

Full Length Research Paper

Determinants of intensity of market participation among banana traders in western Kenya

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Traders both wholesaler and retailers play a significant role in banana markets. In Kenya the banana market is not fully developed. This demands targeted studies to assess their performance. This study aims at examining banana traders' intensity of participation in the markets and constraining factors. A survey was conducted in 2013 in four counties. One hundred and ninety traders were randomly selected using multi-stage sampling technique. Data were collected on personal, market parameters, and institutional factors. Descriptive statistics and Tobit model were utilized in the analysis. The results showed that traders received market information from multiple sources probable to check on the reliability and accuracy. The results of the Tobit regression showed that the age and sex of traders distance to markets, type of banana and information sources significantly influence the volume of banana fruits handled by traders. Therefore based on the study findings, some of the suggested policy recommendations include; the need to foster development of banana infrastructures and also efforts should be geared towards improving market information sources among traders.

Key words: Banana traders, market participation, tobit model, Kenya.

INTRODUCTION

Markets are driving forces to increasing production and productivity of any farm enterprise like banana. Subsequently markets contribute to economic growth at both household and national levels. The growth of agricultural based economies like that of Kenya are dependant of markets (Republic of Kenya, 2013). This implies that enhanced agricultural production should be accompanied by improving output and input market considerations. This change occurs at household, regional and national levels. Since independence, the

policy of Kenya government has been to enhance food security and poverty reduction. As manifested in all Development Plans since 1963 to Vision 2030, the emphasis of has been on food security, poverty eradication and health for all (Republic of Kenya, 2007). Banana enterprise has been one of the food crops that contribute to food security in the country (Njoroge et al., 2013). The acreage and production of the crop has progressively increased over years as shown by Republic of Kenya.

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It is imperative that self-sufficiency in food production is now an important political-economic goal of the many governments including Kenya (Watson, 2013). The central Government and now the County Government have intentionally invested in banana productivity increasing strategies. About two decades ago. Some of the interventions targeted smallholder farmers. There are a number of government interventions in banana production. Such intervention included the tissue culture banana technology which was developed to enhance production targeting smallholder farmers (Wambugu and Kiome, 2001). This intervention coupled with other agronomic technological components addressed the supply side of the banana value chain by progressively increasing banana production over years. However, the banana market development has not grown in tandem with production (Mwangi and Mbaka, 2010). This implies that despite efforts of some market stakeholders to enhance its marketing, banana markets has not been good (Wanjiru et al., 2013).

Middlemen play a key role in banana marketing. They are categorized in two major groups; the merchant and agent middlemen. The agents perform distribution functions and they receive commission for the work done for consumers, wholesalers and producers. The merchant middlemen own the goods they sell and also bear the risk involved in marketing them. They stand to make profits or losses from the sale of the goods. The two main types of merchants who are involved in banana trade are wholesalers and retailers.

It is hypothesised that trader (retailers and wholesalers) participation in banana market is important because they promote banana distribution and subsequently promote the upgrading of technologies. The trader (wholesalers and retailers) participation in banana markets has not been fully documented not only in Kenya but also in the east African region. In addition banana markets are not well in Kenya developed unlike other cereal crops like maize, wheat, rice and beans for many years. Market participation is regarded as the participation of any stakeholder (as the wholesalers, retailers, processors or consumers) in any market related activity which promotes the sale of produce. This study was designed to identify determinants of level/intensity of banana market participation among banana traders in western Kenya; and identify constraints faced by traders. It is believed that banana production, marketing and consumption are crucial for all value chain actors in banana sub-sector.

The number of traders and volume of banana fruits traded are increasing over years. This is manifested presence of fruits in super markets, and street/roadside involvement in the trade. However, most research has given emphasis on farmer participation in markets in Kenya and outside Kenya (Chegea et al., 2015; Fischer and Qaim, 2011, 2012) but limited work on traders' banana trade. This is against the background that the banana traders and volumes of sales could be increasing

over years. Traders play significant roles in transportation and distribution of goods to distant markets where the products are in scarcity. The market participation studies have used a number of techniques which included logit, probit and tobit (Adenegan et al., 2012).

MATERIALS AND METHODS

Study area description

The study was conducted in Trans Nzoia, West Pokot and Uasin Gishu in North Rift region and Bungoma and Busia counties in Western Kenya, while Kisii was in Nyanza region with diverse agro-ecological zones (Jaetzold et al., 2005). Banana is one of the emerging crops in the county occupying varying proportions of agricultural land. Trans Nzoia County is the main maize producing and exporting region in Kenya. It is located at latitude $0^{\circ}52' - 1^{\circ}18'N$, and longitude $34^{\circ}38' - 35^{\circ}23'E$. The human population is about 818,757 and a density of 741 persons per square kilometre (Republic of Kenya, 2010). The County covers an estimated area of about 1,559 km² with a bimodal rainfall pattern with a rainfall amount ranging from 1,800 to 1,900 mm. The County is covered by three main agro-ecological zones which include: Upper humid (UH), Upper midland (UM) and Tropical alpine (TA) zones. The altitude ranges from 1,000 to 1,200 m above sea level.

