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Analysis of factors that influence market channel choice of smallholder vegetable farmers in Mashonaland east province of Zimbabwe

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Abstract

Smallholder vegetable production is a very important activity in Zimbabwe, contributing significantly towards household food security and income. However, vegetable farmers are constrained from participating in remunerative markets by several factors. The main aim of this study was to analyse factors that influence market channel choice of smallholder vegetable farmers in four districts of Mashonaland East Province of Zimbabwe. The survey used cross-sectional data which was obtained in 2016 from 385 smallholder vegetable farmers. Multistage sampling procedure was employed to construct the sample. The multinomial logistic regression model was used to analyse these factors. Results of the model revealed that distance to market, group membership, adding value, road infrastructure and quantity produced influence participation in rural local markets. On the other hand gender, distance to market, market information, group membership, producer price, adding value, road infrastructure, quantity produced and market infrastructure influence farmers' participation in urban markets. Policies, aimed at availing resources for improved productivity of vegetables should be gender sensitive. In the same way, crafting of appropriate policies and programmes which foster collective action amongst farmers are required. Again, farmers' transaction costs can be reduced by investment in infrastructure such as roads. This can enable them to participate in more lucrative markets.

Keywords: Smallholder Vegetable Farmers; Market Channel Choice; Multinomial Logistic Regression Participation; Zimbabwe

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1. Introduction

The crucial role that smallholder agriculture plays in the livelihoods of rural dwellers in most parts of sub-Saharan Africa cannot be over emphasized (Dorward et al., 1998). Vegetable production by smallholder farmers in particular has potential to improve livelihoods through enhancing food security, employment creation, improve access to income and general poverty reduction in most countries (Heinemann, 2002; Zivenge and Karavina, 2012). Despite that, according to Zamasiya et al.(2014), the various reasons which cause smallholder farmers in several developing countries not to be integrated into remunerative markets have not been adequately explored. However, some studies have highlighted that smallholder farmers are constrained from participating in remunerative markets by several factors (Ghezán et al., 2002; Kherallah and Kirsten, 2002; Siziba et al., 2011; Zamasiya et al., 2014). These include but are not limited to lack of capacity to meet requirements, poor bargaining power, presence of middlemen, lack access to institutional and physical infrastructure, high transaction costs inadequate private and public investment and services as well as shortage of productive assets. Household characteristics such as labor shortages, low education levels also negatively impact participation in market economy. The above scenario is compounded by the fact that in many Southern African countries, the bulk of agricultural produce is also lost soon after production mainly because of poor postharvest handling (Phiri and Otieno, 2008). This is more pronounced in the case of fruits and vegetables because of their high perishability, low production volumes and lack of value addition.

Smallholder fruit and vegetable production is a very important activity in Zimbabwe, contributing significantly towards household food security, income and rural development. For instance, according to Matondi and Chikulo (2012) Zimbabwe's domestic horticultural market which is mainly supplied by smallholder farmers was estimated at US\$70 million per annum in 2006. This figure was more than double the size of the country's export market. It is projected that smallholder farmers supply about 60% of all vegetables supplied in Zimbabwe's local markets (Zivenge and Karavina, 2012). Further, in Zimbabwe, the government, non-governmental organisations and the private sector have availed support programmes geared towards addressing smallholder fruit and vegetable farmers' production constrains such as, establishment of smallholder irrigation schemes. Nonetheless, marketing of the smallholder farmers' horticultural produce remains a major challenge, despite improved production (Zivenge and Karavina, 2012).

Smallholder vegetable farmers' decision to sell in the output market is guided by available market surplus. In the same way, the decision on the marketing channel to use precede a preliminary decision whether or not to sell (Goetz, 1992). Once the decision has been made smallholder vegetable farmers in Zimbabwe's communal areas are faced with an array of marketing channels to use. According to Bindu and Chigusiwa (2013) these marketing channels include selling to urban horticultural central markets e.g Mbare Musika, selling at farm gate, rural service centres and road side marketing. However, smallholder vegetable farmers in Zimbabwe often tend to prefer marketing their produce at the farm-gate. This is because this channel minimise transaction costs as usually the middlemen come to purchase at the farm with their own transport. In other instances, smallholder farmers might sell their produce to hawkers who would then sell at the road side markets. In the same way, smallholder farmers can sell their produce to informal middle men who would then transport it to open air markets such as Mbare Musika. Yet, if the farmer chooses to transport their own

produce to Mbare Musika they would be responsible for finding their customers, transport as well as finding a fair price for the day. Nonetheless, smallholder farmers find it difficult to supply supermarkets because of strict quality requirements, volumes as well as supply consistency.

The marketing conditions set within each marketing channel in Zimbabwe heavily influence smallholder farmers (SHFs) decision. The formal market with its emphasis on supplying consistent volumes as well as quality generally excludes smallholder farmers from using them. As a result they resort to informal markets which have minimal emphasis on quality and they are also supply driven (Matondi and Chikulo, 2012).

