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Factors Contributing to Smallholder Organic Crop Farms Profitability in South Africa

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ABSTRACT

Organic agriculture is growing in importance both globally and in South Africa but awareness is still limited despite increasing popularity. This could be because producers are unaware of profitability of the system. Hence, this study proposes to determine the factors contributing to smallholder organic crop farms' profitability in South Africa. Specifically, to described the existing cropping pattern in the Eastern Cape Province of South Africa. A multi- stage random sampling technique was used to obtain primary data from one hundred and sixty smallholder organic crop farmers with the aid of structured questionnaires. Data collected were analysed by descriptive and inferential statistics using Statistical Package for Social Sciences (SPSS). The analysis of the data using Ordinary Least Square (OLS) regression model showed that factors such as household size, gender, farming experience, education, farm size, source of labour and access to credit contribute to smallholder organic farm's profitability. The findings further asserted that combination of maize, cabbage, carrot, tomatoes spinach, butternut, onion, beetroots, potatoes, cauliflower and broccolis were existing cropping pattern frequently cultivated by smallholder farmers in the area. Therefore, government is advised to encourage the practice of organic farming by giving short-term loans to smallholder farmers, to enable them invest more in their organic crop farms.

Keywords: Profitability, Organic farming, Smallholder organic crop farms, OLS, South Africa.

1. INTRODUCTION

Organic agriculture is growing in importance both globally and in South Africa but awareness is still limited probably because profitability has not been well demonstrated (Kisaka-Lwayo and Obi, 2014). Organic

farming is practiced in approximately 160 countries of the world and the area under organic management is continually growing with 37 million ha being managed organically (Willer, et. *al.,* 2012). For instance, global area under organic farming in Oceania is 12.1 million ha, Europe is 10.0 million ha, Latin America is 8.4 million ha, Asia, 2.8 million ha, North America, 2.7million ha and Africa is 1.1 million ha (Willer, et. *al.,* 2012). The shift towards organic practice is slowly growing in Africa, and now, there are 39 countries having sizeable hectares under organic production.

In the South Africa context, organic farming is growing and will continue to grow. This can be projected from the land under organic farming with 50 000ha trailing Tunisia which has the largest area of 154 793ha and Uganda with 88 439ha (FiBL- IFOAM, 2012). Furthermore, 20 percent of the entire area under certified organic farming in Africa is in South Africa, with 250 certified commercial farms (DAFF, 2011). Although, there is a small but effective group of organic farmers in South Africa provinces like Eastern Cape (Kisaka-Lwayo and Obi, 2014). Organic farming has made lots of jobs available for smallholder farmers, youth and women in South Africa and cares for their financial welfare (DAFF, 2011). In addition, the market for organic food in the country has become a stable expanding business. Recently, organic products are seen in designated retail shops like Woolworth, Pick and Pay and other similar malls in South Africa. The market for organic products in the country has been estimated to increase annually by 30 percent according to international report (UNDP, 2012).

The foregoing suggests that, organic production may be one way to sustainable farming in the world. It has being identified as one of the sustainable approaches to reduce environmental degradation, safeguard human health and improve global food security (FAO, 2013). The farming practice maintains the fertility of the soil, increases yields and profitability and avoids chemical fertilizers and pesticides that could lead to bioaccumulation of unwanted chemicals in the environment (Ullah *et. al.,* 2015). This farming practice has generated worldwide interest, because it offers farmers a wide range of relative economic advantages (Morgera *et. al.,* 2012). Surveys indicate conversion to organic farming in developing countries leads to higher yield and profitability for smallholder farmers (Seufert *et. al.,* 2012). Several reviews have also proved that organic farming is a profitable investment despite the difficulties facing smallholder organic farmers in developing countries and larger returns from the practices can be traced to higher yields and low costs of production (Eyhorn *et. al*., 2007; Nemes, 2009; IFOAM, 2013; Delate *et. al.,* 2015). Therefore, lower production costs, higher market prices and premiums were presented as most prominent factors that contribute to smallholder organic farm's profitability in developing countries (Brown *et. al.,* 2015). Although yields from organic crop farms have propensity to be less, but costs of resources used are lower. Hence, the practice can compete well with any other farming method in the world even before the addition of organic prices premium (Chavas *et. al.,* 2009).