Bungoma County lies between latitude $0^{\circ} 25.3'$ and $0^{\circ} 53.2'$ North and longitude $34^{\circ} 21.4'$ East and $35^{\circ} 04'$ East. It covers an area of 2,068 km², which is about 25% of the total area of the province. The altitude ranges from about 2,000 m above sea level to 1,200 m. The county has a two-season rain regime, the long rains covering March to July while the short rains start in August to October. The average precipitation ranges from 1250 to 1800 mm with the central and north areas receiving a higher amount. The population of the district is estimated at 1,630,934 million in 2009.

West Pokot county lies between Latitudes $1^{\circ} 10'$ and $30^{\circ} 40'N$ and Longitudes $34^{\circ} 50'$ and $35^{\circ} 50'E$. The district has a total area of 9,100 square. Altitude ranges from 900 m to about 3,000 m. Rainfall is bimodal with the long rains falling between March and June and the short rains occur between Septembers to November. The rainfall amounts range from 700 to 1600 mm. Temperatures ranges from 9 to 30°C. The district has a population of 512,690 people with a density of 37 persons per square. The greatest challenges are endemic poverty and food insecurity that renders the community dependent on food aid on annual basis. Agriculture has a huge potential for providing viable livelihood options to West Pokot people and thus alleviating the high poverty levels in the county. The potential also exists of transforming the pastoralist nomadic lifestyles to a sedentary one thereby impacting on planning for social amenities. The county is known for the production of banana and other fruits trees, maize, beans, potatoes, sorghum, finger millet, dairy, and beef (Wanyama et al., 2006).

Sampling procedure

A multistage sampling technique was used to generate market data. The target population composed of all traders involved in banana fruits trade in all the markets in western Kenya. The first stage involved purposive sampling of four counties based on levels of banana production and sell. Kisii and Bungoma counties were net exporters while Trans Nzoia, Busia, Uasin Gishu and West Pokot were net banana importers. The second stage involved random sampling of all active banana markets. The final stage involved the choice of the respondents using the linear systematic sampling technique. A list of banana traders (sample frame) was

made with the help of local government officials (Ministry of Agriculture, Livestock Development and Fisheries staff and County Government staff) who were in-charge of the various markets. The sample frame was established before the actual survey began in each market. The number of banana markets sampled were; 72 (Bungoma), 69 (Kisii), 27 (Trans Nzoia), 11 (Uasin Gishu), 6 (west Pokot and 5 (Busia). Sample size computations are important in ensuring that estimates are obtained with required precision. An estimated sample size of 190 were chosen using Cochran (1963)'s sampling formula (Equation 1) based on 2009 human population census (Republic of Kenya., 2009).

$$n = \frac{Z^2(1-p)p}{e^2} \quad (1)$$

where n is the sample size, Z is the desired confidence level, p is an estimated proportion of an attribute that is present in the population in this proportion of banana traders in Kenyan markets, and 'e' is the absolute size of the error in estimating 'p' that researcher adopted. From previous studies and own experience it assumed that about 25% of all traders in western Kenya are engaged in banana trade. Against this background the sample size was computed at 95% confidence interval with $\pm 3\%$ margin of error. The sample size was approximately 188 traders (Equation 2).

$$n = \left(\frac{(0.95^2(1-0.25)0.25)}{0.03^2} \right) \approx 190 \quad (2)$$

A semi-structured questionnaire was used to collect data. The data collection clerks were selected based on their good knowledge from on the local markets and banana markets. They were also selected on the basis of fluency in the local language/Kiswahili. They were trained for three days on survey design/implementation and allowed to pre-test the questionnaire in the neighbour markets that were not in the study area.

Data collection

The study was based on primary data collected through the use of structured questionnaire from a cross-section of cassava farmers. Data collected included demographic characteristics of the farmers; socio-economic, living standard and farm-specific variables; as well as income and expenditure variables.

Data for the study were collected from both primary and secondary sources. Primary data were collected through the use of structured questionnaire, personal interviews and direct observations were conducted. Data for banana traders (wholesalers and retailers) included quantities of banana fruits sold, market cost and selling prices, pricing strategies, sources of banana products, problems encountered, market information sources, market channels, personal characteristics of traders, distance to markets, sources of funds and personal characteristics of traders. Data collected were analyzed using descriptive and inferential statistics. The descriptive statistics such as frequencies distribution and percentages, mean, standard deviation, and variance were used and Tobit model.

Tobit model specification

One of the major decisions of banana traders is how much of the banana fruits to sell influences the profits. The purpose of the study was to assess the factors that influence the level of magnitude of

market participation among banana traders. It was hypothesized that trader characteristics, Institutional factors, bio-physical factors look at factors that influence the level of banana sales.

In consumer theory, utility is a relative measure of satisfaction after consumption of goods (eg banana fruits) or services. Utility functions give us a way to measure traders' preferences for capital accumulation and the amount of risk (by investment in banana business) they are willing to undertake in the hope of attaining greater wealth through banana sales. Traders make decisions about what crop to trade, how much to trade, when and where to establish and sell the se; banana fruits in such a manner that they get maximum satisfaction.

