Poverty Status among Irrigators and Homestead Gardeners in Eastern Cape Province of South Africa

Abstract

The study analysed the poverty status and the determinants among farmers in the Eastern Cape Province of South Africa. Primary data were collected with the aid of well-structured questionnaire and a total of 267 respondents were chosen through a multi-stage random sampling technique. The data collected were analysed using descriptive statics, poverty index (Foster-Greer-Thorbecke (FGT), logit regression and correlation matrix. The headcount index of the pooled data indicated that 49 percent of the respondents in the study area were poor with poverty severity and poverty gap indices of 0.15 and 0.25, respectively. The depth of poverty was higher and severe among the female homestead gardeners in Tyhefu and among farmers with less than 2ha of farmland. The logit regression revealed that, years spent in school, household size, size of cultivated farmland, extension services and being a member of an association have significant influence on the likelihood of being poor. Only the age of respondents was not significant. The study therefore recommends that, institutions in charge of credit facilities, education, extension services be strengthened to give farmers meaningful well-being.

Keywords: Poverty indices, logit regression, correlation matrix

Introduction

Existing data show that the rate of poverty and the level of income inequality in South Africa is high (Klasen, 1998; UNDP, 2007). According to SSA (2014), the estimated Gini coefficient for South Africa in 2011 stood at 0.69, showing a persistent decline in welfare. Such an outcome is consistent with the reality that, among the Medium Human Development countries in which South Africa is grouped by the UNDP, the HDI assessment for 2014 is 0.66; but when the value was discounted for inequality in the distribution of the HDI dimension indices, the HDI fell to 0.428 (UNDP, 2015). Furthermore, the estimated youth unemployment rate in March 2011 as reported by MEC for Social Development was 41.4 percent at provincial level above the national figure of 35 percent (Majodina, 2011). The adult unemployment rate was also estimated at 18.4 percent (Majodina, 2011).

As a result of the natural events in the current year, South Africa witnessed her most devastating drought in more than a century. Thus, cutting down farm jobs and increasing the cost of producing food (Vollgraaff, Mokhema and Mbatha, 2016). Experts in the field of climatology and atmospheric research are of the opinion that the drought experienced in South Africa is a manifestation of climate change. The magnitude of the predicted changes is unclear, but emerging facts agreed on the direction of changes, and recognize that climate change will persist (Compass Resource Management, 2007). This occurrence has further compounded the rising food prices in addition to global situations to make the welfare situation worse in the urban and rural areas. As a result, incessant mass protests have become rampant. Without question, the recent fees-must-fall protests are linked to deteriorating welfare indices affecting the entire households of the protesting students.

These unfavourable conditions, according to Moyo (2010), are in part consequences of inefficient land reforms and controlled access to farming resources. Obi (2007), reported that restricted access to the area of land that South African black farmers could access hindered their ability to compete actively in the agricultural market hence, making them poor. This situation has spurred major political and economic discourse which sought after the redistribution of assets and other forms of wealth.

The Freedom Charter of the ANC and the struggle of the black population revolved around land and how race should not determine the size of land holding (Seeking and Nattrass, 2005). In line with these fundamental, Government, since the inception of democratic rule in 1994, has undertaken several actions, including a comprehensive land reform. For instance, the land redistribution programme are complementary programme for economic empowerment through credit assistance, subsidization of farm infrastructure and other forms of support included under schemes such as Comprehensive Agricultural Support Programme (CASP), the Micro Agricultural Financial Institutional Scheme of South Africa (MAFISA), to mention a few (OECD, 2011). Despite all these programmes established to mitigate poverty, farmers are still poor.

While many studies (Francis, 2006; Marichen and Ignatius, 2015; SSA, 2014 and SSA, 2017) have helped established the national poverty level and other crucial economic indicators relating to poverty in South Africa, similar studies at the townships and villages which are aggregated administrative units of the national entity still leave much to desire. The growing level of poverty especially among the rural farming households affirmed a missing link that probably arose from insufficient information about the cause of poverty adequate to build a pragmatic approach to mitigate poverty.

Therefore, this study seeks to profile important socioeconomic variables and examine the determinants of poverty among farmers who cultivate under the irrigation system (irrigators) and homestead gardeners in Qamata and Tyhefu of the Eastern Cape Province (ECP) of South Africa. It is important to have a fundamental knowledge about the root cause of rural poverty especially among farming household because a number of reforms have been established to give farmers (black farmer living in the former homeland) unrestricted access to production resource yet, many are still poor. In addition, the rural population is growing at a significant rate, of which majority of these people rely on farming as a mean of livelihood.

Following this section that gives a background information about the paper, the remaining part is structured as follow; section 2 explain the procedure adopted in enumerating the respondents and subsequently the process used to gather data. In addition, the questionnaire design and the type of data are important part of this section. Method of data analysis is presented in section 3 and this is immediately followed by an assessment of poverty and estimation of poverty line. The result and discussion appeared in the 5th section where factors influencing the poverty among farmers are discussed. Lastly, the 6th section concluded the study suggesting important policy dimensions to mitigate poverty among rural farmers.

Sampling procedure and the data

A multi-stage stratified sampling technique was used to select a total of 267 farmers who cultivate maize and cabbage under the small-scale irrigation scheme and homestead gardening in the Eastern Cape Province of South Africa. The first stage was the purposive selection of Qamata and Tyhefu irrigation schemes as the Primary Sampling Units. These two schemes were selected based on their attributes (i.e. their functional status and the number of assessable respondents) from a sample frame of eight irrigation schemes (Qamata, Bilatye, Ncora, Keiskam ahoek, Tsitsa Basin, Ntshon gweni, Ntshon gweni, Pendu and Tyefu) established across the Eastern Cape Province of South Africa.

The second stage involved listing of the maize and cabbage farming households and the sample frame from each of the area (Qamata and Tyefu) stratified into irrigators and homestead gardeners following the principle of Probability Proportional to Size (PPS). The sample frame of the respondents (irrigators and homestead gardeners) in the study area is presented in Table 1 below.

