Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.4, No.19, 2013

Determinants of Market Participation among Small-Scale Pineapple Farmers in Kericho County, Kenya

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Abstract

Pineapple (*Ananas comosus*) is one of the major cash crops grown in Kericho County, Kenya specifically Bureti district. In the study area, pineapples have been perceived to have high market value, resulting in tradeoffs with staple food. Despite pineapples market value, its market participation has not been studied and quantified. Therefore, this paper aims to determine the factors influencing market participation and its extent. A simple random sampling approach was used to select a sample of 150 small-scale pineapple farmers and primary data was collected using a semi-structured questionnaires. The data was analyzed using the descriptive statistics and Heckman two-stage model. The results showed that age, gender, education level and pineapple yields significantly influenced the decision to participate in pineapple marketing. Further, gender, price information, group marketing, marketing experience, vehicle ownership and marketing under contract significantly influenced the extent of market participation. Based on the findings policy implication was drawn for improving the household income in the study area.

Key words: Heckman two-stage model, market participation, small-scale pineapple farmers

1. Introduction

Agriculture sector in Kenya is characterized by the existence of both large scale and smallholder farmers. There are currently more than 5 million smallholder farmers who account for about 75% of the total agricultural production in the country (GoK, 2007). Smallholder agricultural production is largely characterized by growing of staple food like maize and beans which are primarily targeted for own consumption with little marketable surplus. In Kenya, land holdings have become small due to population pressure hence farmers have transformed from staple crop production to highly market-oriented crops. This agricultural transformation has been a vital development tool for achieving the Millennium Development Goal that calls for reducing of the share of people suffering from extreme poverty and hunger by 50% (Cervantes-Godoy and Dewbre, 2010). Horticultural crops are gaining popularity among smallholders' farmers in Kenya. Pineapples are among such horticultural crops adopted and several farmers are practicing crop trade-off. Anderson (2003) argued that horticultural crops have high market value and yields more and regularly and hence suit the needs of smallholder farmers who face resource constraint and have no marketable surplus. Horticulture is an important source of income for the smallholders, which accounts for over 70% of their total production (McCulloch and Ota, 2002). According to Minot and Ngigi (2003), horticultural crop like pineapple was perceived to have higher returns than cash crops like tea hence; it is suitable for production on the currently declining farms sizes in varying agro-ecological zones. Markets act as pivotal point in the agricultural transformation process. Recognition of the potential of markets to unlock economic growth and agricultural development gave rise to market-led rural development paradigm during the 1980s (Readon and Timmer, 2007). In Sub-Saharan African countries like Kenya, the government previously used to play a role in assisting farmers with marketing of agricultural produce. However, the problem of poor market participation which manifests as little marketable surplus has been previously seen as largely caused by poor pricing policies, this led to market and price liberalization in the 1980s. In the 1980s and 1990s, there were major reforms in these countries on market liberalization in an effort to create open market-led exchange, aimed at boosting economic growth (Dorward *et al*., 2005). Major reforms like improving market infrastructure by providing more and better markets and making it easier for farmers to access them is deemed necessary for increasing the level of commercialization, especially in the developing countries (Shilpi and Umali-Deininger, 2008).

2. Methodology

2.1 Study area and sampling technique

Bureti district is one of the districts in Kericho County. The district is located in 0.5^0S and 35.25^0 E. The district occupies a total area of 955 km^2. Economic activities in the district include: tea growing and processing; dairy farming; and commercial businesses. Other agricultural products include pineapple, maize, beans, potatoes, vegetables, and coffee.

Multi-stage sampling procedure was used in the selection of representative sample. The first step involved purposive selection of two divisions among the three divisions and then five locations in Bureti district. The areas were selected purposively based on quantities and the numbers smallholder pineapple farmers. Finally, 30 farmers in each location were selected randomly using simple random sampling to give a total sample of 150 farmers who were ultimately interviewed. Primary data was collected through the administration of semi-structured questionnaires.