Traders' behaviours are based on the basic idea that they aim at maximizing a utility function subject to availability of resources for investment (e.g. initial capital, market information, stores, education) or budget with which to satisfy benefits they receive. In this study the Traders maximize the utility (U_i) by buying and selling banana fruits (U_{Trad}). Thus, a trader rationally engages in banana trade if utility from profits received from banana trade is greater than a given threshold. The more the quantity sold the more the profits.

In this study the traders maximize the utility (U_i) by selling more produce to consumers (U_{Trad}) in an effort to maximize profits (U_{π}). Thus, a trader rationally sell more and more banana fruits if and only if total utility is increasing from the enhanced sales (TU_{sales}). This decision is influenced by a number of factors (U_x) (eg investment costs, sources of cash,) as shown in Equations (1).

$$Max - TU_{Trad} = F(U_x, U_{uo}) \quad (3)$$

Subject to resource (Cash, profits, and marketing strategies) constraints. Where TU_{trad} is the total utility derived from total banana sales, U_x is the banana sales while U_{uo} is the unobserved factors and F denotes function of. The Tobit model or censored normal regression model for situations in which y is observed for values greater than 0 but is not observed (that is, it is censored) for values of zero or less (Greene, 2003; Adenegan et al., 2012). The standard Tobit model is given in Equation (4).

$$Y_i^* = \beta_0 + \beta_i X_i + \varepsilon_i \quad (4)$$

where $\varepsilon \sim N(0, \sigma^2)$, Y_i^* =quantity of banana sold in kg. These quantities were observed only for traders who participated in the market. β_{1i} =parameters to be estimated. ε_i =error term The independent variable specified as determinants of volume of banana sold/ intensity are defined as X_i . Thus X_i =vector of explanatory variables included in the model. The variables were hypothesized to affect the level of market participation. The variables were derived from empirical literature review (Kabunga et al., 2014) and researcher's reconnaissance experiences. With Y representing the volume of sales in kilogram while the X_i represents the explanatory variables where Y = Value of total banana produce handles and $X_1, X_2, X_3, \dots, X_{19}$ were independent factors. They included; Log of age of HoH (LNintagres~1), banana selling price per bunch (LNq11sellp~2), log of distance to the nearest market (LNq6estdis~1), log of profit received by traders (LNprofit), used loan as initial source business (aqrdln), friends as initial source of cash for business (srcfnd), sex of trader (sxown), other traders as market information source (othertraders), use phone as market information source (phones), ripening banana (ripening), Kisii banana markt (kisicode), western region (westcode), primary level of education for trader (educrpm), secondary level of education for trader (educrsec), tertiary level of education for trader (educrtert), vehicle as main mode of transport (vehiclecode), bicycle transport as main mode of transport (bicyclecode), motor-cycle as main mode of transport (motocyclec~e) and Wholesale in banana (wholesaler)

Table 1. Definitions and hypothesized sign the variables.

Variable name	Description	Expected sign
LNintagres~1	Log of age of HoH (LNintagres~1),	±
LNq11sellp~2	Banana selling price per bunch(LNq11sellp~2),	+
LNq6estdis~1	Log of distance to the nearest market (LNq6estdis~1),	-
LNprofit	Log of profit received by traders (LNprofit),	+
aqrdln	Used loan as initial source business (aqrdln),	+
srcfnd	Friends as initial source of cash for business (srcfnd),	+
sxown	Sex of trader (sxown), 1=male; 0=female	+
othertraders	Other traders as market information source (othertraders),	-
phones	Use phone as market information source (phones),	+
ripening	Ripening banana (ripening),	±
kisicode	Traders in Kisii banana markt (kisicode),	+
westcode	Traders in western region (westcode),	+
educrpm	Primary level of education for trader (educrpm),	+
educrsec	Secondary level of education for trader (educrsec),	+
educrtert	Tertiary level of education for trader (educrtert),	+
vehiclecode	Vehicle as main mode of transport (vehiclecode),	+
bicyclecode	Bicycle transport as main mode of transport (bicyclecode),	+
motorcyclec~e	Motor-cycle as main mode of transport (motorcyclec~e)	+
wholesaler	Wholesale in banana (wholesaler)	+
awareness	Retailer (awareness).	+

and retailer (awareness). Several functional forms were fitted onto the data set in order to select one with best fit.

$$Y = 0 \dots \text{If } Y^* = \beta_0 + \beta_1 X_i + \varepsilon \leq 0 \quad (5)$$

$$Y = \beta_0 + \beta_1 X_i + \varepsilon \dots \text{If } Y^* = \beta_0 + \beta_1 X_i + \varepsilon \geq 0 \quad (6)$$

For ease of interpretation, the marginal effect for Tobit model was computed as shown given in Equation (8);

$$\frac{\partial Y}{\partial X} = \alpha \left(\frac{\beta_i X_i}{\sigma} \right) \beta_i$$

This is interpreted as a one unit change in an independent variable X_i and its effects on the observations (Table 1).