Table 1: Population and Sample Size of Farmers in Selected Scheme in ECP

Schemes	Population	Proportion	Strata	Sample frame	Proportion	Sample size
Qamata	975	0.68	Irrigators	675	0.69	125
			Homestead gardeners	300	0.31	56
			Total	**975**	**1**	**181**
Tyhefu	466	0.32	Irrigators	296	0.64	55
			Homestead gardeners	170	0.36	31
			Total	**466**	**1**	**86**
Grand Total	**1,441**	**1**		**1,441**		**267**

Survey Data (2015)

Inferring from the Table, irrigators and homestead gardeners in Qamata represent 69 percent and 31 percent of the sample frame whereas they represent 64 percent and 36 percent in Tyhefu, respectively. Taking into account the predetermined proportions,

sample sizes of households within each stratum were obtained through simple random technique and the household heads were then administered the questionnaire.

The sample of irrigators and homestead gardeners drawn enabled the collection of the needed data from the household heads in the study area. Studying the demographic and socioeconomic characteristics provided a resource for scientific understanding and policy analysis (Gjonça and Calderwood, 2004). Demographic and socioeconomic characteristics give the opportunity to understand questions around demographic shift, population trends, trends in the workforce, changes in productive activities and other economic arrangements and their impact on the economy (Gjonça and Calderwood, 2004).

Questionnaire design

The need to design a questionnaire stemmed from rising level of poverty among rural population and the need to particularly assess the phenomenon among rural smallholder farmers in the Eastern Cape Province of South Africa. A questionnaire was considered because of its ability to reach large audience in good time coupled with economic advantage (not very expensive) in gathering data. The contextualization began with extensive literature review (on the subject matter), aimed at isolating relevant questions and thereafter presented in an unambiguous manner. A conscious effort was made to avoid leading questions capable of directing respondents' response in a specific way.

The researcher organized a meeting to assemble potential interviewers (who are mostly students of the Agricultural Economics Department at the University of Fort Hare) and dummy respondents (who are cooperative farmers from ntselamanzi township in Alice). The meeting helped enriched the content of the questionnaire as some questions and options initially included were rephrased. Following this stage, the interviewers were reconvened and the modified questionnaire was administered to them.

Administering the questionnaire to the interviewers was imperative to ensure the content is fully understood and could easily be interpreted to respondents in Xhosa language on the field. This process also resulted in an improved version of the questionnaire that reordered the sequence of response to questions. The standardized questionnaire was subsequently pretested on a sample of farmers in Melani village. Though, the questionnaire was written in English language, it was administered in Xhosa local language to gather primary data such as farmer's socio-economic characteristics such as age, household size, number of years spent in school, marital status, numbers of extension contact, membership of association, farm size, income, information on inputs, output and marketing used for the study.

Ethical considerations

This study is an appendage of a broad study. Thus, the permission to conduct the research was sought from the appropriate authorities. An ethical clearance was necessary to ensure this study was conducted with integrity, fairness and honesty whilst upholding the privacy and confidentiality of the respondents. In addition, the research is underpinned by ethical standards that ensured irrigators and homestead gardener enjoyed no preferential treatment.

Method of data analysis

The Foster-Greer-Thorbecke was adopted to assess the dimension of poverty in the study area. Equally, factors influencing the poverty level of irrigators, homestead gardeners as well as the pooled data were assessed using a logit regression model to understand the relationship between poverty and some selected socioeconomic characteristics. Furthermore, a correlation matrix was equally estimated for irrigators, homestead gardeners as well as the pooled data to affirm the determinants of poverty among respondents in the Eastern Cape Province of South Africa.

FGT assessment of poverty

The poverty model proposed by Foster-Greer-Thorbecke (FGT) (1984) was used to determine the poverty status of household heads in the study area. The model is presented as follows:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\left(\frac{g}{Z}\right)^\alpha I(Y_i < Z)\right] \quad \text{.....(1)}$$

Where P_α = Poverty parameter, α = Degree of poverty aversion, n = Total number of households, q = Number of poor households, $g = Z - Y_i$ = Per capita income deficit (Rand), Z = Poverty line and $I(Y_i < Z) = \begin{cases} 1 \text{ if } Y_i < Z \\ 0 \text{ if } Y_i > Z \end{cases}$ = Indicator function.

According to Sanusi, Owagbemi, and Suleman (2013), if

$\alpha = 0$, P_α = Poverty incidence (Headcount). It represents the proportion of households below the poverty line.

$\alpha = 1$, P_α = Poverty gap (Poverty depth). It represents the proportion of the poverty line that is required for a poor household to become non-poor.

$\alpha = 2$, P_α = Poverty severity (Squared poverty gap). It represents the extent of severity of a poor household. The closer the value to 1, the difficult it is for the household to be none poor.

Estimation of the poverty line

Expenditure and income data are critical indicators when evaluating human well-being (Woolard and Leibbrandt, 1999). Ravallion (1992), Meyer and Sullivan (2003) observed that many developing countries prefer to adopt expenditure data rather than income data as an indicator of well-being because they are of the view that many households cut back on their actual income. However, Covarrubias, de la Campos, and Zezza (2009) argued that income data, when carefully collected, allows an in-depth

assessment of inequality as well as income designs. In line with the foregoing, and for this study, the income of household heads was chosen and collected to assess the well-being of respondents because it emerged to be more reliable and easier to collect.

Therefore, the mean per capita income of household heads was computed by dividing the aggregate per capita income of household heads by the number of household heads surveyed to get the mean per capita income of household heads. The mean per capita income was computed for irrigators, homestead gardeners as well as for the pooled data. Furthermore, two-third of the mean per capita income of the household heads were taken and fixed as poverty line. This was done for irrigators, homestead gardeners and the pooled data. Any household head whose two-third mean per capita income value falls below the fixed values in any of the categories is considered poor.

In order to identify determinants of poverty status of the farm households sampled for this study, a logit regression model was estimated. Logit regression has been defined as the amount of change in the value of one variable associated with a unit change in the value of another. Logit regression analysis therefore helps to determine the effect of changes in the explanatory variables on the dependent variable. Logit model is used whenever the dependent variable is binary (also called dummy) which takes values 0 or 1. Logit regression is a non-linear regression model that forces the output (predicted values) to be either 0 or 1. Logit model estimates the probability of your dependent variable to be 1 (Y=1). This is the probability that some event happens.