In terms of development, organic farming is best fit for smallholder farmer's transformations in South Africa, which are located in the rural areas. These farmers did not depend on artificial inputs and this has assisted them to experience higher returns and food security (UNCTAD, 2008). Organic farming in developing countries has assisted to keep strong traditional heritage of the people. It has been said to sustain communities and provide youth incentive to fully engage in farming, then reducing rural-urban migration.

In this view, organic farming is a potential activity worldwide and its input to sustainable food security embraces the Sustainable Development Goals (SDG's) of poverty reduction and to promote shared

prosperity (World Bank, 2015). However, for developing countries, markets for certified organic products are limited. Latin America is the top region among developing countries for certified organic production, with Argentina and Brazil taking the most developed domestic markets (IFAD, 2013). The Asian region has experienced much development in organic farming production and sales, exclusively in China, Malaysia, Philippines, India, Singapore and Thailand.

In Africa, certified organic farming is under developed, but growing slowly in East Africa, Egypt, South Africa and Tunisia (Kisaka-Lwayo and Obi 2014).This has hindered the improvement and promotion of sustainable smallholder organic crop farms. One disadvantage of having limited data on factors contributing to smallholder organic crop farms' profitability is that measures to reduce costs and increase profitability cannot be effectively designed because there is no solid basis for such efforts. If farmers and policy makers know the profitability structures with precision, they will be in a position to identify areas of flexibility in the system that can form the basis of a meaningful transformation to improve farmer profitability. Smallholder farmers therefore need information on factors contributing to profitability to make better choices on the farm. Hence, this study was conducted to fill that gap by generating data to allow for the determination of factors contributing to smallholder organic crop farms' profitability in the Eastern Cape Province of South Africa so that to be in a position to advice the practice appropriately. Specifically, to describe the existing cropping pattern in the area.

2. METHODOLOGY

2.1. Description of the Study Area

This study area was chosen because of the population of smallholder organic crop farmers residing in the rural area of the municipality. Amathole District Municipality is characterised by factors such as high unemployment rate, environmental degradation and limited access to arable land (ADM, 2015). Although farming activities is very high, productivity is limited by steep slopes and hilly areas surrounding the district with altitude ranging from 550mm to 680mm (ADM, 2012). The district agricultural sector contributes 17 percent to the municipality's GDP and has high potential for agricultural production with various agricultural activities including crops farming, beef and dairy production (ADM, 2012). The most common languages speak in the area are isiXhosa, followed by Afrikaans and English (SA. info reporter, 2012).

2.2. Sampling Procedure

The research design used for this study was cross- sectional research design. This design was used because they are quantitative, and there is no follow up. This procedure has clear advantages, including that it is quick, easy and inexpensive to carry out. The population of all the smallholder organic crop farmers in the Amathole District Municipality of South Africa was sampled. To achieve this, multi-stage sampling technique was used because of the several stages involved in selecting the smallholder organic crop farmers. In the first stage purposive sampling was used to select Amathole Municipality from the six District Municipalities in the Eastern Cape Province, because it's well known for agricultural practices, potential for organic crop farming and the population of smallholder crop farmers (Kisaka-Lwayo and Obi, 2014). In the second stage, simple random sampling technique was used to select Alice, Middle drift, Fort Beaufort, Keiskamahook and Mdantsane villages in Amathole District Municipality. These villages were randomly selected based

on literature and information from extension officers. The third stage involved snow ball technique to locate the smallholder organic crop farmers through the help of extension officers from the Department of Agriculture in South Africa. A total of 160 smallholder organic crop farmers' were selected, which made up the sample size for the study. This procedure follows appropriate literature guidelines.

2.3. Data Collection

The data for this study were collected from primary sources which are the smallholder organic crop farmers. A structured and validated questionnaire was the instrument for collecting the primary data. To make sure unbiased data was collected and to capture most vital details for the study, the questionnaire was subjected to validity and reliability tests. This allowed the respondents to be honest by providing details information about their farms. The questionnaires were used to collect data from the smallholder organic crop farmers in Amathole Municipality to achieve the purpose of the study. Data were collected in June to August, 2016.

2.4. Data Analysis and Analytical Framework

This study adopted descriptive and inferential statistics in form Ordinary Least Square (OLS) regression model to analyse data collected from the smallholder organic crop farmers. Descriptive statistics involve the use of chart to describe the cropping pattern practiced by the farmers. Inferential statistics involve OLS to determine factors contributing to smallholder organic crop farms' profitability. The collected data were coded and analysed using Statistics Package for Social Sciences (SPSS) version 24. This analytical framework follows appropriate procedure of literature. The detailed descriptions are presented in the sub-sections that follow.