2.2 Method of data analysis

STATA version 12 was used to process the data. To analyze data, descriptive statistics were used together with the Heckman two-stage selection model. The main descriptive indicators that were employed were t-test and Chi square to investigate the relative difference between market participants and non-market participants. The Heckman two-stage selection model was used to determine the market participation and extent of participation. The decision to participate in pineapple market or not is a binary choice. This is because of the dichotomous nature of the dependent variables, that is, to participate or not to participate in pineapple market. The decision on whether or not to participate is considered under the general framework of utility or profit maximization (Norris and Batie, 1987; Pryanishnikov and Katarina, 2003). Within this framework, economic agents, in this case, small-scale pineapple farmers will decide to participate if the perceived utility or net benefit from this option is significantly greater than in the case without participation. Although utility is not directly observed, the actions of economic agents are observed through the choices they make. Suppose that U_j and U_k represent a household's utility for two choices, which are, correspondingly, denoted by Y_j and Y_k . The linear random utility model could then be specified as in equation 1;

$$U_{ij}(\beta_j X_i + e_j) > U_{ik}(\beta_j X_i + e_j), k \neq \forall_i \quad (1)$$

Where U_j and U_k are perceived utilities of pineapple market participation and non-pineapple market participation choices *j* and *k*, respectively, X_i the vector of explanatory variables that influence the perceived desirability of each choice, β_j and U_k utility shifters, and e_j and e_k are error terms assumed to be independently and identically distributed (iid) (Greene, 2000). In the case of pineapple market participation, if a household decides to use option j, it follows that the perceived utility or benefit from option j is greater than the utility from other options (say k) depicted as in equation 2;

$$U_{ij}(\beta_j X_i + e_j) > U_{ik}(\beta_j X_i + e_j), k \neq \forall_i \quad (2)$$

Heckman two-step selection model involved estimation of two equations: First, is whether a household participated in the pineapple market or not, and second is the extent of market participation (proportion of pineapple sales). The proportion of pineapple sales were conditional on the decision to participate in the market. Heckman procedure is a relatively simple procedure for correcting sample selectivity bias (Hoffman and Kassouf, 2005). It consists of two steps. First, a selection equation is estimated using a Probit model. This model predicts the probability that an individual household participate or does not in the pineapple market as shown.

$$pr(Z_i = 1 \mid w_{i,}\alpha) = \Phi\left(h(w_{i,}\alpha)\right) + \varepsilon_i \quad (3)$$

Where Z_i is an indicator variable equal to unity for small-scale pineapple farmers that participates in the marketing, Φ is the standard normal cumulative distribution function, the is w_i a vector of factors affecting the decision to participate in market, the α is a vector of coefficients to be estimated, and ε_i is the error term assumed to be distributed normally with a mean of zero and a variance σ^2. The variable Z_i takes the value of 1 if the marginal utility the household *i* get from participating in marketing of pineapple is greater than zero, and zero otherwise. This is show as follows,

$$Z_i^* = \alpha w_i + u_i \quad (4)$$

Where Z_I^* is the latent level of utility the small scale pineapple farmers gets from participating in the market, $u_i \sim N(0, 1)$ and,

$$Z_i = 1 \; if \; Z_i^* > 0 \quad (5)$$

$$Z_i = 0 \; if \; Z_i^* \leq 0 \quad (6)$$

In the second step, an additional regressor in the sales equation will be included to correct for potential selection bias. This regressor is Inverse Mills Ratio (IMR). The IMR is computed as:

$$\varphi(h(w_i, \tilde{\alpha}))/\varphi(w_i, \tilde{\alpha}) \quad (7)$$

Where φ is the normal probability density function? The second-stage equation is given by:

$$\mathrm{E} = (\mathrm{Y_i}|\mathrm{Z} = 1) = f(\mathrm{x_i}, \beta) + \lambda(\varphi(h(w_i, \tilde{\alpha}))/\varphi(w_i, \tilde{\alpha})) \quad (8)$$

Where *E* is the expectation operator, *Y* is the (continuous) proportion of pineapple sold, *x* is a vector of independent variables affecting the quantity of pineapple sold, and *β* is the vector of the corresponding coefficients to be estimated. Therefore, Y_i can be expressed as follows:

$$Y_i^* = \beta' x_i + \gamma\lambda_i + u_i \quad (9)$$

Y_i^* is only observed for those farmers pineapple farmers who participates in the marketing Where $u_i \sim N(0,\sigma_u)$. ($Z_i = 1$), in which case $Y_i = Y_i^*$.