RESULTS AND DISCUSSION

Socioeconomic Characteristics of traders

The descriptive statistics of sampled traders are shown in Table 2. Out of 190 traders 97% were business owners and 3% were workers/managers. There were no significant differences between buying and selling prices for traders and wholesalers. However there was a positive price margin between the two levels for both

traders. The wholesaler received a higher price margin (36%) compared to retailers (2%). The average age of the traders was about 40 years with wholesalers having a slightly higher age (40 years) than retailers (39 years). There was significant difference of the distance to banana sources between wholesalers (99 km) and retailers (41 km). This implies that probably transaction costs are high because of long distances to banana sources. The average period in business was 13 years with wholesalers having stayed in banana trade for more years (14 years) than retailers (12 years). Further analysis by gender revealed that there were more female traders than male traders. This implies that probably banana trade is more of a women affair than men. Majority of the business visited and interviewed were individually owned (96%) and about 4% were owned in partnership. Majority of both traders (>87%) interviewed had attained primary and secondary education and very few of them (2%) had post secondary education. There were significant differences ($p < 0.05$) in the distribution of the proportion of traders who received loans for banana trade (wholesaler=28.3% and retailers=13.5%). This implies that very few traders acquired loans for business operations and this constraints growth in the entrepreneurship. Training is an important activity for banana trade to keep abreast of new trends and strategies to improve on business practices. There was significant difference ($p < 0.05$) of the proportion of wholesaler and retailer traders who received business

Table 2. General characteristics of traders sampled.

Variable name	mean±sd			t-value	χ-square	
	Full sample n=190	Wholesaler n=40	Retailer n=150			
Average buying price per bunch	229.7±18.2	220.1±20.5	257.6±38.8	0.90ns	...	
Average selling price per bunch	298.2±25.5	300.0±	261.9±81.7	0.48ns	...	
age of respondent	39.78±11.6	40.4±10.01	39.4±12.4	0.49	...	
Distance to nearest market	64.2±11.5	98.7±33.7	40.6±9.2	2.33***	...	
Period trading in bananas	13.2±9.7	14.3±10.1	12.4±9.7	1.18ns	...	
% Respondent in West Pokot (N=6)	3.2	66.7	33.3			
% Respondent in Trans Nzoia (N=27)	14.2	18.5	81.5			
% Respondent in Bungoma (N=72)	37.9	20.8	79.2			
% Respondent in Uasin Gishu (N=11)	5.8	45.5	54.5	...	15.67***	
% Respondent in Kisii (N=55)	36.3	45.5	54.5			
% Respondent in Busia (N=5)	2.6	20.0	80.0			
% Respondent Acquired loan (1=yes)	18.3	28.3	13.5	...	5.24**	
% Respondent by sex of owner	Male	9.7	14.5	7.5		
	Female	90.3	85.5	92.5	...	2.13ns
	None	8.9	9.4	8.6	...	
% Respondent in by highest educational level	Primary	55.0	67.9	49.1	...	
	Secondary	34.3	20.8	40.5	...	6.51**
	Tertiary	1.8	1.9	1.7	...	
% attended any training in trade (1=yes)	13.2	23.6	8.4	...	7.61**	
% Respondent in by banana business ownership	Individual	93.6	90.7	94.9	...	
	Private company	3.5	3.7	3.4	...	1.97ns
	Partnership	2.9	5.6	1.7	...	
% Aware of TCB technology (1=yes)	54.5	61.8	51.2	...	1.7ns	

Source: Survey data, 2011/2012. Sd=standard deviation; ns=non-significant. *** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.

training. Out of 190 traders about 24% of the wholesalers and 8% of retailers received training in business entrepreneurship skills. Pooled analysis showed that out of 190 traders of about 13.2% received training. This number is relatively low and demands for intervention in order to improve entrepreneurial skills in banana trade.

Market price information behaviour of banana fruits

Producers and traders are direct beneficiaries of the accurate and timely market information and equally timeliness of the same can benefit other actors like consumers. This trend may also lead to market efficiency and enhanced competition among chain actors. Subsequently, producers, traders and consumers require appropriate market information on the most current banana prices in the markets. In this study, banana information sources were diverse. About 52% of the sample traders used radio as their primary source of market price information (Figure 1.). The other 33% of traders got information by visiting the markets, 36%

through Cell-phones and the remaining 24% traders got from other traders dealing with the same commodity (Figure 1). This implies that farmers did not rely on a single market information source but multiple. Probably they triangulate the prices from different sources to confirm the reliability and accuracy of the prices (Asiabaka and Owens, 2002). It is recognized that if banana traders had limited market and weak bargaining power partly due to limited market information and seasonality in production. These information sources are prone to low accuracy, inconsistent and delayed transmission for production and marketing decision.