Market information particularly with regard to price which is being offered for a particular market is key in farmers' selection of market channel. Lack of market information makes it difficult for smallholder farmers to know products that are needed at the market, when such products are needed, in what quantities and quality they are needed and at what price (Mangisoni, 2006). Despite the expansion of information and communications technologies (ICTs), smallholder farmers in many developing countries continue to have limited or no access to market information (UNCTAD, 2015). As a result, they sell their produce at the farm gate or village markets where profits are low. Additionally, lack of vital market information on supply and demand led to reduced margins to the farmers as a result of commodity gluts. Furthermore, smallholder vegetable farmers also lack collective action in the form of producer groups which can potentially assist them to overcome financial barriers, deal with transportation costs and eventually access high rewarding markets (Markelova et al., 2009). However, it should be noted that fostering collective action amongst smallholder farmers presents its own challenges such as lack of trust, which leads to failed cooperation and collaboration. On the other hand, the rise of modern markets specifically supermarkets in developing countries is generally viewed as a positive move for the rural poor (van der Heijden and Vink, 2013). Yet, scholars agree that there are many challenges smallholder vegetable farmers have to overcome for them to obtain access to formal markets such as supermarkets. For perishable products such as fruits and vegetables supermarkets might consider contract arrangements with smallholder farmers (Rao and Qaim, 2011; Trebbin, 2014). Contract farming with supermarkets can be beneficial to smallholder farmers in developing countries as they open up marketing opportunities (Ochieng et al., 2017). They can enable farmers to gain access to stable prices, inputs and technology (Reardon and Timmer, 2014). Nonetheless, at times smallholder farmers drop out of contracts with supermarkets for reasons which are not clearly known. Towards that end there is paucity of information on how contract design affect smallholder farmers' participation in supermarkets (Ochieng et al., 2017). Even though there are differences across countries in participation of farmers in the marketing channels, there are no conclusive findings on factors that influence farmers decisions to participate in modern channels (Natawidjaja et al., 2014). Thus from the above discussion selection of appropriate marketing channel by smallholder vegetable farmers becomes a daunting task. In the Zimbabwean case apparently literature on the extent and nature of both formal and informal marketing systems of smallholder vegetable farmers is scarce. Hence, this study intends to extend literature on smallholder vegetable farmers' participation in markets. The specific objective of the study is to examine factors that influence market channel choice of smallholder vegetable farmers in Mashonaland East Province of Zimbabwe. Findings from this study will inform policy formulation that intervenes in agricultural marketing. This will go a long way in improving the livelihoods of smallholder vegetable farmers in Zimbabwe's communal areas.

2. 2. Materials and methods

2.1. Research area

The study was conducted in four districts of Mashonaland East Province of Zimbabwe. The province is divided into nine (9) administrative districts as shown in Figure 1 below (Zimstat, 2012a). The four districts in which the study was carried out are Mutoko, Goromonzi, Murehwa and Seke districts. The selection of these districts was based on the intensity of smallholder farmers' vegetable production. These districts are where there is intensive production of vegetables by smallholder farmers for sell in different marketing channels (Heri, 2006). In all these four districts smallholder vegetable farmers have the option of using different marketing channels such as: selling to urban horticultural market places e.g Mbare Musika, selling at farm gate, rural service centres and road side marketing (Bindu and Chigusiwa, 2013).

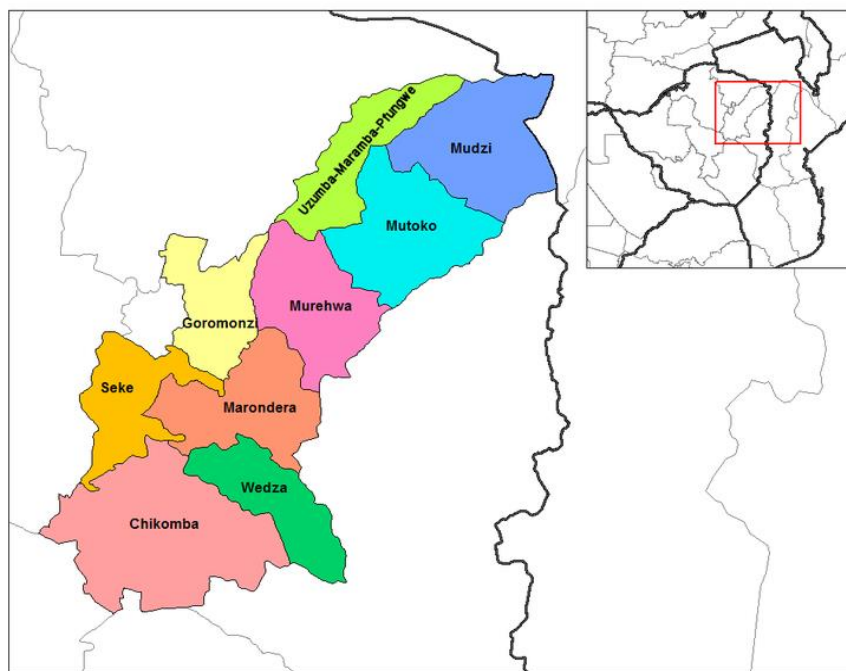


Figure1. Mashonaland East Province and location of study areas

Mutoko district is situated 143 km north east of Harare along the Harare-Nyamapanda highway. Zimstat(2012a) estimated that the district has a total population of 146 127. The population of Mutoko district constituted about 10% of Mashonaland East Province's total population. A small town called Mutoko is the capital of the district. The district lies in Natural Region III which is characterized by three marked seasons: a warm wet summer (November-April), a cool dry winter (May-August) and a short hot dry spring (September-October) (Matikiti, 2015). The district is renowned for smallholder farmers' vegetable production such as tomatoes, rape, carrots and cucumbers in the country. Goromonzi district is located about 32 km southeast of the country's capital Harare. It covers an approximate area of 9,100 km². According to Zimstat(2012a)the