The model can thus be estimated as follows; in the first step of deciding whether to participate in pineapple marketing or not. This can be specified as:

$P_i (_{0,1}) = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots \beta_n X_n$ + e

$P_i(_{0,1}) = \beta_0 + \beta_1 age + \beta_2 gend + \beta_3 Educ + \beta_4 Hsize + \beta_5 Occup + \beta_6 HsInc + \beta_7 VehOwn + \beta_8 PinOutcm + \varepsilon_i$ (10)

The Second step (outcome equation) which involves a decision on the extent of pineapple marketing is estimated by use of an OLS as follows;

$Y = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots . \beta_n X_n$ + e

Proportion of pineapple sales $(Y_i) = \beta_0 + \beta_1 age + \beta_2 gend + \beta_3 Educ + \beta_4 Hsize + \beta_5 Occup + \beta_6 HsInc + \beta_7 VehOwn + \beta_8 Distmkt + \beta_9 Pric + \beta_{10} PinOutcm + \beta_{11} MktGrp + \beta_{12} Contr + \beta_{13} Pricinfr + \beta_{14} MktExpr + \beta_{15} IMR + \varepsilon_i$ (11)

Table 1: Variables used in Heckman two-stage model

Variable	Description	Measurement	Expected sign
Age	Age of the household head	Years	±
Gend	Gender of the household head	1 =Male, 0 = Female	±
Educ	Number of formal education of the household head	Years	+
Hsize	Numbers of persons in the household	Numbers	+
Occup	Occupational status	1= Farmer, 2 = Businessman, 3 = Employed	+
HsInc	household income status	Kenya shilling	+
VehOwn	Vehicle ownership	1 = Yes, 0 = No	±
DistMkt	Distance to the market	Kilometres	+
PineOutcm	Amount of pineapple produce	Kilograms	+
Pricinfr	Price information	1 = Yes, 0 = No	±
Price	Price of output	Kenya shillings	+
Contr	Marketing under contract	1= Yes, 0 = No	±
MktGrp	Marketing in groups	1= Yes, 0 = No	±
MktExpr	Marketing experience	Years	+

3. Results and Discussion

3.1 Socio-economic and marketing characteristics in relation to market participation

Tables 2 and 3 present socio-economic characteristics of market participants and non-market participants whereas Tables 4 and 5 depict marketing characteristics in relation to market participation.

Table 2: Socio-economic characteristics of market participants and non-market participants (Continuous variables)

Characteristics	Mean		Overall	T-ratio
	Market participant	Non-market participant		
Age	44.890	51.020	46.930	-21.153***
Household size	5.750	5.760	5.750	-1.256
Pineapple yield	201.600	107.800	170.330	235.282***
Education level	8.870	6.640	7.750	26.281***

***: significant at 1% level

The results in Table 2 shows that the two tailed test for age was statistically significant suggesting that the mean age of market participants was less than that of non-market participants. The result is consistent with argument by Arega *et al*. (2007) who stated that market participation declines with age because the older people are perceived to be risk averse and reluctant to adopt new technologies. In terms of household size, the two tailed test was statistically insignificant meaning the household size between the market participants and non-market participants were not different. In terms of pineapple yield, the result for the two tailed test was statistically significant indicating that the market participants had higher pineapple yields than non-market participants. The result is consistent with the findings of Omiti et al. (2009) and Astewel (2010) who confirmed that increasing the volume of production increases market participation. In terms of education level, the result for the two tailed test

was statistically significant indicating the education mean of market participants were greater than that of non-market participants. Makhura *et al*. (2001) argued that human capital represented by the household head's formal education is posited to increase a household understanding of market dynamics and therefore improve decision about the amount of output sold, inter alia.

Table 3: Socio-economic characteristics of market participants and non-market participants (Dummy variables)

Characteristics	Category	Market participants		Non-market participants		Overall	χ^2
		Freq	%	Freq	%	Freq	
Gender	Male	69	69	9	18	78	34.735***
	Female	31	31	41	82	72	
Vehicle ownership	Yes	47	47	11	22	58	8.784***
	No	53	53	39	78	92	
Household income	1,000 - 10,000	59	59	32	64	91	5.670
	10,000 - 20,000	26	26	11	22	37	
	20,000 - 30,000	8	8	5	10	13	
	30,000 - 40,000	7	7	2	4	9	

***: significant at 1% level

The results in Table 3 revealed that the chi square of the gender of household head was statistically significant indicating that the male households who participate in pineapple market were more than those who did not participate. The explanation for this is that women in SSA are disadvantaged in marketing because of unequal distribution of resources as well as cultural barriers (Chikuvire *et al*, 2006). In terms of vehicle ownership, the chi square result was statistically significant indicating that more of market participants owned vehicles than non-market participants. The vehicle ownership greatly boosts the morale of the farmer to participate in the market because it convenient the farmers on the place to market and time. In term of household income, the chi square result was statistically insignificant indicating the household income distribution between market participants and non-market participants were not different.