Banana transportation

Effective banana distribution depends on efficient transportation system. The traders interviewed revealed that they used multiple mode of transport. This included; head-load (foot), bicycles, motorcycles, tricycles, cars and buses. Most of the traders (wholesaler and retailer) used vehicles (57 to 60%) and bicycles (17 to 33%) in the

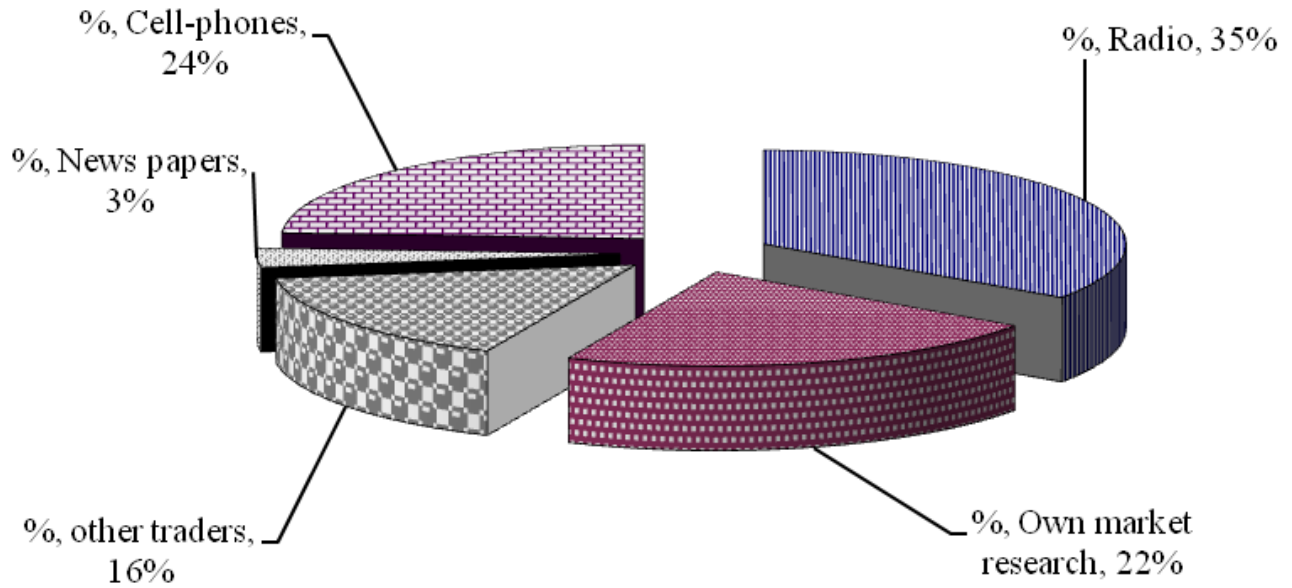


Figure 1. Market information sources of banana fruits for traders. Source: Survey data, 2011/2012.

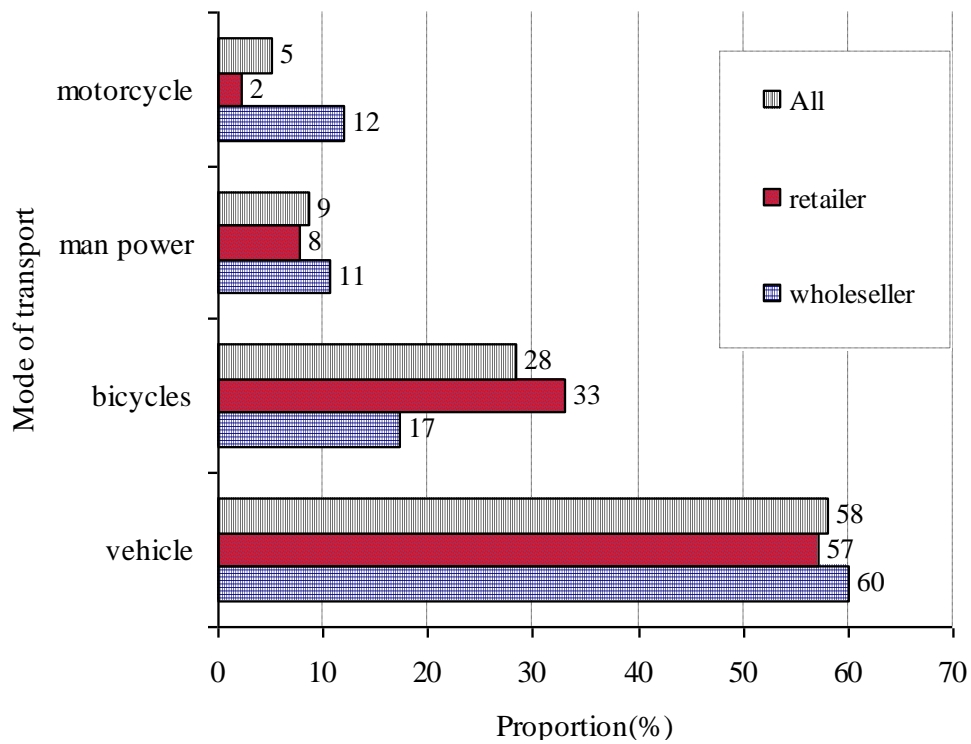


Figure 2. Percentage response on mode of transportation for banana trade. Source: Survey data, 2011/2012.