district has a total population of 224 987. This is the district with the highest population in the province constituting about 17% of the total provincial population. The district lies in natural region IIa which is suitable for horticulture production such as tomatoes and leafy vegetables. Murewa district is located, 75 kilometres northeast from the capital Harare along the Harare-Nyamapanda highway. According to the Zimstat(2012a) the total population of the district is estimated at 199 607. It has the second highest population in the province constituting about 15% of the total provincial population. The district lie in natural agro-ecological region II, and receives average rainfall of 500-700 mm in a unimodal pattern between November and April (Rusinamhodzi, 2015; Vincent and Thomas, 1960). The district has suitable climatic conditions for production of vegetables such as carrots, rape and cucumbers. Seke district is located in natural agro-ecological region II, with an average rainfall of 500-700 mm. However, the amount of rainfall received vary within the district. It is located approximately 25km from the capital Harare. The district has a total population of 100 756 (Zimstat, 2012a). Vegetable production such as rape, covo, and tomatoes are the main agricultural activities practised by smallholder farmers in the district (ZimTrade, 2012).

2.2. Sampling strategy

A multistage sampling procedure was used to select specific locations for the study, moving from the district level to specific wards and later to specific villages and households. This technique was considered the most appropriate for this study because sampling frames were not available at district level. The first stage used purposive selection of four districts (Mutoko, Goromonzi, Murehwa and Seke) out of the 9 districts in the study area. The selection of these districts was based on the intensity of smallholder farmers' vegetable production. These districts are where there is intensive production of vegetables by smallholder farmers for sell in different marketing channels. The second stage was the selection of three wards in each district where communities are engaged in vegetable production to give a total of 12 wards. The selection of these wards was guided by information obtained from agricultural extension workers and Non-Governmental Organizations (NGOs) that were operating in the districts. Furthermore, accessibility of the area was another criteria which was considered in identifying these wards. The third stage involved use of cluster sampling to select three villages (clusters) in each of the three wards. Finally, at the village level, simple random sampling was applied to select households based on the sampling frame provided by the village head. A total sample size of 385 smallholder vegetable farmers was ultimately interviewed in all four districts. Face-to-face interviews were conducted with farmers in the study areas with the assistance of Agricultural Extension Officers which were trained as enumerators. Data collection was conducted from August-October 2016.

2.3. Questionnaire

A structured questionnaire was designed and used as a key instrument for data collection. Both qualitative and quantitative data were captured by the questionnaire. The questionnaire was pre-tested and collected primary data include demographic characteristics (such as farmer age, sex, marital status, and education), and institutional factors that include (market infrastructure and distance to the market). A pre-test of the questionnaire was done to check for reliability and validity.

2.4. Method of analysis

Collected data was coded and entered into Statistical Package for Social Scientists (SPSS) version 23, for analysis. Both descriptive statistics and the multinomial logistic regression model (MNL) were used to analyse data that was collected from smallholder vegetable farmers. In this study it was hypothesized that smallholder vegetable farmers are faced with three choices; urban markets, informal local rural markets and non-market participation. It is assumed that these decisions are made based on the option that maximises utility subject to technical, institutional and socio-economic constraints. The MNL model used in this study was adopted from Gujarati and Porter(2010) and is represented as follows (Equation 1):

$$P_i = E(Y = |X_i) = \frac{1}{1+e^{-(\beta_1+\beta_2X_i)}} \dots \dots \dots (1)$$

Where

P_i represents probability

The equation is written as Equation (2) for ease of exposition

$$P_i = \frac{1}{1+e^{-z_i}} = \frac{e^z}{1+e^z} \dots \dots \dots (2)$$

Where $z_i = B_1 + B_2X_i$

Z_i ranges from $-\infty$ to $+\infty$

P_i ranges between 0 and 1 and is nonlinearly related to Z_i

Equation (1) can be linearized as shown in equation 3:

$$1 - P_i = \frac{1}{1+e^{z_i}} \dots \dots \dots (3)$$

Therefore, it can be written as illustrated in equation 4

$$\frac{P_i}{1-P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{z_i} \dots \dots \dots (4)$$

Taking the natural log of equation (4) yield the following result (Equation 5)

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = B_1 + B_2X_i \dots \dots \dots (5)$$

For estimation purposes equation (5) is written as follows (Equation 6):

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = B_1 + B_2X_i + u_i \dots \dots \dots (6)$$

$$\ln\left(\frac{P_i}{1-P_i}\right) = \text{logit for market channel choice}$$

$P_i = \text{probability of participating in markets}$

$1 - P_i = \text{probability of not participating in markets}$

$X_i = \text{independent variables}$

$B_i = \text{parameters to be estimated}$

$u_i = \text{error term}$

In the model, market participation choice represents the dependent variable where non-market participation has been set as the reference category. Market participation choice describes the decision to market or not, and the different marketing channels (either informal local rural markets¹ or urban markets²) used by smallholder farmers to market their vegetables. In that respect $(1 - P_i)$ represents the probability of not participating in vegetable marketing and P_i represents either informal local rural markets or urban market participation. In other words, the model was used to assess the odds of: informal local rural markets participation vs. not participating; and urban market participation versus not participating.