Table 4: Marketing characteristics in relation to market participation (Continuous variables)

Variable	N	Min	Max	Mean	Std
Marketing experience (yrs)	100	3	13	7.19	0.258
Distance to market (Kms)	100	0	50	6.45	0.784
Pineapple price (Kshs)	100	10	40	23.55	0.560

Table 4 presents the results of continuous marketing variables. The marketing experience mean was found to be 7.19 years. In essence, marketing experience captures the aspects relating to social networks and linking with marketing players, which accrue over time. The existence of such links reduces transaction cost in searching for the trading partners, contracting, negotiating and enforcing contracts which in turn increases market participation. In terms of distance to the market, the average mean was found to 6.45 kilometres. The distance to the market has been found to have negative impact on market participation. Ogunleye and Oladeji (2007) found that a greater distance to the market increases transportation costs and marketing costs and this hampers the extent of market participation. Pineapple mean price was found to be 23.55 shillings. Better output price is the key incentive for the sellers to supply more to the market.

Table 5: Marketing characteristics in relation to market participation (Dummy variables)

Variable		Frequent	Percentage
Group marketing	Yes	32	32
	No	68	68
Contract marketing	Yes	53	53
	No	47	47
Price information	Yes	45	45
	No	55	55

The result in Table 5 revealed that 32% of the market participants were in group marketing while 68% were not in a group. This implies that group marketing in the study area is still low. Marketing in a group is essential because it facilitates information exchange among the members which reduces the transaction cost and hence increases the extent of market participation. In terms of contract marketing, the results show that 53% of the market participants were under market contract while 47% were not under contract. Marketing under contract have been perceived to increase market participation because the farmers are assured of the ready market for their produce. In term of price information, 55% of market participants had price information while 45% did not have. Price information plays crucial role of informing the farmers on pricing condition.

3.2 Factors influencing market participation.

Table 6 shows the Heckman outcome selection results. Age, gender, education level and pineapple yield significantly influence the market participation among the small-scale pineapple farmers. The Inverse Mills Ratio (IML/Lambda) term was significant and positive at (0.003), which suggest that the error term in the selection equation is positively correlated.

Table 6: The Heckman two-step selection equation result

Variable	δy/δx	Coef.	Std. Err	P>|z|
Age	-0.0002**	-0.0498	0.0241	0.040
Gender	0.0388**	1.1690	0.5550	0.035
Household size	-0.0044	0.2781	0.1838	0.130
Education in years	0.0002***	0.1613	0.0528	0.005
Pineapple yield in Kgs	0.0002***	0.0528	0.0100	0.000
Vehicle ownership	0.0459	0.1610	0.6412	0.802
Occupation	0.0002	0.0494	0.3997	0.902
Household income	-0.0140	0.0823	0.2882	0.775
Mills lambda	-0.0690***	-0.0690	-0.0690	0.003
Rho	-1.0000			
Sigma	0.0690			

***: significant at 1% level; **: significant at 5% level

Age of the household head significantly and negatively influenced market participation. An increase in the age of household head by one year decreases the probability of participating in pineapple market by 0.02%, all other factors held constant. This implies that the younger people are more enthusiastic to participate in pineapple market than the older people. Barret *et al*. (2007) stated that younger people participated more in the market because they are more receptive to new ideas and are less risk averse than the older people. The finding concurs with that of Chalwe (2011), who found younger people to participate more than older people in marketing of beans in Zambia.

Gender of the household head significantly and positively influences market participation. Being male-headed household increases the probability of participating in the pineapple market by 3.88%, all other factors held constant. This suggests that the male-headed households are more market oriented than female, hence they participate more in the market for cash crops like pineapple. This finding is in line with argument by Doss (2001) who argued that men are responsible for providing cash income to the household and to accomplish this they grow cash and export crop.

Education level of the household head significantly and positively influences market participation. One year increases in household head's education increase the probability of participating in pineapple market by 0.02%,

all other factors held constant. This can be explained by the fact that as an individual access more education he/she is empowered with the marketing skill and knowledge that will spur individual to participate in the market. This is in line with Astewel, (2010) who illustrate that if paddy producer gets educated, the amount of paddy supplied to the market increases, this suggests that higher level of education provides a greater opportunity for the farmers to participate in pineapple market.

Pineapple yield significantly and positively influences market participation. An increase in weight of pineapple yield by one kilogram increases the probability of participating in pineapple market by 0.02%, all other factors held constant. This implies that as the pineapple yield increases, market participation also increases. This is in line with the findings of Abay (2007) and Adugna (2009) who found that an increase in amount of tomato and papaya yield augment the marketable supply of these commodities significantly

3.3 Factors influencing the extent of market participation

Table 7 shows Heckman outcome equation results. Gender, price information, contract marketing, group marketing, marketing experience and vehicle ownership significantly influence the extent of market participation in pineapple marketing.