transportation of banana fruits and the least was motorcycles (2 to 12%) (Figure 2).The use of multiple mode of transport in metropolis and non-metropolis

environments have reported by other authors (Emerole et al., 2007). Solutions to some of these problems require both public and private partnerships active involvement in

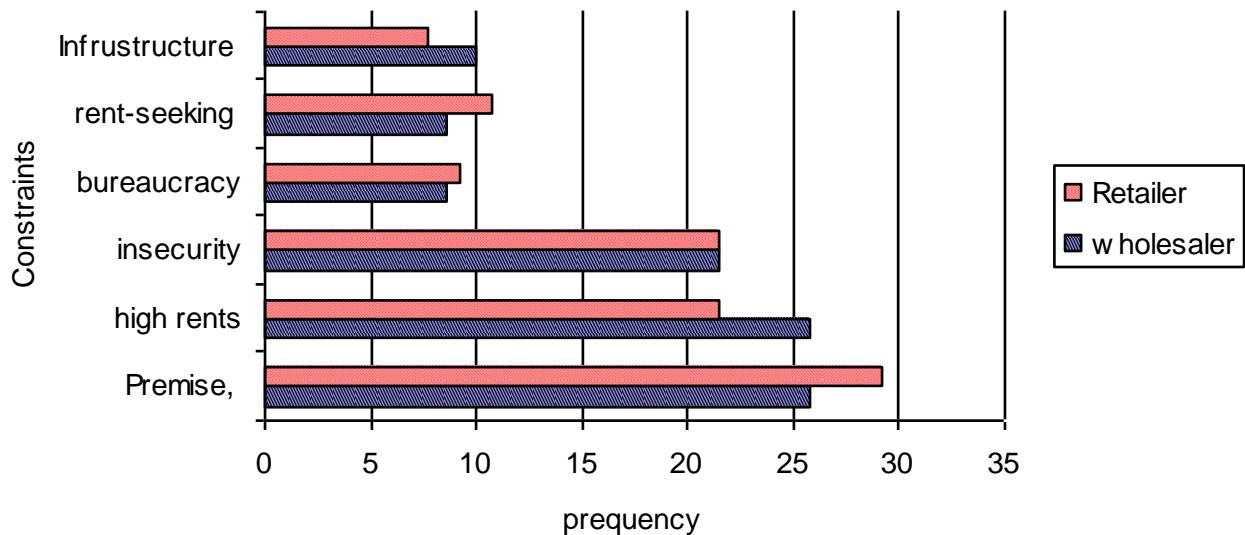


Figure 3. Constraints in banana trade. Source: Survey data, 2011/2012.

interventions. This implies the road infrastructure need to be improved as initiatives of increasing banana production by both County and National Governments.

Constraints to banana trade

The banana marketing system in western Kenya is afflicted with diverse problems. The problems noted by traders were: lack of premise, high rents, insecurity, bureaucracy and rent-seeking (Figure 3). Some of these problems have been raised in a number of studies in Kenya and outside outside (Kahangi et al., 2004; Republic of South Africa., 2012; Kasyoka et al., 2011). These constraints are likely to discourage expansion of banana trade in Kenya. Eventually farmers may not have incentives to invest in innovative technologies like Tissue culture banana. The County and National Government including the private sector support could be geared towards solving the problems for enhanced market efficiency. The use public and private transportation, camel and donkeys and their heads to transfer their goods across the borders to local and regional markets. Private transportation included animal-drawn carts, cars, small trucks and vans, and large trucks.

Determinants of market participation

The Tobit model results are presented in Table. Some variables were dropped during the estimation process because of multicollinearity. The Likelihood Ratio (LR) Chi-Square test is 52.43 with the p-value (that is, probability of obtaining the chi-square statistic value) of

0.000, meaning that at least one of the regression coefficients in the model is significantly different from zero since the values are less than 0.01. The results of the model revealed that only six variables were significant. The explanatory power of the specified variables as reflected by Pseudo R^2 value of the censored Tobit was 23.4%. This is relatively low but it is common among survey studies though this value is outside the values of 0.2 to 0.4 are considered highly satisfactory (Yoruk, 2011).

The coefficient of age of the traders had a negative and significant effect on intensity of banana sales. One percentage increase in the traders' age would decrease the intensity of banana sales by about 17%. This is probably because as traders increase in age they divest into other business activities other than banana.

The variable distance to banana market ($LNq6estdis\sim 1$), was positive and significant, ($p\leq 0.10$). One percentage increase in distance to banana fruits markets would increase banana sales by about 4%. The more the distance to the product markets sources the more banana sales handled by traders. This could be because traders who transport banana from far tend to use relatively big trucks for transportation. Bulk transportation reduces transportation cost per unit. Therefore, this demands for the good road systems network to give incentives for traders to engage in the activity. In addition there should be good packaging done to avoid losses. Similar observations on bulk transportation have been made by other authors (Wasala et al., 2015; Vigneault et al., 2009)

Being a male trader (sxown) reduces the likelihood increasing volume of banana sales compared to female traders. One percent increase in the proportion of male

Table 3. Determinants of market volume of sales/participation – The Tobit model.