2.5. Description of variables used in the model

The independent variables that influence market channel choice of smallholder vegetable farmers adopted from literature are shown in Table 1 below. Gender has an effect on market participation of female and male headed households (Zamasiya et al., 2014). Gender of the farmer was set as a dummy variable where female took the value of 1 and zero otherwise. It is assumed that male smallholder farmers tend to have better access to productive resources necessary to meet quality requirements hence they might have a wide option of marketing channel choices compared with their female counterparts.

Smallholder farmers' level of education can improve production and marketing practices. The higher the level of education, farmers are expected to have high productivity, engage in value addition activities and ultimately have diverse marketing channels (BIRTHAL et al., 2005; KUMA and GETNET, 2011; MAMO et al., 2014).

According to Alene et al. (2008) household size can be used as a proxy for available family labour that can be channeled towards production activities. Nonetheless, bigger household sizes may mean higher household consumption and reduced market surplus. Therefore, a negative sign is expected if a household consumption

¹ In this study local rural markets were defined as those informal markets in the rural areas where farmers sell their produce at the farm gate to neighbours, spot markets such as middlemen who come to buy directly at the farm, selling to local shops and road side marketing

² Urban markets were a mixture of both formal markets such as supermarkets, restaurants, hospitals and informal wet markets such as MbareMusika in Harare, Chikwana and Jambanja in Seke District, Murehwa Centre in Murehwa District and Domboshava Showgrounds in Goromonzi District. For farmers to access these markets in most cases they have to travel long distances. Furthermore, these markets are more lucrative offering higher producer prices compared to local rural markets. However, there is also high emphasis on grades and standards and competition in these markets is very stiff compared to local markets.

leads to reduced market surplus. Conversely, a positive sign is expected if household size translates to more marketable surplus.

Table 1. Description of variables used in the model

Variable	Definition	Coding of Variable	Category	Expected Sign
X ₁	Gender	1 if female, 0 if male	Dummy	+/-
X ₂	Education level	1 if literate, 0 if illiterate	Dummy	+
X ₃	Household size	Number of family members	Continuous	+
X ₄	Age	Number of years	Continuous	+/-
X ₅	Farming experience	Number of years	Continuous	+
X ₆	Distance to market	Number of kilometers	Continuous	-
X ₇	Market information	1 if yes, 0 if no	Dummy	+
X ₈	Credit	1 if yes, 0 if no	Dummy	+
X ₉	Group membership	1 if group, 0 if individual	Dummy	+
X ₁₀	Producer Price	US\$ Price/ kilogramme	Continuous	+
X ₁₁	Extension	1 if yes, otherwise 0	Dummy	+
X ₁₂	Family labour	1 if yes, otherwise 0	Dummy	+
X ₁₃	Add value	1 if yes, otherwise 0	Dummy	+
X ₁₄	Road infrastructure	1 if good, 0 if poor	Dummy	+
X ₁₅	Quantity produced	Number of kilogrammes	Continuous	+
X ₁₆	Market infrastructure	1 if good, otherwise 0	Dummy	+

Age was measured in years of smallholder vegetable farmers. Age influence participation in markets through various ways such as experience, risk preference and access to resources (Ochieng et al., 2017; Zamasiya et al., 2014). Younger farmers are expected to be risk takers, innovative and to be involved in activities such as value addition so as to access other alternative markets. Alternatively, older farmers are expected to have gained experience and have access to resources (Mamo et al., 2014). Therefore, the expected sign might be negative or positive.

Farming experience improve market participation of smallholder vegetable farmers through improved bargaining power in the output market and enhanced connection with traders such as middlemen. Experience was noted as a key factor which improve farmers' negation skills in the output market (Vakis et al., 2003). A positive sign is expected for this variable in this study.

Distance to market was measured in kilometers from the smallholder farmer production area to the market. Several studies have established the negative influence of distance on smallholder farmers' participation in markets (Alene et al., 2008; Makhura et al., 2002; Mariano et al., 2012; Siziba et al., 2011). The longer the distance from the farmer's production area to the market, the less likely the farmer is to participate in that particular marketing channel. This is because the farmer's profit returns are bound to be reduced as a result of increased transportation costs and the encountered opportunity cost of time. As such, a negative sign was hypothesized for this variable.

Access to market information was measured by the farmer's ability to access market information and the aptitude to interpret it correctly (Jari and Fraser, 2009). Farmers were interviewed with regards to communication channels available to them. Access to market information had been set as a dummy variable, where a farmer with access to market information took the value one or zero otherwise. Access to market information was expected to influence market channel decisions positively.

Access to credit may enable smallholder vegetable farmers to have increased output. Therefore, they can have bulk marketable surplus, which might enable them to participate in distant urban markets. The variable was measured as a dummy (1 if farmer had access, 0 if no). A positive correlation was expected for this variable.

Studies have highlighted the importance of smallholder farmers working collectively to access lucrative markets (Abdul-Hanan et al., 2014; Markelova et al., 2009). Farmers were interviewed whether they belong to a farmer group or they operate individually, the responses were allocated dummy values. Group marketing is anticipated to impact positively on market participation and choice of marketing channel amongst smallholder farmers

Producer price denoted the price offered by a particular vegetable marketing channel. Farmers spend a considerable amount of resources and time searching for markets which offer lucrative prices. A marketing channel offering higher price is likely to act as an incentive for farmers to participate in that particular marketing channel (Zivenge and Karavina, 2012). Therefore, a channel offering a better price was hypothesized to have a positive effect on the selection of that particular marketing channel.

