Socio-economic Analysis of Factors Affecting Access to Markets by Smallholder Cooperative Vegetable Farmers

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ABSTRACT The study aimed at determining factors that affected the marketing of vegetables among smallholder cooperative farmers. Beneficiaries of an agricultural cooperative in a rural area of South Africa were selected for the study. A simple random sampling method was used to select a sample of 50 active farmers from a total population of more than 100 farmers. Primary data were collected using questionnaires. All questionnaires were administrated through face to face interviews held with farmers on their farms. Preliminary analyses included descriptive statistics, followed by tests of equality of group means and correlation matrix. Binary Logistic Regression method was employed for further analysis of the data. The results of the study indicated that female smallholder vegetable farmers who had some qualification and experience in farming were more likely to have access to the marketing of vegetables. The study recommended that female vegetable farmers who are more likely to have access to markets compared with their male counterparts should be encouraged through the provision of necessary inputs.

INTRODUCTION

Access to the marketing of produce from the farm constitutes a crucial business activity associated with the flow of goods from the producers to the consumers (Antwi and Seahlodi 2011). Acquisition of some farming qualification coupled with farming experience guide farmers in making informed decisions (IFAD 2010). Educational level of the farmers also assists farmers in the planning, production and the marketing of produce to sell at the maximum price to obtain maximum profit. These marketing constraints constitute barriers for smallholder vegetable farmers when it comes to access to markets (Baloyi 2010).

Smallholder farmers in South Africa can be categorised into smallholder, communal and emerging farmers, where communal farmers tend to be a sub-group of smallholder farmers. These farmers generally farm on projects initiated or supported to varying degrees by the various provincial departments of the government (Chikazunga and Paradza 2013). Smallholder farmers include those who have access to very small pieces of land sometimes only a couple of hundred square metres, such as home gardens and food plots or possibly less than 3 to 5 hectares. Vegetable farming is one of the most popular type of farming among smallholder farmers. Vegetables

are grown in cooking and used in salads. Vegetables grown by smallholder farmers are grown under rainfed or irrigated conditions. The major market outlet is the local fresh market in rural and urban areas (Mwanda 2010). Berdegué et al. (2010) reported that a step towards continued access to markets is a demonstration of consistent production of quality and safe produce. Kleih (2010) conducted a study on the impact of transport on smallholder vegetable farmers' access to market opportunities in four rural communities in Malawi. The study showed that smallholder farmers in rural areas considered poor roads, lack of access to information, lack of means of transport as well as experience of farmers to be the most important factors affecting access to markets. The study also showed that smallholder farmers who initially were supported by government but later had the supports withdrawn faced problems in accessing markets for their produce (Kleih 2010).

Killick et al. (2012) stated that market access is determined by information about product availability, attributes and prices, including the frequency, quality and cost of this information. Again, information about counter-parties to transactions, trustworthiness, the extent of confidence in the market conduct, how well markets are regulated; and the physical costs of access-

ing the market, are also crucial in gaining access to the market.

Lack of access to profitable markets has also been considered a major problem among vegetable farmers (Mussema and Dawit 2012). Smallholder farmers are often inexperienced and unaware of strict market requirements and are also unaware of niche markets. A number of detailed studies have been undertaken to understand opportunities and challenges facing smallholder farmers in accessing markets (Altman et al. 2010). These studies have shown that mainstream markets have limited opportunities for smallholder farmers contributing to low productivity as well as stringent procurement practices of the marketing business (Matungul et al. 2013).

Studies have shown that there are some socio-economic characteristics that affect access to markets in general. However, limited knowledge is known about those characteristics that affect smallholder vegetable farmers in rural areas. The identification of such socio-economic characteristics should assist in improving agricultural productivity, market access and high farm incomes among smallholder farmers.

Objectives

The objectives of this study were:
- To determine the socio-economic factors affecting access to markets by smallholder vegetable farmers;
- To recommend possible solutions that could improve market access by smallholder vegetable farmers to enhance income generation and food security.

Hypothesis

Socio-economic characteristics such as gender, age group, level of education, farming qualification, farming experience and income received from farming are likely to have significant effect on access to the marketing of vegetable in the study area.

Significance

This study is expected to be useful in assessing the barriers that vegetable small-holder farmers' face in marketing their produce. It will also highlight the issues and challenges faced in accessing markets that are unique to all small-

holder farmers. The study will be useful to other researchers, as stepping stone for further studies on the problems faced by smallholder farmers relating to the marketing their vegetables.

METHODOLOGY

This study was conducted in a rural area in South Africa using beneficiaries of an agricultural cooperative as units of observation. The agricultural cooperative was selected due to its dominance by smallholder vegetable farmers. A simple random sampling method was used to select a sample of 50 active farmers from a total population of more than 100 farmers. These selected farmers cultivated mainly cabbage, spinach, beetroot and carrots. The study area is in the Greater Giyani Municipality in the Mopani District, Limpopo Province of South Africa during the 2014/2015 growing season. The main agricultural activity is mainly vegetable farming dominated by cabbage, spinach, beetroot and carrots. The climate in the study area is classified as a humid subtropical which is suitable for vegetable production.