2.4.1. Determinants of Factors Contributing to Smallholder Organic Crop Farms' Profitability

To achieve the factors contributing to smallholder organic crop farms' profitability in the Amathole District Municipality of South Africa, an OLS regression model were used to determine the factors. OLS models are statistical methods that seek to examine the relationship of several independent variables on the value of dependent variable (Gujarati and Porter, 2011). In addition, the model intends to predict the association between two or several explanatory variables by multiple linear equations to analyse the set of data collected (Gujarati and Porter, 2011).Several studies have used multiple regression models to examine the relationship of several independent variables on profitability (Omotesho *et. al.,* 2010; Ohen and Ajah, 2015). It is therefore possible to fit a simple linear model of the form:

$$Y = f(X_1, X_2, X_3, ..., X_n) \quad (1)$$

where,

Y = Profitability, which is the dependent variable, while the X's are the explanatory variables.

The following equation is used for the estimation between (Y) dependent variable and independent variables. The regression model is therefore stated in equation (2).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_n X_n + \mu \quad (2)$$

where,

Y is the dependent variable being the profitability of the smallholder organic crop farms and X's were the independent variables.

(β_0) is the estimated intercept

(β_1, β_2, β_3, ..., β_n), are the estimated slope coefficients.

(X_1, X_2, X_3, ..., X_{10}), are the factors contributing to profitability of the smallholder organic crop farms.

The regression coefficient (β) measure how strongly each factor (X) contributes to the profitability (Y). This means that the higher the regression coefficient value the greater the contribution of the factors on the profitability. At this point it is assumed that there is a linear relationship between the dependent variable and explanatory variables. By fitting the variables into the model, it is presented as shown in equation (3).

$$Y = \beta_0 + \beta_1 Age + \beta_2 Gender + \beta_3 Household size + \beta_4 Farm experience + \beta_5 Farm size + \beta_6 Labor + \beta_7 Occupation + \beta_8 Education + \beta_9 Extension + \beta_{10} Accredit + \mu \quad (3)$$

However, given the rather large number of variables enumerated, test of multi-collinearity was applied. Multi-collinearity is the existence of near-linear relationships among the set of independent variables or excessive correlation of the predictor variables (Gujarati and Porter, 2011). Assuming two variables, X1 and X2, collinearity is suggested if:

$$X_1 = \lambda X_2 \quad (4)$$

A formal detection tolerance or the variance inflation factor (VIF) for multi-collinearity as illustrated by Gujarati (2003) can also be used as follows:

$$VIF = \frac{1}{\text{tolerance}} \quad (5)$$

where, tolerance = 1 – R2

Tolerance of less than 0.21 or 0.10 and/or VIF of 5 or 10 and above indicates multi-collinearity of variables. In this case, multi-collinearity was not detected on the basis of the value of the VIF, and tolerance level.

3. RESULTS AND DISCUSSION

3.1. Existing Cropping Pattern

Figure 3.1 presents the summary statistics of existing cropping pattern cultivated by the smallholder organic crop farmers in the Amathole District Municipality of South Africa. According to Figure 3.1, maize, cabbage, carrot, tomatoes spinach, butternut, onion, beetroots, potatoes, cauliflower and broccolis were crops frequently cultivated by smallholder farmers in the area. Almost all the crops produced used mixed cropping system and had over average participation by the farmers, although the result suggests that cabbage, spinach and onion are the dominant crops. All the others mentioned crops; maize, potatoes, carrot, tomatoes and beetroots also added to smallholder farmer's profitability. These crops are sold to people in the community and to the nearest markets in town such as Alice market, Fort Beaufort, King's Williams Town and as far as East London local market in South Africa. Each crop contribution to income makes a difference in farmer's livelihood. This result supports the finding by DAFF (2011) that South Africans organic farmers grow varieties of crops such as grains; vegetables, roots and tubers; herbs and spices; fruits,

nuts and Rooibos tea. The results further indicate that the bulk of the smallholder organic crop farmers are strongly involved in growing vegetable crops because of their smaller farm sizes than cultivating other staple foods that calls for larger farm size. It further affirms the subsistence cropping pattern of smallholder farmers' production in the locality.