Access to extension services convey knowledge, market information and technical skills to smallholder vegetable farmers (McNamara and Tata, 2015; Roy et al., 2013). This is also very important for smallholder vegetable farmers to participate in marketing channels that offer higher premiums. Dummy values were allocated to this variable, farmers with access to extension services took the value of one and zero if otherwise.

Closely related to household size is the issue of family labor. Farmers were asked whether they had adequate family labour for vegetable production or not responses were assigned dummy values. Availability of adequate family labour is expected to boost productivity and increase marketable surplus. Thus, a positive relationship is expected for this variable.

Ability of smallholder vegetable farmers to add value to their produce, enable them to access lucrative markets and curb postharvest losses. The variable was set as a dummy (1 if farmer add value, 0 otherwise). Expertise of farmers in grades and standards improve participation in both informal and formal markets (Jari and Fraser, 2009; Panda and Sreekumar, 2012). It is expected that value addition influence market participation positively.

Availability of good roads is expected to have a positive influence on market participation. Roads that are accessible to farmers particularly feeder roads that can link farmers to major highways are central to marketing of perishables. Thus, poor road infrastructure constrain market access of smallholder farmers (Ochieng et al., 2017; Panda and Sreekumar, 2012).

The quantity of vegetables produced was measured in kilograms. The more the quantity of vegetables produced, the more likely the chances that the farmer would participate in distant urban markets. Hence, it was expected to have a positive influence on market channel choice.

Market infrastructure: this variable was measured by the availability of infrastructure like marketing stalls, storage facilities, and their condition. Dummy values were assigned to this variable were one indicate availability, zero is either unavailability or poor condition. A positive sign is expected for this variable.

3. Results and discussion

3.1. Socio-economic characteristics of farmers

Table 2 summarized the descriptive statistics of the farmers' socio-economic characteristics in the study area. The table shows that the majority of households in the study area were male-headed (68.1%) and having at least attained some primary education, with all the household heads in the four districts having attained some primary education. This could be attributed to the country's high literacy rate which is estimated at 96% (Zimstat, 2012b). Mutoko district had the highest proportion of farmers with post primary education (74.7%) followed by Seke (56.9%). However, a small proportion of vegetable farmers in Mashonaland East Province had attained some tertiary education (1.6%). Murehwa district did not even have any farmers who reported to have attained any tertiary education. According to Musasa et al.(2015) literacy level of smallholder farmers and middlemen is very important as it allows for better flow of product information and knowledge within the value chain. Therefore, more efforts still need to be done to provide tertiary education to vegetable farmers. The majority of interviewed vegetable farmers were married (76.6%). Mutoko district had most of the households' heads being married (82.7%) followed by Seke district (76.5%) and the least was Goromonzi district (73.3%).

Table 2. Socio-economic characteristics of survey respondents

Variables	District				Total
	Seke	Goromonzi	Murehwa	Mutoko	
Sample size (N)	102	105	103	75	385

Gender of household head (%)										
Males	70.6%	56.2%	68.9%	80.0%	68.1%					
Females	29.4%	43.8%	31.1%	20.0%	31.9%					
Marital status (%)										
Married	76.5%	73.3%	75.7%	82.7%	76.6%					
Single	3.9%	2.9%	2.9%	0.0%	2.6%					
Divorced	2.0%	3.8%	4.9%	2.7%	3.4%					
Widowed	17.6%	20.0%	16.5%	14.7%	17.4%					
Education level (%)										
Primary education	41.2%	45.7%	47.6%	24.0%	40.8%					
Secondary education	56.9%	51.4%	52.4%	74.7%	57.7%					
Tertiary education	2.0%	2.9%	0.0%	1.3%	1.6%					
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	50.31	11.94	54.20	15.61	48.91	12.93	44.69	9.42	49.90	13.25
Household size	5.78	2.14	5.07	3.35	5.50	1.90	6.32	1.65	5.62	2.43
Years in vegetable farming	19.85	12.35	25.74	16.21	14.35	10.42	10.69	6.53	18.16	13.38

The average level age of farmers varied among the surveyed districts, ranging from a mean of 45 years in Mutoko district to 54 years in Goromonzi district. The mean age of all districts combined was 50 years. Therefore, Mutoko district is the one which had young farmers while Goromonzi district was characterised by old farmers. The high concentration of young vegetable farmers in Mutoko district might be attributed to irrigation schemes which tend to be lucrative and profitable hence they attract young farmers. The average household size comprised about 6 individuals and on average the respondents had about 13 years of vegetable farming experience. The mean household size varied among the survey districts, Mutoko having the highest average household size than all other surveyed districts. The average household size obtained from the study is slightly higher than the average size of household obtained during the last census in 2012 which was 4.1 (Zimstat, 2012a). Hence, this might be attributed to the average rate of natural increase in the province over the years since the last census was conducted, 5 years ago.