Data Collection and Analysis

Primary data were collected using questionnaires which were administrated to participants through face to face interviews. Welman et al. (2010) considered the method of data collection in research to be crucial in the analysis of the logic behind the selected research techniques. The questionnaires comprised both opened-ended and closed-ended questions. The information collected was captured into SPSS V. 22 of 2015. Data cleaning was conducted before analysing the data to check for errors and omissions.

Initial analyses included descriptive statistics, followed by tests of equality of group means and correlation matrix. Binary Logistic Regression method was finally employed to determine socio-economic factors that were likely to affect access to the marketing of vegetables by smallholder farmers in the study area. The general theoretical binary logistic regression model employed was specified as follows (Gujarati 2003).

$$Ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \sum_{i-1}^{k}\beta_i X_i + u_i \qquad (1)$$

Equation (1) is then expanded to express the general logistic regression model of the study as:

$$Ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_j X_j + u_i \quad (2)$$

Where;

P_i= the probability of having access to market (Yes=1; 0=otherwise)

Ln= the natural logarithm function

β_0 = the model constant term

β_i-β_j = regression parameters

X_i-X_j = covariates

Ui = stochastic error term.

The significance of each explanatory variable included in the model was tested using the likelihood ratio statistic in the SPSS V.22 statistical package. The statistical model employed which was based on likelihood ratio (LR) was deemed appropriate for the study. This ratio was defined as follows (Field 2005):

$LR = 2(LogL_R - LogL_U)$

Where $LogL_u$ was defined as the log-likelihood for the unrestricted model and $LogL_r$ was the log-likelihood for the model with k parametric restrictions imposed. The likelihood ratio statistic follows a Chi-square (χ^2) distribution with k degrees of freedom. The likelihood ratio is reported as -2 Log likelihood in Table 4. The preceding operations were feasible within the SPSS package. In relation to equation (2) the analysis generated the odd ratios using the maximum likelihood procedure (Field 2005). The estimated Logistic regression in this study can be written as follows:

$MKT_i = \beta_0 + GENE\beta_1 + AGE\beta_2 + EDU\beta_3 + QUAL\beta_4 + EXPE\beta_5 + RECE\beta_6$

The description of the variables is presented in Table 1.

RESULTS

Table 1 indicates the description of variables (dependent and independent) used in the model. Test of equality of group means of the independent variables are reported in Table 2. The results indicate significant differences, at least at the one percent level, among age groups, educational levels, qualifications, experience and the income from vegetable sales when comparing farmers who have access to market to those who do not have access. The significant differences are indicated by the *P*-values (Table 2).

Correlation matrix of the independent variables is presented in Table 3. The main aim of the correlation matrix was to determine if the in-

Table 1: Description of variables

Variables	Description
Dependent Variable	
MKT	Market for your vegetable (1=yes; 2=no)
Independent Variable	
GENE	Gender of the respondent (0=male; 1=female)
AGE	Age group of the respondent (1=15-35 years, 2=36-50 years, 3=51 years and above)
EDU	Level of education (1=never attended, 2=primary level, 3=secondary level, 4=tertiary level)
QUAL	Farming qualification (1=yes; 2=no)
EXPE	Farming experience (1=yes; 2=no)
RECE	How much do you receive from produce sales? 1=R2000-R5000, 2=R5001-R8000, 3=R8001 and above

N=50

dependent variables were correlated high enough to result in multicollinearity in the subsequent Binary Logistic regression. The results showed that the independent variables were not highly correlated enough to result in multicollinearity. All the correlation coefficients had weighting values of less than 0.5 (Table 3). Kaiser-Meyer-Olklin (KMO) measure of sampling adequacy also indicated a low sampling adequacy of 0.454 and significant result of Bartlett's test of sphericity (*P*-value = 0.00). The results of the KMO and the Bartlett's test of sphericity indicated low correlation among the independent variables.

Binary logistic regression results are presented in Table 4. The variables in the equation output shows that the regression equation can be written as:

$In(\text{odds}) = -1.272 + 1.879X_1 - 0.978X_2 - 1.340X_3 + 0.452X_4 + 5.140X_5 - 1.904X_6$

The results indicate that if the respondent (farmer) is a female (X_1=1) the more likely she will have access to markets. Similarly, farmers with some farming qualification (X_4=1) and with farming experience (X_5=1), are more likely to have access to markets than their counterparts. Comparatively, young farmers (X_2=1) who have never attended school (X_3=1) and receive less income from vegetable farming (X_6=1) are less likely to have access to markets. The Exp (β) gives the magnitude of the extent of the likelihoods. For example, female farmer is 6.547 times more likely to have access to markets that male farm-