variable name	Coef.(SE)	ME(SE)
LNintagres~1	-0.313(0.1794)*	-0.165(0.0946)*
LNq11sellp~2	-0.196(0.1872)	-0.103(0.0986)
LNq6estdis~1	0.072(0.0425)*	0.038(0.0224)*
LNprofit	-0.029(0.0334)	-0.016(0.0176)
aqrdln	0.110(0.1609)	0.059(0.0884)
srcfnd	0.026(0.0472)	0.014(0.0248)
sxown	-0.897(0.2067)***	-0.472 (0.111)***
othertraders	-0.561(0.1571)***	-0.315(0.095)***
phones	-0.110(0.616)	-0.056(0.302)
ripening	-0.378(0.190)**	-0.182(0.084)**
kisicode	-0.032(0.194)	-0.017(0.101)
westcode	0.241(0.178)	0.129(0.097)
educrpm	-0.255(0.198)	-0.135(0.105)
educrsec	-0.078(0.211)	-0.041(0.109)
educrtert	0.019(0.467)	0.010(0.248)
vehiclecode	0.065(0.188)	0.034(0.099)
bicyclecode	0.221(0.190)	0.119(0.105)
motorcyclec~e	0.197(0.313)	0.1098(0.184)
wholesaler	0.533(0.156)***	0.311 (0.100)***
awareness	-0.119(0.136)	-0.063 (0.073)
cons	4.316(1.264)	1.822
/sigma	0.818(0.042)	0.7352
No. of obs.	190.000	
Prob > F	0.000	
LR chi2(16)=	52.43	
Prob > chi2	0.000	
Pseudo R2	0.234	
Log likelihood	-240.992	

ME=marginal effects, *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level. Source: Survey data, 2011/2012.

banana traders reduces banana sales by about 47%. Probably this could be attributed to the fact that there are more female banana traders than men who have specialized in the business. Similar arguments were advanced by Baden (1998) and World Bank (2012).

Market information sources are key performance indicators for traders as they may encourage/discourage agriculture value chain actors (Jack, 2013). The market information source from other traders (othertraders) had a negative effect on volumes of traded. This implies that those traders who relied on market information from other traders tended to sell less volumes of banana. This could be attributed to market competition among traders which lead.

Cooking and ripening (ripening) are the main types of banana consumed in green and ripe stages. The coefficient on type of banana dealt by traders was negative a significant. This revealed that trading in ripening types (ripening) tended to reduce the volumes of

banana sold compared to dual and cooking banana. This could attribute to probably the low shelf life (and losses) of ripening banana which discourages traders from dealing in them. This may imply that probably traders dealing in more volumes of cooking banana compared to other types. This could be attributed to non-duality (sold as cooking and ripening) of the same unlike the cooking banana fruits. However, this is contrary to what was found by Kasyoka et al. (20011) that most farmers grew ripening banana which fetched high prices in the markets.

Being a wholesaler (wholesaler) enhances the likelihood of trading in larger volumes of banana compared to being a retailer. The wholesalers normally deal in large volumes probably due to the resource and experience they have compared to retailers. However, there some wholesalers who were also retailers and this enhances their ability to sell more volumes of fruits. Such strategies signify market vertical integration of wholesaler in an effort to enhance profit margins. This practice

diminishes individual retailers' market power and profit margins as indicated by Nijs et al. (2009).

Conclusion

This study examined various characteristics of banana farmers in western, Kisii and north rift regions. Most of the trader's initial sources of funds was from their own sources followed by loans. Traders received market information from multiple sources probable to check on the reliability and accuracy. The traders also received banana fruits from multiple sources. The results of the regression showed that the age of the traders, sex of trader, distance to markets, type of banana and fellow traders as information sources, and wholesaling and mode of transport (motor vehicle and bicycle) used significantly influence the volume of banana fruits handled by traders. The multiple constraints identified require public-private active involvement. This implies that the interventions may be different in different regions. Some target zones and traders may demand increased production in order to enhance supply while other areas may not. The findings from this study also indicated the need to increase trader participation in banana trade as the volumes dealt were low. Therefore, based on the study findings, some of the suggested policy recommendations include the need to fostering development of banana infrastructures and effort should be geared at improving market information sources among traders.

Conflict of Interest

The authors have not declared any conflict of interest.