Following Adekoya (2014), the logistic (logit) probability function is specified as:

$$P_i = \frac{1}{1+e^{-z_i}} = f(Z_i) \quad \text{...} (2)$$

Where P_i is the probability that a household *i*(i=1, 2, …n) will be poor. Index Z_i is a random variable which predicts the probability of a household being poor or non-poor. The probability P_i in equation 2 is further transformed to give equation 3.

$$P_i = \frac{e^{z_i}}{1+e^{z_i}} \text{...} (3)$$

Hence, the ith observation of a household is stated as:

$$Z_i = \frac{\ln P_i}{1-P_i} = \beta_0 + \sum \beta_0 X \text{..} (4)$$

Therefore, $\ln(P/1-P) = 1$, if the household is poor while $\ln(P/1-P) = 0$, if otherwise, i.e. non-poor. Drawing from the foregoing, the estimated empirical model is stated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_{41} X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon \text{..........................} (5)$$

where:

Y is the poverty status of household, X_1 is the age of the respondents, X_2 is Years spent in school, X_3 is the household size of respondents, X_4 is the size of farmland cultivated, X_5 is extension services, X_6 is association membership, ε i is the error term, β_0 is the constant and β_i are the coefficients of regression.

Furthermore, a correlation matrix was estimated to affirm the determinants of the poverty level of the respondents and the functional form is stated as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e_i \text{......................} (6)$$

where:

Dependent variable Y is the per capita income, X_1 is the gender of the respondents, X_2 is the household size of the respondents, X_3 is the age of the respondents, X_4 is the size of farmland cultivated, X_5 is years spent in school, X_6 is the marital status of the respondents, e_i is the error term, α is the constant and β_i are the coefficients of regression.

Results and discussion

This section presented the description of variables and the outcome of poverty analysis with a view to identifying factors influencing poverty among the respondents. First, the variables were described along the study area. The presentation of poverty analysis is followed by the discussion of results.

Statistical description of variables

The summary of the descriptive statistics of the respondents in Qamata and Tyhefu is presented with a difference test in Table 2.

Table 2: Summary of descriptive statistics

Variables	Unit of Measurement	Pooled (267)	Qamata (182)	Tyhefu (86)	Diff. test
Age[a]	Years	61 (12.60)	62 (12.56)	58 (12.26)	-2.65***
Education[a]	Years	5 (4.48)	6 (4.67)	5 (3.98)	-1.94*
Household size[a]	Number	5 (2.43)	4 (2.13)	5 (2.94)	2.15**
Farm cultivated[a]	Hectares	1.07 (0.97)	1 (1.11)	1 (0.52)	-1.95*
Gender[b]	Dummy	176 (66)	134 (76)	42 (24)	-4***
Marital status	Dummy	195 (73)	132 (68)	63 (32)	0.13
Association[b]	Dummy	163 (61)	147 (90)	16 (10)	-9.73***
Extension[b]	Dummy	164 (61)	128 (78)	36 (22)	-4.46***
Irrigators[b]	Dummy	181 (68)	126 (70)	55 (30)	-0.86
Per capita income[a]	Rand	2300.36 (2085.6)	2613.13 (2260.4)	1638.47 (1459.4)	-3.65***

Source: Estimated from survey data, 2015

Note: *Values in brackets are standard deviation and percentage for continuous and discrete variables, respectively. T-test and Z-test were used as difference test for continuous and discrete variables, respectively. Where a and b were used to indicate continuous and discrete variables, respectively.*

The mean age of respondents in Qamata and Tyhefu was 62 years and 58 years with the standard deviation of 12.56 and 12.56, respectively. In the pooled data, the mean age was 61 years with a standard deviation of 12.60. The standard deviation value showed that majority of the age value in this sample are clustering within 12.60 around the mean. This estimate from the pooled data revealed that respondents were somewhat old but significantly older in Qamata relative to Tyhefu. The finding was contrary to several studies on maize and vegetable production, in general, such as

those of Fakayode *et al*. (2004); Onojah *et al*. (2013); Onuk *et al*. (2010) and Tchale and Sauer (2007) who found out that average maize farmers were middle-aged. The dominance of older respondents may be linked to the migration of the youth to urban areas in search of better wage jobs and security. This result is an indication that more aged people may be found poor in the study area. The quantum of energy required for farm work which many aged farmers do not have may explain why aged farmer's income decline with poor farm activities.

Male representation in Qamata and Tyhefu was 76 percent and 24 percent, respectively. In the pooled data, male representation was 66 percent. This result showed a farming system that is male dominated. Having more men may have direct influence on the resource control pattern as it is believed that male farmers get preferential treatment over the female farmers. The presence of more male signaled the likelihood that the number of males that would be found poor would be greater among men than among the female, and not male farmers categorized as being poorer than the female gender.

In Qamata, 68 percent of the respondents were married while 32 percent were married in Tyhefu. The pooled data revealed that 73 percent of the respondents in the study area were married. This result suggested that majority of the respondents are likely to enjoy on-farm assistance from their spouses, all things being equal. Being married affords the possibility of having sufficient household size that may be used as family labour on farm to cut the cost of hiring labour. Married respondents that uses family labour may be found not poor in the study area considering the money saved and the dedication to increase production that may help them increase income.

Moreover, 90 percent of respondents in Qamata and 10 percent of the respondents in Tyhefu are members of one association or the other. In the pooled data, it was observed that 61 percent of the respondents belonged to one association or the other. With respondents having significant participation in activities of the association, it is

expected that innovative farming ideas that translate to more income would be exchange among members.

The number of years respondents spend in school (education) in Qamata and Tyhefu was 6 years and 5 years with the standard deviation of 4.67 and 3.9, respectively. The pooled data revealed 5 years as the number of years respondents spend in school with a standard deviation of 4.48. The standard deviation value showed that majority of educated respondents in this sample have their educational status clustering within 4.48 year around the mean. Although the dispersion of the level of education of the respondents around their mean value was high, it can be said that farmers had, on average, primary level of education according to the estimate from the pooled data. This revealed that an average respondent in the study area had primary level education which on one hand can enable him/her to read, write, interpret instructions relating to the use of machinery, farm inputs and also take advantage of extension services. This statement may be considered valid in line with Koshy in Bembridge (2000) who reported 4 years of education as the standard level of education and that anything otherwise is unlikely to have acquired any functional literacy. On the other hand, poverty is likely to be pronounced in the study area since many have the equivalent of primary school education, whereas, higher education according to Slabbert and Sekhampu (2009), affords better opportunity to earn better income and a life out of poverty.

