Examining the contribution of entrepreneurship spirit to the performance of smallholder maize producers in Mhlontlo Local Municipality in the Eastern Cape Province of South Africa

[a]Avuletey R* and [b]Obi A

[a] Graduate Student, Department of Agricultural Economics and Extension, University of Fort hare, Private bag X1314, Alice, Eastern Cape, 5700, South Africa

[b] Professor, Department of Agricultural Economics and Extension, University of Fort hare, Private bag X1314, Alice, Eastern Cape, 5700, South Africa

ABSTRACT

The main purpose of this study is to determine the impact of smallholder farmers' entrepreneurship capability in maize production in Mhlontlo Local Municipality of South Africa. The study focuses on performance (technical efficiency) because it is an important subject in developing agriculture where resources are limited but high population growth is very common. The objectives of the study was to determine the level of technical efficiency and to identify the key entrepreneurial spirit variables (positive psychological capital) and other socio-economic characteristics that influence the technical efficiency of small-scale maize producers in Mhlontlo local municipality in the Eastern Cape. Purposive and Snowball sampling techniques were used to collect primary data from 120 small-scale farmers. Data envelopment analysis (DEA) was used to determine the levels of technical efficiency among farmers in the area. The Multivariate OLS was used to analyze the positive psychological capital variables and key socio-economic factors that have influenced the performance (technical efficiency) in maize production. The OLS results showed hope as positive and significant in the farmers' entrepreneurship capability. It further revealed quantity of fertilizer, labour usage, household size, farm size and years in schooling as significant and important variables that influence maize farmers' efficiency. The DEA results revealed an overall technical efficiency of 89 percent with the lowest score of 62 percent and maximum score of 100 percent under the variable returns to scale (VRS).

Key words: Snowball, OLS, Technical efficiency, Data envelopment analysis, variable return to scale.

Introduction

Agricultural production can simply be defined as the process of transforming inputs (factors of production) into outputs (Doll and Orazem, 1984). Among factors of production needed in the transformation process of inputs to outputs include natural resources (mainly land and water), labour and capital (mainly physical and financial capital) (Djomo and Sikod, 2012). The accessibility and use of these factors of production is crucial in achieving the desired output (Djomo and Sikod, 2012). The level of accessibility and use of these factors of production is thought to be influenced by the individual's human dimensions (Padilla-Fernandez and Nuthall, 2001). For example, the human capital that includes skill and knowledge avails information needed to apply fertilizers, pesticides, and herbicides and adopt resource-saving and enhancement productive technologies (CIMMYT, 2000).

Production can be enhanced by social capital through farmer groups and cooperatives which pool resources together for large-scale operations (FAO, 2000). Further, social capital is viewed as a buffer to farmer's risks and shocks especially those related to crop failure and general production. In the presence of more accumulated social capital, one can easily access farm implements, inputs and group labour at no or low cost (McAllister, 2010). Entrepreneurial spirit is among the human dimensions and can be described as a person who is creative and constantly looking for opportunities to improve or expand businesses for increased profits. Entrepreneurs have ability to calculate economic risks and mind about profits and losses, and they are innovative in nature to catch-up with growing global competition (Masaviru, 2011). They are goal-oriented, persistent hardworking and energetic, willing to take initiative, and have a strong sense of commitment. Smallholders' low agricultural production may be attributed to low entrepreneurial spirit. Robert (2012) indicated that individuals' level of entrepreneurship is crucial in accumulating productive assets and financial assets for maximizing output and profits.

Psychological characteristics (positive psychological capital) are used to measure farmers' entrepreneurial spirit capability and such variables include hope, resilience, optimism and self-efficacy. These four psychological characteristics are used as the variables to measure the entrepreneurial spirit of the farmers. Each of the four positive psychological capacities has been theorized as an independent concept (Snyder, 2002). Theoretical differences exist in relationship to the treatment given to the outcome value, goal-related thinking, perceived capacities for agency-related thinking, and perceived capacities for pathways-related thinking (Snyder et al., 2002). Psychological Capital, or simply PsyCap is defined as an individual's positive psychological state of development that is characterized by having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks, making a positive attribution (optimism) about succeeding now and in the future, persevering toward goals and, when necessary, redirecting paths to goals (hope) in order to succeed; and when beset by problems with adversity, sustaining and bouncing back and even beyond (resiliency) to attain success (Luthans et al., 2007a).

The study therefore investigates the effect of the entrepreneurial spirit of farmers in the study area. Positive psychological capital was analyzed to measure the entrepreneurial spirit of farmers and its impact on farmers' performance in maize production was also estimated. The study uses the estimates of farmers' technical efficiency as a measure of performance. The four psychological characteristics were evaluated to measure the entrepreneurial spirit of the farmers using several questions developed into a questionnaire (PsyCap questionnaire).