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REFERENCES

- Adenegan KO, Adepoju A, Nwauwa LOE (2012). Determinants of market participation of maize farmers in rural Osun State of Nigeria. *Int. J. Agric. Econ. Rural Dev.* 5(1):28-29.
- Asiabaka CC, Owens M (2002). Determinants of adoptive behaviors of rural farmers in Nigeria, AIAEE 2002 Proceedings of the 18th. Annual Conference Durban, S. Afr. pp. 13-20.
- Baden S (1998). Gender issues in agricultural market liberalisation Report No. 41 Topic paper prepared for Directorate General for Development (DGVIII) of the European Commission. Institute Dev. Stud. pp. 1-48.
- Chegea CGK., Anderssonb CIM, Qaim M (2015). Impacts of Supermarkets on Farm Household Nutrition in Kenya. *World Development* August 2015, 72:394-407.
- Emerole CO, Osondu KC, Anyiro CO, Orji AO (2007). Trade enhancement characteristics of dessert banana fruits and estimates of transaction costs In Okigwe Metropolis, Imo State Nigeria. *Int. J. of Food Agric. Econ.* 1(1):141-150.
- Fischer E, Qaim M (2011). Smallholder farmers and collective Action: What determines the Intensity of participation? RTG 1666 Global Food Transformation of Global Agri-Food Systems: Trends, driving forces, and implications for developing countries. *Global Food Discussion Papers* pp. 1-30.
- Fischer E, Qaim M (2012). Linking smallholders to markets: Determinants and impacts of farmer collective action in Kenya. *World Dev.* 40(6):1255-1268.
- Greene WH (2003). *Econometric Analysis*, New York University, New York University, Upper Saddle River, New Jersey USA.
- Jack BK (2013). Market inefficiencies and the adoption of agricultural technologies in developing countries. *Agricultural Technology Adoption Initiative J-PAL (MIT) – CEGA (Berkeley)* May 2013 pp. 1-69.
- Jaetzold R, Schmidt H, Hornetz B, Shisanya C, (2005). *Farm Management Handbook of Kenya– Natural Conditions and Farm Management Information –West Kenya-Subpart A1*. Western Province Nairobi, Kenya: Government printers. 2:1-319.
- Kabungo NS, Dubois T, Qaim M (2014). Impact of tissue culture banana technology on farm household income and food security in Kenya. *Food Policy* 45:25-23.
- Kahangi EM, Muthee AM, Chege BK (2004). Banana Marketing in Rwanda, Burundi and South Kivu CIALCA Project Survey Report. In *Acta Hort.* 638, ISHS 2004, (Ed E. L. B. a. J. D. Anderson) pp. 441-447.
- Kasyoka MR, Mwangi M, Korir N, Mbaka J, Gitonga JN (2011). Banana distribution and their seed systems in central and eastern Kenya *African Crop Science Conference Proceedings*, 10:457-459.
- Mwangi M, Mbaka J (2010). Banana farming in Kenya: Options for rejuvenating productivity. A paper presented in Second RUFORUM Biennial Meeting 20 - 24 September 2010, Entebbe, Uganda pp. 901-905.
- Nijs V, Misra K, Anderson ET, Hansen K, Krishnamurthi L (2009). Channel Pass-through of trade promotions. *Market Science Informs* pp. 1-18.
- Njoroge K, Ombati JM, Oywaya-Nkurumwa A (2013). Implementation of Njaa Marufuku Kenya intervention in Kajiado County and the implications for food security. *Academia J. Agric. Res.* 1(7):122-130.
- Republic of Kenya (2007). *Kenya Vision 2030*. A competitive and prosperous nation Nairobi. Kenya.: Ministry of Planning and National Development in partnership, Kenya and Government of Finland.
- Republic of Kenya (2009). *Kenya 2009 Population and housing census highlights*. Nairobi, Kenya.: Government ministries.
- Republic of Kenya (2010). *Kenya 2009 Population and housing census Highlights*. Nairobi, Kenya: Kenya National Bureau of Statistics.
- Republic of Kenya (2013). *Economic review of agriculture (ERA)*. Prepared by central planning and project monitoring unit (CPPMU). Nairobi, Kenya. pp. 1-123.
- Vigneault C, Thompson J, Wu S, Hui KPCH, LeBlanc DI (2009). Transportation of fresh horticultural produce. *Postharvest Technol. Hortic. Crops, Kerala, India.* 2:1-24.
- Wambugu FM, Kiome R (2001). The benefits of biotechnology for small-scale producers in Kenya. ISAAA, Brief No 22:7.
- Wanjiru R, George O, Lagat J (2013). Decision making in the presence of transaction costs –evidence from smallholder banana farmers in Murang'a County, Kenya. pp. 171-180.
- Wanyama JM, Nkonge C, Muyekho FN, Rono S, Chesoro, J, Ligeyo DO, Wanyonyi M, Lusweti F, Onyango R, Makete N, Ndung'u KW, Powon M, Nandasaba J, MacOsore Z, Onginyo E, Omolo P,

- Barkutwo J, Kalama P, Masinde AO, Cheruiyot DT (2006). Report on Centre Research Priority Setting for KARI Kitale. Kitale, Kenya.
- Wasala WMCB, Dharmasena DAN, Dissanayake TMR, Thilakarathne BMKS (2015). Vibration simulation testing of banana bulk transport packaging systems. *Tropical Agric. Res.* 26(2):355 -367.
- Watson DD (2013). Political economy synthesis. The food policy crisis. United Nations University. pp. 1-30.
- World Bank (2012). Africa can help feed africa removing barriers to regional trade in food staples. *Poverty Reduction and Economic Management Africa Region* October 2012. pp. 1-60.
- Yoruk E (2011). The influence of technological capabilities on knowledge network component of innovation systems: Evidence from advanced materials. Paper to be presented at the DRUID 2011 on innovation, strategy, and structure - Organizations, Institutions, Systems and Regions at Copenhagen Business School, Denmark.