Table 2: Test of equality of group means

Variable	Yes	No	Pooled	Wilks'λ	F	df1	df2	P- value
GENE (X_1)	1.24	1.45	1.33	0.952	2.360	1	47	1.13
AGE (X_2)	2.24	2.35	2.29	0.994	0.275	1	47	0.60
EDU (X_3)	2.97	1.85	2.51	0.756	15.210	1	47	0.00
QUAL(X_4)	1.48	1.90	1.65	0.814	10.712	1	47	0.00
EXPE (X_5)	1.03	1.45	1.20	0.743	16.237	1	47	0.00
RECE (X_6)	2.07	1.45	1.82	0.845	8.590	1	47	0.01

Table 3: Correlation matrix of independent variables

Variables	X_1	X_2	X_3	X_4	X_5	X_6
Gender (X_1)	1					
Age (X_2)	0.217**	1				
Education level (X_3)	-0.156	-0.419**	1			
Farming qualification (X_4)	-0.055	0.052	0.039	1		
Farming experience (X_5)	-0.054	-0.145	-0.198	0.209	1	
Income (X_6)	0.210	-0.045	0.329	-0.063	-0.050	1

Kaiser-Meyer-Olkin measure of sampling adequacy	=	0.454
Bartlett's test of sphericity:		
Approximate chi-square	=	41.790
df	=	15
P-value	=	0.000

** $P<0.01$, (2-tailed); N=50

ers. Out of the six variables that were chosen to have effect on market access, four were significant at least at the ten percent level of significance, and two were not, indicated by their P-values in Table 4.

The overall predictive power of the model was estimated to be 85.7 percent. This is also the magnitude of sensitivity of prediction which is relatively high. An indication of a good predictive power of the Binary Logistic model. The model also predicted 82.8 percent of the respondents who had access to markets correctly, and as high as ninety percent of those who indicat-

ed no access to markets. The cut-off value employed was fifty percent. The additional statistics: -2 Loglikelihood, Cox and Snell and Nagelkerke R^2 all indicate a good and suitable model used in the analysis.

DISCUSSION

The results indicate that if the respondent (farmer) is a female (X_1=1) the more likely she will have access to markets. Similarly, farmers with some farming qualification (X_4=1) and with farming experience (X_5=1), are more likely to have

Table 4: Binary logistic regression results

Variables	β	S.E	Wald	df	P-value	Exp (β)
X_1	1.879	1.075	3.056	1	0.080*	6.547
X_2	-0.978	0.943	1.076	1	0.300	0.376
X_3	-1.340	0.649	4.261	1	0.039**	0.262
X_4	0.452	1.191	0.144	1	0.704	1.572
X_5	5.140	2.169	5.616	1	0.018**	7.710
X_6	-1.90	0.990	3.699	1	0.054*	0.149
Constant	-1.272	4.198	0.092	1	0.762	0.280

-2 Log likelihood = 31.043; Cox and Snell R^2 = 0.513; Nagelkerke R^2 = 0.692; *$P<0.10$; **$P<0.05$
Classification results:
Yes	=	82.8%
No	=	90.0%
Overall	=	85.7%
Cut value	=	0.500

access to markets than their counterparts. Comparatively, young farmers (X_2=1) who have never attended school (X_3=1) and receive less income from vegetable farming (X_6=1) are less likely to have access to markets.

This study was aimed at determining the socio-economic factors of smallholder vegetable farmers that are likely to affect their access to markets and to provide possible strategies to improve market access by vegetable small holder farmers. From the results of the study, it can be inferred that female vegetable farmers are more likely to have access to markets than male farmers. Again, farmers with some farming qualifications in addition to more farming experience, are also more likely to have access to markets than their counterparts (Table 4). These results support Brockelsby and Hobley (2003) who found out that female farmers are more likely to have access to markets than their men counterparts in livelihood programmes. According to Carr et al. (2000) home-based workers who are females are also able to have enough time to market their produce from smallholder enterprises, mostly vegetable farming, than men.

The results presented in Table 4 indicate that farmers who are young, less educated and receive less income from vegetable farming are less likely to have access to markets. Takane (2011) reported that they were farmers who received less income from farming and other sources, mainly from off-farm sources such as welfare payments and wage remittances. With little income they were not able to have access to information and other equipment such as cars and storage equipment.

Mathenge et al. (2010) found that young farmers had less interest in market participation compared with old farmers among marginalized and poor smallholder farmers in Kenya. An increase in age coupled with high formal education levels had more contributory factors to the marketing of vegetables. Gani and Adeoti (2011) also found that in Nigeria farmers' participation decision in marketing was negatively influenced by their low levels of education. Studies also show that more years of experience in farming determine better knowledge and the ability to access market for farm produce among smallholder farmers (Awan et al. 2012).

CONCLUSION

From the results of the study, it can be concluded that that female vegetable farmers were more likely to have access to markets compared to their male counterparts. Furthermore, farmers with some farming qualification and farming experience, were also more likely to have access to markets. Comparatively, young farmers who had never attended school and received less income from vegetable farming were less likely to have access to markets.

RECOMMENDATIONS

The study recommended that female vegetable farmers who are more likely to have access to markets compared to their male counterparts should be encouraged through the provision of necessary inputs. To attract male farmers, appropriate policies and strategies should be in place. Further research is recommended to investigate why farmers with some farming qualification and farming experience are more likely to have access to markets.

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