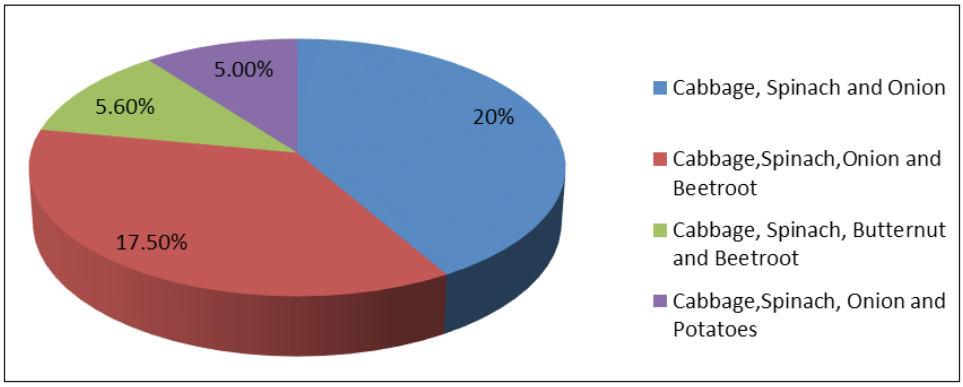

Figure 1: Distributions of Organic Crop Farmers by Existing Cropping Pattern
Source: **Field Survey, 2016**

4.2. Factors Contributing to Smallholder Organic Crop Farms' Profitability

This section looks at factors that could contribute to profitability organic crop farms. Although profitability of smallholder organic crop farms are influenced by several factors. Following Ndungu *et. al.*, (2013) that used similar variables to determine factors that influence profitability, found age, level of education, and number of trainings attended, farm size, farming experience and irrigation had a positive relationship with profitability of organic vegetable production system. Therefore, age, gender, household size, farming experience, level of education, farm size, and source of labour, access to extension services and access to credit were included in this study to determine the factors that could contribute to profitability of organic crop farms. Hence, an OLS model was fitted with the dependent variable and explanatory variables as presented in Table 1 and Table 2, respectively. To correct for multi-collinearity, a formal detection tolerance or the variance inflation factor (VIF) for multi-collinearity as illustrated by Gujarat (2003) was adopted where tolerance of less than 0.21 or 0.10 and/or VIF of 5 or 10 and above indicates multi-collinearity of variables. In this study, multi-collinearity was not detected on the basis of the value of the VIF, and tolerance level.

Table 1
Model summary on profitability

Model	*R*	*R square*	*Adjusted R square*	*Std. Error of the estimate*	*R square change*	*F change*	*Sig*
1	0.808[a]	0.653	0.630	7095.8199	0.653	28.023	0.000***

[a]Predictors: (Constant), Household size, Gender, Age, Level of education, Occupation, Farming experience, Labor, Access to extension service, Farm size, Access to credit
[b]Dependent Variable: Profitability
Source: Results from SPSS generated from Field Survey, 2016 where Std. Error = Standard Error

According to the results summarized in Table 1, R-Square (i.e. coefficient of determination) is 0.653. This means that as much as 65 percent of the variation in the profitability is explained by the explanatory

variables included in the model. The remaining 35 percent is explained by other factors not included in the model. Adjusted R-Squared is lower than R square which shows a good model. This suggests that the Adjusted R-Squared value of 0.653 explains 65 percent of the variation in the dependent variable. It takes into account the number of variables entered into the model and does not necessarily increase as more variables are added. It further suggests that correction has been made to reflect the number of variables in the equation and estimate of variance explained and removes variability that is likely due to chance. F-Value (28.023) is significant at one percent implying that the model is statistically significant. This means all the independent variables together predict the net profitability, but not all the independent variables uniquely predict the profitability. What this suggests is that the explanatory variables combined, significantly influence changes in profitability at 0.000 levels and it is statistically significant in explaining dependent variable and predicts it better.

Table 2 presents the results of the estimation of the OLS model. The results suggest that profitability of the smallholder organic crop farms is significantly influenced by the household size, gender of the household head, level of education, farming experience, source of labour, farm size and access to credit at 1 percent, 5 percent and 10 percent, respectively. According to the analysis, coefficient of household size is positive and significant at 0.00 levels suggesting that a unit change in the household size will increase profitability by 0.179. This implies that as more family labour is used the more the profitability and lesser operating costs, however, a unit increase in the household size may put pressure on food consumption and reduce profitability.

The coefficient of gender is positive and significant at 0.021 levels suggesting that for every one unit change in gender profitability will increase by 0.127. The probable reason is that women are better off in handling and managing farm decision than men who may have migrates to the cities to get alternative job. Though men are seen to favour adoption of organic farming (Demiryurek and Ceyhan, 2008), there was observed gender influence on profitability in the study area.