The average household size of respondents in Qamata and Tyhefu was 4 and 5 members with a deviation of about 2 and 3, respectively. The pooled data showed an average household size of 5 members with a standard deviation of 2. The standard deviation value showed that majority of household sizes in this sample have their house size clustering within 2 around the mean. This implied that the household size of the farmers going by the pooled data and across the irrigation schemes was small when compared to the studies of Fakayode *et al.* (2004), Ohajianya *et al.* (2010) and Ahmed *et al.* (2013). This suggested that many households in the study area may not be able to use family labour to reduce the cost of production, get more profit margin in form of increased income and invariably stay out of poverty. This hint, also show an avenue

where hired labourers could possibly earn wages by helping household with small household size do their on-farm jobs.

The average farm size cultivated in Qamata and Tyhefu is 1ha with a standard deviation of 1.11 and 0.52, respectively. The average size of farm cultivated going by the pooled data was 1.07 ha with a standard deviation of 0.97. The standard deviation of majority of the cultivated farm size in the sample is clustered within 0.97 ha around the mean. This implied that respondents in the study area are smallholder farmers. The implication of this result is that respondents may not be able to scale-up production in quantity that can unshackle them from poverty.

It was also discovered that 70 percent and 30 percent of the farmers grow their crops under the irrigation scheme in Qamata and Tyhefu, respectively. Also, 68 percent of the farmers in the pooled data practiced more of an irrigated system of farming. The implication of this result is that majority of the respondents in the study area have access to plots under the irrigation scheme programme, and this gives them the opportunity to cultivate crops all year round; avail them a bumper harvest; and profit/income to reduce the effect of poverty.

Assessing the poverty level of respondents

The result in Table 3 presents the poverty profile of respondents in the study area using a poverty line of R1537.41.

Table 3: Poverty profile analysis of respondents

Variables	Headcount (P_0)	Poverty gap (P_1)	Poverty Severity (P_2)
Pooled	0.49 (0.03)	0.25 (0.02)	0.15 (0.02)
T-value	15.81***	12.67***	10.12***
Gender			
Male	0.45 (0.04)	0.2 (0.02)	0.11 (0.02)
Female	0.56 (0.05)	0.34 (0.04)	0.24 (0.03)
Difference	-0.12 (0.06)	-0.14 (0.04)	-0.13 (0.03)
T-value	-1.82*	-3.20***	-3.83***

Irrigation Scheme			
Qamata	0.39 (0.04)	0.16 (0.02)	0.08 (0.01)
Tyhefu	0.65 (0.05)	0.4 (0.04)	0.28 (0.03)
Difference	-0.26 (0.06)	-0.24 (0.04)	-0.2 (0.04)
T-value	-4.11***	-5.61***	-5.53***
Irrigator and Homestead gardener			
Irrigators	0.45 (0.04)	0.22 (0.02)	0.14 (0.02)
Homestead	0.56 (0.05)	0.3 (0.03)	0.18 (0.03)
Difference	-0.12 (0.07)	-0.08 (0.04)	-0.04 (0.03)
T-value	-1.76*	-1.86*	-1.26
Land classes			
<2 ha	0.55 (0.04)	0.3 (0.03)	0.2 (0.02)
>=2 ha	0.38 (0.05)	0.15 (0.02)	0.07 (0.02)
Difference	-0.17 (0.06)	0.16 (0.04)	-0.13 (0.03)
T-value	-0.04	4.35***	-4.93***

Source: Estimated from survey data, 2015

****P<0.01,*P<0.1. Values in brackets are standard errors. Poverty line = 2/3* (Per capita income) =1537.41*

The headcount (poverty incidence) index of the pooled data was 0.49, which implied that 49 percent of the respondents in the study area were poor. The poverty gap index was 0.25, which implied that farmers in the study area would need about R614.96 to be liberated from poverty. Poverty severity index was 0.15; this could be interpreted as the depth of poverty after accounting for inequality among the poor. This finding is close to the result of a study conducted by Baiyegunhi and Fraser (2014), where they found that 44 percent of smallholder farmers were poor in the Eastern Cape Province. Since majority of the respondents in the study area were found poor, it hinted that majority of the respondents would require external assistance to reduce poverty.

The gender headcount analysis of male and female respondents in the study area was 0.45 and 0.56, respectively. However, the headcount differential of -0.12 was significant

at 10 percent level of probability between male and female respondents. This revealed that poverty was prevalent among the female farmers in the study area. The poverty gap among the male and female farmers was 0.2 and 0.34 with a significant difference of 0.14. The implication of the finding is that the average poor female respondent was poorer than the average poor male farmer in the study area. In other words, female and male respondents would need on the average, R522.72 and R307.48, respectively to be out of poverty. The economic implication of this finding is that more financial commitment is required to move female gender out of their present poor state than would be required for the male gender in the study area.

The poverty severity among the male and female respondents was 0.11 and 0.24; this implied that the depth of poverty was higher among the female farmers than their male counterparts even after accounting for the inequality among the poor. Since poverty severity is more among female than male, it followed that more male respondents would be easily lifted out of poverty than their female counterpart.

The headcount from the area/location of the scheme was 0.39 and 0.16 for Qamata and Tyhefu, respectively. The headcount differential of 0.26 was significant at 1 percent level of probability. This result revealed that poverty was more prevalent in Tyhefu than in Qamata. The poverty gap in Qamata and Tyhefu was 0.16 and 0.4, respectively; this implied that the depth of poverty was higher in Tyhefu than in Qamata. In other words, respondents in Qamata and Tyhefu would need an average of R246 and R614.96, respectively to be lifted out of poverty. The poverty severity index in Qamata and Tyhefu was 0.08 and 0.28, respectively. This index informed that the depth of poverty was higher in Tyhefu than in Qamata after accounting for inequality among the poor. The head count, poverty gap and poverty severity in Tyhefu is greater than what is obtainable in Qamata. It implied that more attention in term of intervention is required in Tyhefu than in Qamata to lift farmers out of poverty.