3.2. Multinomial logistic regression results

The multinomial logistic regression results for factors that influence market channel choice of smallholder vegetable farmers are shown in Table 3. The dependent variable in the multinomial logistic regression was ordered as follows: 0= non-market participation; 1= households participating in local rural markets; 2= households participating in urban markets. Findings from empirical studies revealed that the redundant category should be used as the reference category (Gujarati, 1992). Hence, non-market participation was used as the reference category in this model. Table 3, shows the estimated coefficients (β values) standard error, significance values, and odds ratio of independent variables in the model. The direction of influence of the variable on the logit is shown by the signs of the coefficients. As such, a positive sign of the coefficient implies

an increase in the likelihood of a farmer participating in either local rural markets or urban markets. Conversely, a negative value on the coefficient shows that a farmer is less likely to consider that alternative.

Table 3. Multinomial logistic regression results

Variable	Local markets				Urban markets			
	Coefficient	SE	Significance	Odds Ratio	Coefficient	SE	Significance	Odds Ratio
Gender	0.425	0.361	0.240	1.529	-1.491	0.707	0.035**	0.225
Education	-0.424	0.341	0.215	0.655	-0.395	0.544	0.468	0.674
Household size	0.041	0.320	0.899	1.042	-0.709	0.575	0.218	0.492
Age	-0.328	0.396	0.407	0.720	-0.490	0.658	0.456	0.612
Farming experience	-0.253	0.354	0.475	0.777	-0.731	0.659	0.267	0.481
Distance to market	-0.897	0.390	0.021**	0.408	3.428	0.744	0.000***	30.810
Market information	-0.506	0.610	0.407	0.603	0.998	0.345	0.004***	2.714
Credit	0.501	0.570	0.380	1.650	0.234	0.881	0.791	1.264
Group membership	1.021	0.435	0.019**	2.775	2.920	0.906	0.001***	18.535
Producer Price	0.041	0.569	0.942	1.042	0.772	0.388	0.047**	0.462
Extension	0.299	0.545	0.584	1.348	-1.859	1.433	0.195	0.156
Family labour	-0.546	0.335	0.103	0.579	0.352	0.552	0.524	1.421
Add Value	-3.035	0.592	0.000***	0.048	3.835	0.779	0.000***	0.022
Road infrastructure	0.784	0.375	0.037**	0.456	1.815	0.674	0.007***	0.163
Quantity produced	2.123	0.456	0.000***	0.120	2.864	.592	0.000***	0.057
Market Infrastructure	-1.475	1.124	0.190	0.229	1.476	0.748	0.049**	0.229
Intercept	4.966	1.223	0.000	-	2.630	1.736	0.130	-

- a) Base Category = Non market participation
b) No. of Observations = 385
c) LR chi-square (32) = 327.588***
d) Overall Classification % = 75
e) Pseudo R -Squared = 68.3

Significance at *** 1 percent, ** 5 per cent, * 10 percent

With regards to the proportion of variance in the dependent variable a Pseudo-R² (Nagelkerke's Pseudo-R²) of 0.683 was obtained in the model as shown in Table 3. This implies that 68 percent variation in the dependent variable (i.e. choice of marketing channel) was explained by the independent variables included in the model. The chi-square (χ^2) value was significant at $p < 0.01$ suggesting that the model was a good fit. Hence, the null hypothesis (0 independent variables) is rejected. Thus, the independent variables combined influence marketing channel choice of smallholder vegetable farmers in Mashonaland East Province.

The results, shown in Table 3, suggest that distance to market, group membership, adding value, road infrastructure and quantity produced influence participation in rural local markets. On the other hand gender, distance to market, market information, group membership, producer price, adding value, road infrastructure, quantity produced and market infrastructure influence farmers participation in urban markets. Hence, of the 16 independent variables used in the model, 5 and 9 variables in local rural markets and urban market choices, respectively, are statistically significant. Table 3, shows that the significance of the independent variables differ across categories for all marketing channel choices. The results of the estimated equations of the multinomial logistic regression model were discussed in terms of the significance and signs on the parameters.

3.2.1. Gender

Model results confirm a negative association between household head gender and selection of urban market channels. It could mean that in comparison to non-market participation, male headed households are more likely to choose urban market channels instead of rural markets. This implies that female headed horticultural households are less likely to select urban market channels in relation to non-market participation compared to their male counterparts. The observed negative relationship between gender and participation in urban markets (-1.491: 0.035) may be explained by the differences in resource endowments critical for urban market access. Male farmers in the study area tend to have better access to productive resources such as membership in irrigation schemes and ownership of transport which enable them to produce and transport large volumes as well as to meet quality requirements normally a prerequisite for urban markets participation. Therefore, ultimately they end up having a wide option of marketing channel choices compared with their female counterparts. On the other hand, women may have preferred to sell their produce in local markets (neighbouring rural households, local shops and at farm gate) where there is no transport cost and volumes are low as well as quality issues are not a prerequisite. This is because they may be constrained to participate in distant urban markets such as Mbare Musika due to high transaction costs. As such, gender of household plays a very vital role in determining market access in the study area. Similar finding on how gender differences impact on market access were established by Sikwela(2013) arguing that females are risk averse and are likely to sell their produce at the farm gate. Conversely, males are likely to sell their produce in distant markets which are better paying.