The coefficient of level of education is positive and significant at 0.077 levels suggesting that for every one unit change in the number of years in school, profitability will increase by 0.103. This could be interpreted that with increase in level of education, the farmer had greater potentials for adoption of improved farming techniques which will lead to increase in the profitability. This result supports the findings by Ohen and Ajah (2015) who found level of education of smallholder rice farmers' positive and significant at 0.009 levels in Nigeria. The results further indicate that the coefficient of farming experience is negative and significant at 0.003 levels. This implies it is inversely related to profitability. The coefficient (–0.168) suggests that as farming experience increases profitability will decrease by 0.168. This reason could be that majority of the smallholder organic crop farmers in the area are new to the farming system and find it difficult to apply their farming experience in the use of modern organic farming techniques.

The coefficient of source of labour used by the household head is positive and significant at 0.009 levels. This means that a unit change in the source of labour used by household head will increase profitability by 0.1666. This is probably due to use of family labour reflecting the availability of economically active male or female labour in the household. Therefore, households with large family members may cultivate more land, mainly because of the use of family members, who provide cheap labour force.

The coefficient of farm size is positive and significantly influences profitability at 0.000 levels suggesting that a unit change in farm size of the household head will increase profitability by 0.623. The probably

reason for this is that the smallholder organic crop farmers cultivated freehold land and communal land and only used family labour as their main source of labour. This result agrees with the findings of Ohen and Ajah (2015) that increase in farm size will invariably lead to increase in profitability of smallholder rice farmer in Nigeria at 1 percent significant level.

Access to credit is positive and significant at 0.001 levels. This implies that one percent increase in access to credit of the household head will increase profitability of the household head by 0.225. This result agrees with the findings by Hailu *et. al.*, (2014) that access to credit have positive and significant relationship with adoption decision of agricultural technologies in Ethiopia. The results further reveal that age of the farmers, occupation and access to extension services has no significant influence on the profitability of the farmers.

Table 2
Determinants of smallholder organic crop farm's profitability

Model	*Unstandardized Coefficients*		*Standardized Coefficients*	*T*	*Sig*
	B	*Std. Error*	*Beta*		
(Constant)	–18687.375	5354.798		-3.490	0.001***
Household Size	1145.100	340.597	.179	3.362	0.001***
Gender	2961.451	1266.393	.127	2.338	0.021**
Age	34.732	57.155	.035	.608	0.544
Level of education	304.942	171.035	.103	1.783	0.077*
Occupation	486.282	1320.067	.021	.368	0.713
Farming Experience	–282.192	91.801	–.168	–3.074	0.003***
Source of Labor	5515.114	2080.079	.166	2.651	0.009***
Access to Extension Service	1863.892	1282.318	.080	1.454	0.148
Farm Size	8023.219	1005.726	.623	7.978	0.000***
Access to Credit	6783.502	1933.530	.225	3.508	0.001***

[a]Dependent Variable: Profitability
Source: Results from SPSS generated from Field Survey, 2016 where ***, ** and * represents significance level at 1%, 5%, and 10%, respectively. Std. Error = Standard Error

4. CONCLUSION AND RECOMMENDATION

In the context of the objective of the study to determine factors contributing to smallholder organic crop farms' profitability, it could be said that factors such as household size, gender, farming experience, level of education, farm size, source of labour and access to credit contribute to profitability in any farming system. The smallholder organic crop farmers enumerated in this study exhibited clear shortage of information on factors contributing to their organic crop farms' profitability.

The findings further affirmed that maize, cabbage, carrot, tomatoes spinach, butternut, onion, beetroots, potatoes, cauliflower and broccolis were crops frequently cultivated by smallholder farmers in the Amathole District Municipality of South Africa. It is thus necessary to encourage active participation of rural farmers in organic farming to improve their livelihood and household income.

Government is advised to finds ways of integrating smallholder organic farmers into the on-going agricultural restructuring process by providing the basic legal framework for sustainability, among other actions to create an enabling environment for private sector operations. It is also strongly recommended that the private sector should promote the awareness of organic farming profitability whose demand outlook is quite bright. This is particularly crucial in view of the finding that household size, gender, farming experience, level of education, farm size, source of labour and access to credit are the main factors contributing to smallholder organic crop farms' profitability in the Eastern Cape Province of South Africa.

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