Objectives of the study

The broad objective of the study is to investigate the impact of entrepreneurial spirit on the performance of small-scale maize producers in Tsolo Magisterial District in O.R. Tambo District in the Eastern Cape Province of South Africa.

The specific objectives of the study were:

a) To determine the level of technical efficiency among smallholder maize producers in the study area.
b) To identify and determine the effect of entrepreneurial spirit and socio-economic characteristics that influences the technical efficiency of maize producers in the study area.

South Africa's entrepreneurial performance

In some countries, such as those composing the European Union, researchers have taken on the task of investigating the factors and educational processes that could contribute to the development of the entrepreneurial capacities of farmers, with the aim of experiencing successful growth in agricultural business. Although, apparently, it is necessary to develop a certain way of handling diverse entrepreneurial techniques, such as marketing, production and accounting, these are not enough for a business to succeed. Entrepreneurial attitudes, such as innovation, orientation to growth, and risk taking, could be equally important. Now, more than ever, the entrepreneurial spirit is what is required to bridge the divides that exist in the world today; an entrepreneurial spirit that transforms challenges into opportunities and creates a more vibrant future for us all. The entrepreneurial spirit is one of creativity and innovation, ambition and goal driven action, value creation, willingness to take risks and learn from failure and most of all, a sense of play that includes both freedom and responsibility. To build this spirit, is to build a more entrepreneurial culture and it is through education that the entrepreneurial spirit can best be ignited, developed and nurtured.

Global Entrepreneurship Monitor (GEM) used the World Economic Forum's (WEF) classifications to categories South Africa among the efficient-driven economies, however, South African second economy dominated by resource-poor households can be classified among the factor-driven economies (GEM, 2011). The factor-driven economy is characterized by mainly subsistence agriculture and extraction businesses with a heavy reliance on unskilled labour and natural resources (GEM, 2011). Further, the economy is faced with poor entrepreneurial environment. To improve on the entrepreneurial environment, the government of South Africa has developed policies that emphasize promotion of entrepreneurial activity especially in the informal sector. This has been implemented through allocation of vast financial resources to catalyze the establishment of self-owned or joint ventures businesses (Modiba, 2009; GEM, 2011). A vast body of literature confirms the huge support rendered by South African government to improve on the entrepreneurial activities among smallholder agriculture. The support entailed establishment of small-scale irrigation schemes, subsidization of farm inputs, and provision of credit facilities and enacting a number of land reform policies (Ramaila et al., 2011). Notwithstanding the support from government, South Africa's level of entrepreneurial spirit is reported to be the lowest and lagging behind many countries globally (Modiba, 2009; GEM, 2011).

In South Africa, only 1.7 percent of businesses started do survive after a period beyond three years and six months, and the Total early-stage Entrepreneurial Activity (TEA) rate was reported at 9.1 percent (GEM, 2011). The prevalence rates for established self-employed business in South Africa were reported at 2.3 percent (GEM, 2011). Moreover, the country‘s agribusiness sector is the most underdeveloped yet considered being the most important for economic growth of the second economy. Low entrepreneurial spirit indicates a worrying situation for smallholder's agribusiness sector in contributing towards meaningful job creation, and growth of the rural economy (Modiba, 2009).

Methodology

Study area

The study was carried out in Tsolo in Mhlontlo local municipality of the Eastern Cape Province. Tsolo is a magisterial district in the Mhlontlo local municipality. The Mhlontlo municipality is further divided into Tsolo magisterial district and Qumbu magisterial district, with Qumbu as the main centre. Tsolo was chosen as the study area based on the result of the preliminary survey conducted in the study district. Tsolo town is situated 42 km northwest of Mthatha and 22 km southwest of Qumbu (with grid reference of 31.3^0S28.7^0E).The district covers an area of 46.74km^2. According to the 2011 census, the area has a total population of 7,794 with a population density of 166.76 per km^2, constituting 4.1 percent of the total population in the Mhlontlo municipality. The majority of people are black African (96.3 percent), with females dominating the population, with a percentage of 56.6 as reported in the 2011 census. This area has a varied climate which plays a vital role in agricultural production ranging from cereals including maize, and vegetables such as potatoes, tomatoes, cabbage and onion. Tsolo town normally receives about 599mm of rain per year, with most rainfall occurring mainly during mid-summer. The rainfall pattern suggests that this area is well suited for maize production although the Eastern Cape Province as a whole contributes less than 5 percent of South Africa's harvest. Maize production dominates rain-fed cropping systems of small scale farmers in the Eastern Cape Province (EC) in South Africa (Hebninck & Monde, 2007).