3.2.2. Distance to market

Distance to market had a negative sign for local rural markets and was statistically significant at 5% level. These findings are surprising and they tend to suggest that an increase in distance to market reduces the possibility of farmers' participation in local markets and rather opt for urban markets. The results are inconsistent with a *priori* expectations. On the other hand, urban market choice had a positive coefficient and was statistically significant at 1% level. This result is surprising also given the large value in odds ratios (30.810) showing that farmers are likely to increase their participation in urban markets with increasing market distance. The results are contrary to findings of previous studies which establishes that distance negatively influences smallholder farmers' participation in markets (Alene et al., 2008; Makhura et al., 2002; Siziba et al., 2011). All these studies have consistently highlighted that as distance to the market increases it discourages smallholder farmers from participating because of resource constrain. Nevertheless, a possible explanation for this scenario is that farmers in villages that had irrigation schemes specifically those in Mutoko were producing high volumes. These could not be absorbed by local markets because they offer low prices in comparison with MbareMusika in Harare which lies about 160 km from the study area. The premium price that farmers got from urban markets such as Mbare- Musika would offset transport costs. This was in the face of flooded local markets. Consequently, smallholder farmers would profit from price differentials between local markets and prevailing prices in distant markets such as MbareMusika. These findings are however

consistent with those of Zamasiya et al. (2014) that smallholder farmers tend to opt for distant markets if local markets are not offering lucrative returns.

3.2.3. Market information

Access to market information had a positive sign for urban market choices, which is consistent with the *a priori* expectations. The coefficient for market information was significant at 1% level for urban market choice. This suggests that availability of market information improves participation in urban markets. The odds ratio value of more than one (2.714) explains that farmers are likely to double their participation in urban markets if information is available to them. Market information enables smallholder vegetable farmers to align their production as well as their marketing systems in tandem with the demands of various urban market channels. Therefore, this reinforces the notion that availing market information enhances smallholder farmers' productivity. These results support previous empirical studies that availability of market information plays an important role in market channel choice of smallholder farmers (Bindu and Chigusiwa, 2013; Jari and Fraser, 2009; Panda and Sreekumar, 2012).

3.2.4. Group membership

With reference to group membership it had a positive sign for both local and urban market choices, which was in line with the *a priori* expectations. The significance values of 0.019 for the local rural market choice and 0.001 for the urban market choice imply that group membership increase participation in these markets. The value of the odds ratio in both local and urban markets (2.775 and 18.535) respectively supports the higher probability of the variable influence on both the local and urban market choice. Therefore, group participation enables smallholder farmers to gain access to markets which they might find difficult to penetrate individually. The results of the model therefore emphasize the need to upscale group participation of smallholder farmers for them to access markets. These findings are consistent with numerous studies which emphasise the importance of smallholder farmers working collectively to access markets (Abdul-Hanan et al., 2014; Markelova et al., 2009). However, these findings contradict findings of Ziveng and Karavina (2012) who suggest that smallholder vegetable farmers in groups were less likely to participate in formal markets. The reason being in most cases farmers prefer to market their produce individually rather than as a group given the history of mistrust and lack of cooperation with smallholder farmer groups in Zimbabwe. Nonetheless, this present study challenges these earlier findings and recommends group participation of farmers so that they can benefit from economies of scale as well as reduce transaction costs associated with individual participation in markets.

3.2.5. Producer Price

Regarding producer price, the coefficient was positive and significant at 5% level in urban market channel choice. The significant value of (0.047) implies that farmers tend to be guided by producer price for them to participate in urban markets. Farmers tend to receive higher prices in urban markets than in local rural markets. The value of the odds ratio (0.462) reinforces this observation that producer price influence urban

market choice. It shows that as producer price increases, there is a 46.2% chance that smallholder farmers will participate in urban markets. If smallholder farmers are assured of a good producer price they are willing to travel long distances to access urban markets, rather than settling for rural local markets. During the study the respondents cited that local markets may offer very low prices and they might also not be able to absorb the huge volumes that they produced. This was mainly emanating from parts of Mutoko and Goromonzi. Though this may be, farmers had to possess good negotiation skills for them to be able to get a good producer price in urban markets. This is because of the issue of middlemen trying to undercut farmers' prices in the urban markets. A similar positive relationship between producer price and smallholder vegetable farmers' urban channel choice was noted by Zivenge and Karavina(2012)attributing the association to lucrative producer prices which are offered in urban informal markets.

3.2.6. Adding Value

Different value addition practices to the produce by farmers was significant for both local and urban markets choice with a significant value of 0.000 for both. Nonetheless, the coefficient was negative

(-3.035) for local markets and positive (3.835) for urban market choice. A negative sign on its coefficient imply that an improvement in expertise on grades and standards might not result in an increase in local rural markets participation. Conversely, a positive sign on its coefficient suggests that an improvement in value addition practices results in an increase in urban market participation choice by smallholder vegetable farmers. The odds ratio value also explains that it is more likely that smallholder vegetable farmers will change from non-market participation to urban market participation with an increase in value addition practices on their produce. The plausible explanation is that in urban markets there is high emphasis on grades and standards due to stiff competition. Moreover, there was also quality standards competition from imported vegetables from South Africa particularly at Mbare Musika which made the issue of grades and standards of paramount importance. Similar comparable findings were also inferred by previous studies that value addition affect smallholder farmers market channel choice (Jari and Fraser, 2009; Panda and Sreekumar, 2012). Both studies noted that ability of farmers to add value by different means increases participation in formal markets.