The result of the analysis across irrigation/non-irrigation scheme members showed that the poverty incidence among the irrigators and homestead farmers was 0.45 and 0.56,

respectively. This outcome revealed that poverty was prevalent among the homestead gardeners if the significant difference in their headcount is anything to go by. The poverty gap among the irrigators and homestead gardeners was 0.22 and 0.3, respectively. This is an indication that the depth of poverty among homestead gardeners was higher than among the irrigators. In other words, irrigators and homestead gardeners would need on the average, R338.23 and R461.22, respectively to mitigate the effects of poverty. The poverty severity was 0.14 and 0.18 among the irrigators and the homestead gardeners; this implied that the depth of poverty was more among the homestead gardeners than the irrigators even after accounting for inequality. This result may be a demonstration of some greater level of proficiency in farm practices on the part of irrigators relative to the homestead gardeners in the study area which made irrigator less poor than homestead gardeners.

The result of the analysis across land classes showed that the headcount among farmers with less than 2ha and more than 2ha was 0.55 and 0.38. These values suggested that farmers with less than 2ha of land were poorer than those with more than 2ha of land. The poverty gap was 0.3 and 0.15, and this means that the depth of poverty was higher among the farmers with less than 2ha than respondents with more than 2ha of land. Precisely, farmers with less than 2ha of land would need an average of R461.22 to reduce the effect of poverty while those with more than 2ha of land would need R230.612 to do the same. This result suggested that when famers are privileged to increase the area of land cultivated, there may be an increase in their earning (income) when they sell the additional produce harvested from the increased area of land cultivated.

Determinants of poverty level (correlates) among irrigators

The result of the analysis on factors influencing poverty status among irrigators is presented in Table 4.

Table 4: Summary of logit regression estimated for irrigators

	Coefficient	Standard Error	Z	P>[z]
Constant	-.172	1.488	-0.12	0.908

Age	.015	.021	0.75	0.454
Years spent in school	-.134	.059	-2.28	0.023**
Household size	-.673	.142	-4.73	0.000**
Cultivated farm size	1.331	.257	5.18	0.000**
Extension services	1.296	.448	2.89	0.004**
Member of association	1.748	.547	3.20	0.001**

Wald $Chi^2(6)$	=	48.49
Prob>Chi^2	=	0.000
Pseudo R^2	=	0.363
Likelihood ratio	=	-77.600

Source: Estimated from survey data, 2015

**5% probability level

The likelihood ratio value of 77.600 revealed that some of the coefficients of the explanatory variables are statistically different from zero. The chi-square value also indicated that the model performed well. Education, household size, farm size, extension services and membership of association have significant influence on the log likelihood of being poor. Only age appears to be insignificant to the log likelihood of being poor going by the z-statistics. While education and the household size of the respondents reduces the log likelihood of being poor, size of cultivated farmland, extension services, and membership of association increases the log likelihood of being poor among irrigators.

It implied that higher level of education reduces the likelihood of being poor. When observed from a different perspective, respondents with lower educational qualification have limited capacity to seek higher paid jobs that guarantees them a life free of poverty. Equally, when the household size of an irrigator increases by one person the log likelihood of being poor reduces, and this could be explained from the likely supply of family labour to assist in getting the farm work done. When household members help to get farm work done, cost that would have been spent hiring labour is cut and saved. Avenues where farmers are able to reduce cost of production provides opportunity for greater profit margin that can lift farmers out of poverty in form of higher income. On the other hand, an increase in household size may push a household into poverty owing to additional financial burden required to carter to the household.

An interaction between poverty and increase in the size of farm land cultivated revealed significant poverty growth among irrigators. This outcome suggested a possible missing link of how to align and coordinate resources so as to earn profit and protect them (irrigators) from poverty. The fact that extension services increases the likelihood of being poor suggested a gap between practices disseminated and the requisite knowledge that irrigators require to stay out poverty.

Being a member of an association increased the level of poverty among irrigators. The growth in the level of poverty among irrigators maybe a result of uncoordinated activities that do not empower members of the association with the requisite skill to properly align farm resource to maximize productivity; profit and income.

Results of correlation matrix carried out among irrigators in the study area

The result of the correlation matrix conducted on the data obtained from irrigators is presented in Table 5.

Table 5: Summary of correlation matrix estimated for irrigators

	Per capita income	Gender	Household Size	Age	Farm Size	Years of Education	Marital Status
Per capita income	1.0000						
Gender	0.2177	1.0000					
Household Size	-0.5015	-0.0782	1.0000				
Age	0.2615	0.0455	-0.1407	1.0000			
Farm size	0.1771	0.1228	0.2509	-0.2227	1.0000		
Years spent in school	-0.0813	0.0556	0.1501	-0.5736	0.3795	1.0000	
Marital status	0.1633	0.2991	-0.0653	-0.0097	0.1281	-0.0472	1.0000

Source: Estimated from survey data, 2015

It is evident from Table 5 that gender of household heads, age of household heads of farmers growing crops under the irrigation system, size of land cultivated under the irrigation system, marital status of farmers growing crops under the irrigation system all had positive relationship with the per capita household income. On the contrary, the number of years spent in school and the household size of farmers growing crop under the irrigation system has a negative relationship with the per capita income of the irrigators.

Having established a positive relationship between per capita income and gender, it could be inferred that male farmers growing crops under the irrigation have the tendency and capacity to generate more per capita income than their female counterpart. This might be linked to the cultural values that give the male gender more privilege over the female gender in terms of resource control. Inequity in resource distribution particularly between male and female gender often increases the poverty level of the gender with restricted access to the resource in question. In this case, the female gender would be poorer because of lower per capita income.