Table 7: The Heckman two-step outcome equation results

Variable	Coef.	Std. Err.	P>|z|
Household income	-0.0140	0.0089	0.116
Age in years	-0.0000	0.0007	0.980
Gender	0.0387**	0.0177	0.029
Price information	0.0488***	0.0175	0.005
Contract marketing	0.0464**	0.0197	0.019
Group marketing	0.0385*	0.0201	0.055
Distance to market in Kms	-0.0000	0.0015	0.980
Marketing experience	0.0098**	0.0041	0.018
Pineapple yield in Kgs	0.0002	0.0002	0.271
Vehicle ownership	0.0459**	0.0226	0.042
Education in years	-0.0002	0.0022	0.916
Occupation	-0.0001	0.0120	0.993
Price in Kshs	0.0006	0.0018	0.742
Household size	-0.0044	-0.0064	0.499

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

Gender of the household head significantly and positively influences the extent of market participation. A unit increased the gender of the household head by one male increase the proportion of pineapple sale by 0.0387. The male-headed households are believed to have strong bargaining power which in turn increases the proportion of pineapple sales. The results is consistent with that of Cunningham *et al*. (2008) who argued that men are likely to sell more due to their acumen in bargaining, negotiating and enforcing contracts. This argument was advanced by Dorward *et al*. (2004) who concluded that the discriminatory tendencies against women tend to weaken their negotiation prowess and therefore making them less influential in agro-commodity trade.

Price information significantly and positively influences the extent of market participation. The result shows that a unit increases in the price information increase the proportion of pineapple sales by 0.0488. Price information is vital instrument during marketing because it informs the farmers about marketing conditions. Farmers who have price information prior to marketing tend to sell more of their produce than those without. The finding is consistent with economic theory by Key *et al*. (2000) and Alene *et al*. (2008) who found the existence of positive relationship between the price and the proportion of sale and confirm price to be an incentive to sell.

The coefficient of contract marketing was found to be positive and significant. The farmers who were under contract in marketing had higher probability of increasing the proportion pineapple sale by 0.0464. This denotes that the farmers who were marketing under contract sold more of pineapple produce due to availability of ready market. The finding is in line with that of Jari and Fraser (2009) who found an increase in formal market participation with the availability of contractual agreement amongst smallholder and emerging farmers in the Kat river valley, South Africa.

Group marketing positively and significantly influences the extent of market participation. The result showed that the pineapple farmer who belongs to marketing group had a higher probability of increasing the proportion of pineapple sale by 0.0385. Marketing in group has enabled the farmers to pull their resources together and take advantage of economies of scale. Kirsten and Vink (2005) argued that belonging to a group empowers farmers to bargain and negotiate for better trading terms. This enhanced trading term increases the extent of market participation among the pineapple farmers.

Marketing experience positively and significantly influences the extent of market participation. An increase in a farmer's marketing experience by one year increase the proportion of pineapple sale by 0.0098. The marketing experience has direct relationship with the farmer's level in bargaining prowess and marketing network. This means that the farmers with more years in marketing have higher ability to sell more pineapple produces in the market. The finding concurs with that of Abay (2007) who found an increase in farmer's experience resulted in the increases of tomato being supplied to the market in Fogere, South Gonder.

Vehicle ownership positively and significantly influences the extent of market participation. The result shows that one unit increase in vehicle ownership by one vehicle increases the proportion of pineapple sale by 0.0459.Vehicle ownership plays crucial role in lowering the transport cost as well as boosting the volume of transport and this increases the proportion of pineapple sales to the market. The finding concurs with that of Jagwe (2011) who found the ownership of bicycle to increase the banana sales.

4. Conclusion and Recommendation

Different socio-demographic characteristics of both categories of farmers (market participants and non-market participants) were determined. It is apparent that factors like age, gender, education level and pineapple yield positively influences the decision to participate in pineapple market. On the extent of market participation the result indicate that gender, group marketing, price information, marketing experience, vehicle ownership and contract marketing had positive influence on the proportion of pineapple sales.

Based on the findings, the study recommends that for holistic market participation among pineapple farmers, proper marketing infrastructure must be put in place. The government and other policy makers should increase the marketing knowledge and skill of pineapple farmers through avenues like mass media, extension service and other means of capacity building.

5. Acknowledgement

We would like to acknowledge the African Economic Research Consortium (AERC) for fully funding the study. Special thanks go to the enumerators for data collection and farmers who volunteered information. God bless them.

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