awareness creation. A successful awareness creation can increase demand and make a given product more inelastic. However, the increased revenue should cover the costs of the awareness creation for profits to be realized.

Having a mass of market information may aid an individual to make informed decisions in business operations. The mass of information could be achieved through substantial experience in business activities. Thus, one would expect a positive relationship between better business performance and the duration an individual has taken in the business arena. The current study revealed that a 1% increase in an individual farmer's duration in sweet potato related activities would significantly increase the farmer's profitability by 0.267%. These findings conform to the general understanding of sound business decisions based on skills and experience gathered over time.

4. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

Profitability of sweet potatoes is influenced by several factors which vary in their magnitude of effects. The factors include: Duration of experience in sweet potato farming, market share of the farmer, labour intensity and total operation costs.

4.2. Recommendations

Since the coefficient of duration in sweet potato farming was positive and significant, it implies that through experience, a farmer may learn more about the prevailing market conditions. This leaning by experience should be enhanced through training of the farmers on the existing and potential sweet potato market opportunities such as the production of highly competitive sweet potato varieties and training on post-harvest management techniques to minimize potential handling and storage related losses.

Sales growth rate and market shares should also be enhanced. Ordinarily, the price of market share to a firm is considered in terms of price reduction, quality variation, research and development as well as advertising among others. Haspeslagh (1982) argues that a better way of increasing market share and benefitting from it is to ensure some sort of portfolio planning technique and as a policy, enabling diversified firms to participate only in those markets where they can occupy the number one or number two spot. This argument should be adopted by sweet potato farmers. They should grow diverse varieties of sweet potatoes and concentrate on those

markets where they can sell a large portion of their produce without compromising on the prices of their outputs.

The use of manual labour should be encouraged. However, this should not be done indefinitely because labour exhibits increasing marginal productivity in the short run while in the long run, diminishing marginal productivity may be experienced. There is thus, need for the determination of an optimal number of workers per unit area of land. Normally every rational business manager aims at profit maximization at the least cost possible. The significant negative coefficient of total operation costs also suggests that the farmers can increase their profits by reducing their operation costs.

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