Age also showed a positive relationship with per capita income. This revealed the that older irrigation farmers have wealth of experience sufficient to align their resources in a way that increases their per capita income. Moreover, it was observed that as the size of land cultivated under the irrigation system increases, the tendency of irrigation farmers to earn more per capita income increases. This result hinted on the opportunity an irrigator has to grow crop without relying on rain. Growing crops without recourse rain create an avenue to generate more capita income as more crops will get to the market in exchange for more money. Farmers who are dedicated to their farms and could access this kind of opportunity would rarely be categorized as poor. Equally, the positive link between marital status and per capita income suggested the possibility of household heads and their spouses combining efforts to generate more income. The probability of being categorized as poor reduces when couple renders assistance to each other particularly in increasing the income accruable to the household.

The household size and number of years that an irrigator spend in school have a negative relationship with per capita income. This meant that as household size of irrigation farmer increases, tendency to grow their per capita income would decrease. The fact that an increase in household size possibly reduces the per capita income of irrigation farmers suggested that household heads are burdened with responsibility of large family and this could possibly explain why farmers may not reinvest in farming activities. This often reduces irrigator's per capita income and keep them poor.

Also, as the irrigation farmers spent more years to acquire education, results revealed a reduction in their per capita income considering the negative sign. This finding suggested that higher educational qualifications may empower irrigators to seek higher paid jobs, especially when they are confronted with challenging situation in farming that cause them to abandon farming. Given this situation, the per capita income from farm source is usually reduced.

Determinants of poverty level (correlates) among homestead gardeners

The result of the analysis to know the factors influencing the poverty status of homestead gardeners is presented in Table 6.

Table 6: Summary of logit regression estimated for homestead gardeners

	Coefficient	Standard Error	Z	P>[z]
Constant	1.403	1.854	0.76	0.449
Age	.020	.023	0.85	0.393
Years spent in school	-.039	.068	-0.57	0.570
Household size	-.522	.123	-4.23	0.000**
Cultivated farm size	.304	.455	0.67	0.503
Extension services	.639	.512	1.25	0.212
Member of association	.093	.504	0.18	0.854
Wald $Chi^2(6)$ =	18.77			
Prob>Chi^2 =	0.0046			
Pseudo R^2 =	0.1944			
Likelihood ratio =	-46.896			

Source: Estimated from survey data, 2015

It could be deduced from Table 6 that the coefficient of the explanatory variables is statistically different from zero with the likelihood ration value of 46.896. The value of the chi square revealed that the estimation from the model gave a good outcome. Furthermore, Table 6 revealed that age, years spent in school, size of the cultivated farmland, extension services and being a member of an association have no significant influence on the likelihood of a homestead gardener categorized as being poor. Although the number of years spent in school is not significant to the likelihood of homestead gardeners being grouped as poor, it however reduces the likelihood of

homestead gardeners being poor. This result affirmed the importance of education in farming. Acquiring higher education gives opportunity to assess better job opportunities and, in this case (farming), it empowers farmer's mind to make rational decisions, discuss farm problems with the aim of making sufficient profit that pushes them away from poverty.

Equally, age, cultivated farm size, extension services and being a member of an association were not significant to the likelihood of homestead gardeners being classified as poor; they are however, positively related to the likelihood of being poor. It followed that an increase in any of these variables will increase the likelihood of homestead gardeners being poor. In addition, this result also showed that regardless of your age, homestead gardening could be practiced as a back-yard hobby to reduce spending on some food staples; that no special or serious extension services/consultation is required to grow crops at the back yard in order to save cost; and that being a member of an association to cultivate garden is not important.

Household size of homestead gardeners was observed to have significant influence on the likelihood of being poor. It is also negatively related to the likelihood of being poor. This result hinted that when the household size of a homestead gardener increases, the opportunity to use family labour on homestead garden is possible and would eventually help save the funds that would have being spent on hiring labour hence, reducing the likelihood of homestead gardeners being poor. This is because at every point family labour is substituted for hired labour, there is a reduction in the cost of production which is eventually pushed forward to the profit. Good profit margin reduces the likelihoods of a household to be classified as poor.

Results of correlation matrix carried out among homestead gardeners in the study area

The result of the correlation matrix analysis conducted on the data collected from the homestead gardeners is presented in Table 7. The analysis was conducted to affirm the factors influencing the poverty status of homestead gardeners.

Table 7: Summary of correlation matrix estimated for homestead gardeners.

	Per capita income	Gender	Household Size	Age	Farm Size	Years of Education	Marital Status
Per capita income	1.0000						
Gender	0.0417	1.0000					
Household size	-0.4752	-0.0024	1.0000				
Age	0.1113	0.0215	0.0950	1.0000			
Farm size	0.0673	0.0293	0.1313	0.1816	1.0000		
Years spent in school	-0.1864	-0.0762	-0.1412	-0.5194	-0.2578	1.0000	
Marital status	-0.0420	0.5313	0.0656	-0.0568	-0.0612	-0.0575	1.0000

Source: Estimated from survey data, 2015

Gender, age and farm size are positively related to per capita income of homestead gardeners whereas, household size, years spent in school and marital status are negatively related to per capita income of homestead gardeners.

With the foregoing relationship, it could be said that male household heads who are homestead gardeners have higher tendency to increase their per capita income. This result may be tied to male gender's agility and may possibly be in control of more resource to cultivate their homestead gardens. This perhaps explains the increase in male homestead gardeners' per capita income. Also, it may not be entirely true that the female gender does not possess the same level of agility with men to cultivate their gardens so as to increase their per capita income, it may explain how burdened the female gender is with home chore, making it difficult to apportion time for other activities like keeping gardens.

Similarly, age of homestead gardeners had a positive relationship with per capita income. This is an indication that older homestead gardeners have wealth of experience to handle events that may take away significant part of their income earned from the sale of their farm products which may eventually keep them in a poor state. Although, energy required on farm is enormous and it is a fact that it reduces as farmer grower older, however, this quality could be harnessed when older farmers are positioned to

transfer such knowledge to the younger farmers in an arranged system where younger farmer's farming activities are monitored by the older people. Doing this may help mitigate poverty simply through an increased harvest of agricultural products that will be available for sale in exchange for money, hence, more per capita income.

Furthermore, farm size had a positive relationship with per capita income of homestead gardeners, an outcome which revealed that if more area of land is put under cultivation then per capita income of homestead gardeners will likely increase. It could be inferred that homestead gardening is important in increasing per capita income and by extension reducing poverty. Crops grown in the homestead gardening and used to feed the household saves resource that would have been used to buy the same from a store, market or elsewhere.