3.2.7. Road infrastructure

Road infrastructure had a positive and significant coefficient for both local markets and urban markets as expected. Both local and urban markets had significant values of 0.037 and 0.007 respectively. A positive relationship between the variables confirms the hypothesis that good road conditions have a positive influence on market participation by smallholder vegetable farmers. Smallholder vegetable farmers could find it easier to transport their vegetables for sell at local business centres which were far off if roads were in good conditions. Hence,the condition of the road would affect their decision to participate in these local markets which were far off. Likewise, smallholder farmers were prepared to travel long distances for example from Mutoko to urban markets in Harare if roads were in good condition. However, the majority of farmers in the study area were bemoaning the need for feeder roads that link them to nearby local business centres as well as major highways that connect to urban areas to be maintained. They stated that this will minimise spoilage of their vegetables during transportation as well as reduce their effort in accessing marketing centres. Good

roads will not only reduced time required to reach the market centres but also vegetables will be delivered fresh and undamaged. Hence in good condition vegetables might fetch higher price on the output market. These results confirm earlier findings by Panda and Sreekumar, (2012) that good road infrastructure enhances smallholder vegetable farmers' participation in markets. They argued that roads in good condition minimise the transaction costs of smallholder vegetable farmers.

3.2.8. Quantity produced

The coefficient of quantity produced was statistically significant (0.000) and positive for both local and urban market choice. The positive sign as well as the odd ratio emphasise the importance of quantity produced in determining market participation of farmers in both local and urban markets. This is because smallholder farmers in the study area like everywhere else in the country firstly need to satisfy household consumption requirements before engaging in the decision to participate in markets. Thus, the decision to participate in markets is conditional on surplus quantity produced. These observations support the notion that smallholder vegetable farmers will be willing to travel long distances to business centres or distant urban markets depending on the amount that they will have produced.

3.2.9. Market infrastructure

Finally, the results suggest a positive likelihood of choosing urban markets with respect to improvement in market infrastructure. The positive and significant coefficient (0.047) supports the observation that improvement in marketing facilities encourages participation in urban markets. As expected, market infrastructure in good condition positively influence non participants to choose urban markets. Lack of proper market infrastructure lead to unhygienic conditions under which farmers conduct their transactions. Thus, condition of the market infrastructure where smallholder farmers sell their produce has an effect on their market participation. Similar comparable results were inferred from previous studies that availability of good market infrastructure positively influence smallholder farmers' participation in markets (Jari and Fraser, 2009; Panda and Sreekumar, 2012). As such strategies aimed at improving urban market infrastructure may positively influence smallholder farmers' participation in these markets.

4. Conclusions and recommendations

The main objective of the study was to analyse factors that influence market channel choice of smallholder vegetable farmers in Mashonaland East Province of Zimbabwe. Results from the multinomial logistic regression model suggest that distance and value addition negatively influence participation in local rural markets. Again, group membership (participation), road infrastructure and quantity produced positively influence smallholder farmers' participation in local markets. On the other hand, distance to markets, market information, group membership, producer price, adding value, road infrastructure, quantity produced and condition of marketing facilities positively influence participation in urban markets. Furthermore, despite vegetable production being deemed a "women crop" the study revealed that males were more likely to participate in lucrative urban markets than their female counterparts. The study therefore recommends the

need to empower women with productive resources so that they can also be able to supply urban markets. Thus, policies, aimed at availing resources for improved productivity of vegetables should be gender sensitive. This can be attained through establishment of irrigation schemes as well as availing of credit. Additionally, gender sensitive policies can be effected by considering the following: There is need to research further ways of capacitating women smallholder farmers to produce high value horticulture products which are required in urban markets and ultimately for export. In-order to reduce exploitation of women smallholder vegetable farmers by middlemen in urban markets there is need for policies that enforce proper grades and standards in urban markets. It is also important for policies to give cognizance of different time variations between men and women when producing their vegetables. Women tend to have more time demands as they may need to attend to other reproductive roles which might affect their productivity. Gender sensitive extension should be promoted that deliberately seek to give women smallholder vegetable farmers leadership roles in cooperatives and irrigation schemes. Extension can also tap into the use of information and communication technologies (ICTs) to provide market information that focus on smallholder female farmers' needs. In the same vein, awareness should also be extended to men so that they understand the importance of gender equality in vegetable production and marketing.

Group membership was found to have a positive effect towards participation of farmers in both local and urban markets. Thus, there is need for crafting of appropriate policies and programmes which foster collective action amongst smallholder vegetable farmers. This can be attained through public private partnerships (PPP) from various stakeholders such as government and NGOs. They can assist in offering institutional support so that smallholder farmers can participate in lucrative markets. It is recommended that farmers should form partnerships for them to be able to supply alternative markets which are organised such as hospitals, boarding schools and fast food outlets among others. Such partnerships will also enable them to supply the required volumes and guarantee consistency. Therefore, group participation and cooperatives in production and marketing might be beneficial innovations for smallholder vegetable farmers. Granted that cooperatives and smallholder farmer groups had their own challenges in the past. Nonetheless, these can be circumvented by coming up with mechanisms that foster trust, commitment and collaboration amongst smallholder farmers. Finally, there is an urgent need for government to invest in improving road infrastructure particularly feeder roads that link farmers to major high ways. This can minimise transaction costs of smallholder vegetable farmers. Hence they will be able to access distant urban markets

Conflicts of Interest

The authors declare no conflict of interest.

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