As for the household size having tendency to reduce the per capita income of homestead gardeners, it suggested that homestead gardeners are likely saddled with more responsibility that prevented them from reinvestment to get more income from their homestead gardens. Put differently, it could be that the size of the household exceeds the capacity of the cultivated garden, hence, the household head is compelled to augment with additional fund to carter to the family. When this happens, it is likely that the per capita income of household will reduce and such household may be categorized as poor.

Equally, years spent in school had a negative relationship with per capita income of homestead gardeners. This outcome suggested no relationship between the skills acquired and the practice of homestead gardening. This may cause household to abandon or not to even practice homestead garden at all as the household heads may see themselves as better qualified to take up formal jobs. With a formal higher paying job, it is believed that all the food staples needed could be bought rather than exhaust energy and time on back-yard garden. This is an avenue that may likely reduce the per capita income and by extension, make a household head poor.

Marital status showed a negative relationship with per capita income. It followed that being married reduces the per capita income generated from homestead gardens. This result gives credence to the explanation adduced about the house size, because it is unlikely that married couple will not have children or at least relatives living with them. The size of household may likely put pressure on the per capita income of a household, and homestead gardeners are not immune to this pressure.

Determinants of poverty status (correlates) using pooled data

Irrigators and homestead gardeners' data were combined and the result is presented in Table 8.

Table 8: Summary of logit regression estimated using pooled data

	Coefficient	Standard Error	Z	P>[z]
Constant	2.169186	1.127407	1.92	0.054
Age	-.0037796	.0152133	-0.25	0.804
Years spent in school	-.167759	.0471363	-3.56	0.000***
Household size	-.5250414	.0760485	-6.90	0.000***
Cultivated farm size	.8410316	.2430561	3.46	0.001***
Extension services	.6448872	.3337285	1.93	0.053***
Member of association	1.186706	.3548196	3.34	0.001***
Wald $Chi^2(6)$ =	70.61			
Prob>Chi^2 =	0.0000			
Pseudo R^2 =	0.2743			
Likelihood ratio =	-129.5303			

Source: Estimated from survey data, 2015

The number of years spent in school, household size, the area of land cultivated, extension services and being a member of association have significant influence on the likelihood of farmers being poor in the study area. Only the age of the respondents was insignificant in determining the likelihood of being poor.

The years spent in school had a negative relationship with the likelihood of being poor. It followed that pursing higher educational qualification reduces the likelihood of farmers

being poor. The outcome from this analysis agrees with the results from irrigators. The implication of this result is that education equips farmers with the requisite skill to make informed decisions and judgments that reduce their likelihood of being poor. Although, the results from the homestead gardeners showed similar sign (negative) with the coefficient obtained from irrigators and pooled data it is however, not significant.

Equally, the coefficient of household size is significant and negatively related to the likelihood of farmers being poor. It means an increase in the size of the household reduces the likelihood of farmers being poor. This result tallies with the one obtained from analysis conducted on irrigators' and homestead gardeners. This suggested the possible use of family labour on their respective farms which helped reduce the production cost that would have been used to pay off hired labour.

The size of farmland cultivated in respect to pooled data was significant and positively related to the likelihood of being poor. The likelihood of being poor in respect to cultivated farmland under irrigation is in consonance with result from the pooled data. This implied that an increase in the size of the cultivated farmland increases the likelihood of being poor. This suggested a possible suboptimal use of land that may be linked to lack of proper monitoring, untimely application of required agronomic practices resulting from possible lack of resources. All these decreases yield from additional area of land cultivated. The inability to cultivate the land often make farmers poorer. Under the homestead gardening, the coefficient sign was also positive but insignificant to the likelihood of being poor.

Moreover, increase in the frequency of extension officers' visit considering the pooled data showed a positive and significant relationship with the likelihood of being poor. The foregoing result is in line with the result obtained from irrigators' data. This result hinted that the extension services offered by the extension staff are not in line with the need of farmers to reduce the likelihood of being poor. Unlike the result from the pooled data and irrigator data, extension services are insignificant to the likelihood of being poor considering the homestead gardeners.

The relationship between the likelihood of being poor and being a member of an association is significant and positive. The same relationship was obtained for irrigators This implied that being a member of association increases farmers' likelihood of being poor. It also revealed the possibility of the association not disseminating and empowering members with knowledge capable of pushing members away from poverty. The relationship between likelihood of being poor and membership of association was insignificant considering homestead gardeners.

Though age was observed to be insignificant to the likelihood of being poor considering the pooled data, it however, had a negative relationship with the likelihood of being poor. This outcome revealed that old respondents have wealth of experience that could be passed on to younger ones to help them reduce the likelihood of being poor. In addition, age was insignificant when the irrigator and homestead gardening data was considered together.

Results of correlation matrix using pooled data

The outcome of the correlation matrix conducted using the pooled data is presented in Table 9. The Table showed that gender, age, farm size and marital status of respondents are positively linked to the per capita income. However, per capita income of respondents was observed to be negatively related to size of household and years spent in school.

Table 9: Summary of correlation matrix estimated from pooled data

	Per capita income	Gender	Household Size	Age	Farm Size	Years of Education	Marital Status
Per capita income	1.0000						
Gender	0.1626	1.0000					
Household size	-0.4960	-0.0486	1.0000				
Age	0.2156	0.0378	-0.0575	1.0000			
Farm size	0.1627	0.0910	0.1945	-0.1018	1.0000		
Years spent in school	-0.1113	0.0179	0.0596	-0.5561	0.2030	1.0000	
Marital status	0.1152	0.3744	-0.0403	-0.0445	-0.0445	-0.0282	1.0000

Source: Estimated from survey data, 2015

The positive relationship between per capita income and gender of the household heads in the study area revealed that the male respondents are likely to earn more per capita income than their female counterpart. This results tallies with the outcome from irrigators, homestead gardeners and Olawuyi and Raufu (2012). This indicated that male gender is more agile and possibly have more control over resources to cultivate their farm than their female counterpart.

Age of respondents was also observed to be positively related to per capita income. This result was the same across all the classes of data examined. This link suggested that older farmers deployed their experience to salvage situations which invariably allow them to increase their per capita income. Households that successfully devised ways to align resources owing to experience particularly to increase per capita income would not likely be classified as poor.

Equally, an increase in the size of farmland was linked to an increase in per capita income of the respondents. This result corroborates the outcome from the analysis conducted on data of irrigators and homestead gardeners. This suggested that respondents with access to more land may likely increase the quantity of crops cultivated and thereafter increase their profit and income after the sale of their produce.

Marital status of respondents was observed to increase the per capita income of household heads considering the pooled data. More per capita income arising from the marital status (married) of irrigators agrees with the result from the pooled data. This outcome signaled that household heads that are married perhaps get assistance from their spouses which enables them increase the household per capita income. The result from the analysis conducted using homestead gardening data revealed that marital status reduces the per capita income of the household head.

Household size had a negative relationship with per capita income of respondents in respect to the pooled data. Results from the analysis conducted on irrigators and homestead gardeners are in consonance with the pooled data. The implication of this is that, an increase in household size reduces the per capita income of household heads. This might not be unconnected with the responsibilities that should be met as the number of persons in the household increases. It may reduce the amount of money reinvested into farming activities which also reduces the income that comes from farming. When this happens, such household may be classified as poor.

The years spent in school was found to reduce per capita income of household heads using the pooled data. This result was the same for both irrigators and homestead gardeners. It could be that the knowledge acquired while in school is not related to how to sustainably manage farming. In addition, it may also be that the higher education acquired by respondents spurred them to seek better paying employments in the cities and urban areas. In situations like this household head with higher educational qualification would likely see farming as a venture that consumes time, energy with little financial gain hence little attention may be devoted to it.

Summary and recommendation

The description of important socioeconomic variables established a fundamental knowledge about the respondents; however, the primary purpose of the study has been to examine the relationship between the socioeconomic variables earlier identified and the level of poverty among irrigators and homestead gardeners in Qamata and Tyhefu. The result divulged that respondents are old with at least primary school education; and a mean household size of 5 persons. The average area of land cultivated (farm size) is 1.07ha. Male gender was dominant; of which married respondents are in majority belonging to one association or the other. Majority of the respondents grew their crops under the irrigation system (irrigators); and had access to extension services.

All the poverty indices (headcount, poverty gap and poverty severity) assessed revealed that poverty is more pronounced among female respondents than male respondents;

among homestead gardeners than irrigators; among farmers in Tyhefu than in Qamata; and among farmers who had less than 2ha of farmland than those with more than 2ha.

Age was discovered not to have any significant influence in categorizing a household as poor or otherwise among irrigators. Education (years spent in school) and household size showed a significant influence and capacity to reduce poverty. Surprisingly, the interaction between poverty and size of farmland; extension services and being a member of association increased the poverty status among irrigators. On the other hand, age, education, size of cultivated land, extension services and being a member of association had no significant influence on homestead gardeners' level of poverty. Only household size significantly reduced the tendency of a household being categorized as poor among homestead gardeners.

However, conclusions from the estimated logit regression using pooled data in respect to factors affecting the poverty status of respondents in Qamata and Tyhefu, education (years spent in school), household size, size of cultivated farmland, extension services and being a member of an association have significant influence on the likelihood of a household categorized as poor. Only the age of respondents was not significant.

The correlation matrix revealed that gender, age, farm size and marital status of respondents are positively linked to the per capita income while a negative relationship was observed between per capita income and household size, education (years spent in school).

It is evident from the foregoing results that the socioeconomic variables discussed revealed important dimensions required to categorize irrigators and homestead gardeners as poor or otherwise, it is therefore, recommended that;

Additional farm land be distributed to farmers who have demonstrated capacity to use land optimally (in terms of getting more products) to maximize profit from the sale of their agricultural product and subsequently reduce poverty in such

household. Paying more attention to the fore mentioned, may enable a system that tackle sources of unemployment since there would be need for more labour to cultivate more land. This may help cut down unemployment that gave birth to poor or no income that increases the level of poverty.

Novel how-to-do-it discovered/developed by technologist and intended for farmers' adoption should embed the cultural value of farmers to facilitate easy adoption of the technology that increases production. This process can only be strengthened with an effective extension services that value feedback mechanism and the concept of participatory approach between farmers extension services providers and technology developers. When the foregoing processes are implemented, many farmers will operate at the frontier of production; get their products to the market in good time and form, and thereafter, earn profit/income that lift them out of poverty.

Policies with particular attention on improving access to educational opportunities, especially among those rural farmers trapped in poverty should be strengthened. Also, it is important that the size of family be control to the size one can carter to without being burdened financially.

Since many of the respondents were found old, and old age raises the odd of seemly and staying poor, a social safety structure with wide coverage, fortified with many types of assistances to old people who are currently and later be exposed to economic hardship and poverty be established.

Extension service provider should strive to communicate regularly with farmers and farmers' association. With an effective communication, the chances are high that knowledge and ideas would be easily exchanged among the farmers, and this will likely position farmers to address challenging issues that reduces their harvest and by extension income they earn.

Limitation of the study

The cross-sectional nature of the research design is a possible limitation. Consequently, the outcome of the estimated models should not be used to make a general statement. While estimates from a longitudinal data will be more appropriate to make general statement, caution should be exercised in interpreting the association between one variable and another.

The focus of this study was to examine poverty among irrigators and homestead gardeners in Qamata and Tyhefu areas of Eastern Cape Province of South Africa. Thus, it may be inappropriate that findings from this study would be used as a baseline to assess another province in South Africa. It is only when similar study is conducted in other provinces that a comparison could be initiated.

The enumerated respondents (267) relative to the overall population is small. Study with much larger data would be appropriate for policy statement. In addition, the process of data collection hinged on quantitative approach, therefore, adopting a qualitative approach to collect and analyse the data would bring in a different dimension to the study.

Suggestion for further study

The findings from this study will be better for generalization if a longitudinal data is subjected to the same analytical procedure to establish the poverty status of farmers. Similarly, examining the output (i.e. harvested agricultural product), the quantity sold and the poverty status of farmers would enrich literature coupled with examining the link between land optimization and poverty status of farms in the study area.

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