Data and sample selection

In order to select sample households, multi-stage sampling technique was followed. In the first stage, the study district was purposively selected from the OR Tambo Municipality based on the extent of maize production. In the second stage, four villages, namely Ntshiqo, Nombizo, Manka and Crosbow were selected to represent the study area. Finally, 120 sample farmers were selected for in-depth study. Snowball sampling was employed to identify households that produce maize; once a household has been identified, it was easier to indicate who produced maize as they knew who engaged in what activity in the community.

Primary data was used in this study and was collected through field survey and household interviews using a structured questionnaire. The study selected three questions each for the four psychological characteristics and used it to develop the PsyCap questionnaire which was administered to the target farmers. A 4-point Likert-type scale (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree) was used to scale each question.

Respondents were asked to indicate their level of agreement in response to the 12 farmers' psychological capital statements, where "1" being strongly disagreed and "4" being strongly agree. Farmers socio-economic variables, institutional characteristics were also collected to show how the jointly affect farmers performance.

Method of data analysis

Descriptive data analysis in the form of means, standard deviations and percentages were used to summarize the socio-economic and institutional characteristics in the study area. SPSS software was used for the descriptive analysis and was useful in analyzing positive psychological and household characteristics as well as the relationship between variables. The technical efficiency and its determinants were analyzed using Data Envelopment Analysis (DEA) and multivariate ordinary least square (OLS) method respectively.

Technical efficiency analysis using Data Envelopment Analysis (DEA)

Technical efficiency analysis is the ratio from actual productivity and frontier productivity. It, therefore, requires technical data for analysis. In this study, input-oriented analysis was applied to minimize inputs use of decision making units (DMUs) and still achieve the given current level of maize yields. If a DMU's actual productivity is equal to frontier productivity or lies on the frontier, it is perfectly technically efficient. On the contrary, if a DMU's actual productivity is less than frontier productivity or lies below the frontier, it is technical inefficient.

Estimation of technical efficiency follows non-parametric and parametric techniques. The non-parametric technique constructs frontiers and measures efficiency relative to the constructed frontier using linear programming techniques such as Data Envelopment Analysis (DEA). The parametric technique estimates frontiers and provides efficiency using econometric methods such as Stochastic Frontier Approach and distance functions. The conventional approach to the estimation of production functions consists of first specifying a parametric form for the function and then fitting it to observed data by minimizing some measure of their distance from the estimated function (Banker and Maindiratta, 1988). Statistical tests are performed by postulating again a parametric form for the distribution of the deviations of observed data from the fitted production function. The fundamental weakness of this approach lies in its inability to theoretically substantiate or statistically test the maintained hypotheses about the parametric form for the production function and the postulated distribution for the disturbance term. Furthermore, it is not immediately apparent what restrictions these hypotheses impose on the production correspondence (Javed et al., 2008). Charner et al. (1978) described DEA as a mathematical programming model applied to observational data that provides a new way of obtaining empirical estimates of relations-such as the production functions and/or efficient production possibility surfaces-that are cornerstones of modern economies. Formally, DEA is a methodology directed to frontiers rather than central tendencies. Instead of trying to fit a regression plane through the center of the data as in statistical regression, for example, one floats a piece wise linear surface to rest on top of the observations. Because of this perspective, DEA proves particularly adept at uncovering relationships that remain hidden from other methodologies.

Thus, DEA has main advantages in terms of not requiring the assumption of a functional form to specify the relationship between inputs and outputs, and the assumption about the distribution of the underlying data (Coelli 1995; Krasachat, 2003). DEA efficiency measures are relative, as they refer to the sample they are calculated from. These relative rankings can be fragile if the number of firms in the sample is small relative to the number of outputs and inputs being considered (Andreu, 2008). In this study the number of farms was larger than the rule-of-thumb benchmark, M×N, where M is the number of outputs and N is the number of inputs. Overall, DEA's flexibility in accommodating multiple outputs and inputs in different units with no need to express a specific technical relationship among them has been seen as an advantage. According to Coelli et al. (1998), it is necessary to select orientation from input oriented DEA model or output oriented DEA model according to which quantities the decision maker has more control over. Smallholder farmers in the study areas have more control over inputs than outputs. Accordingly, input oriented DEA model will be used in the study. Besides, it is pointed out that constant return to scale (CRS) DEA model is only appropriated when all firms are operating at optimal scale. However, it is not possible to hold this assumption in agriculture in the study areas since smallholder farmers face constraints. As a result the variable returns to scale (VRS) and constant return to scale (CRS) DEA models were both applied for this study.

The outcomes of DEA of this study were efficiency scores which represent performance indicators as 1= best performance and 0= worst performance. The best of efficient DMUs lie on the frontier while the inefficient ones lie below the frontier. The efficient DMUs can be considered as benchmark of the inefficient DMUs. The inefficient DMUs can improve their performances to reach the efficient frontier by decreasing their current input levels (Cooper et al., 2006).

Estimating the Impact of Farmers' entrepreneurial spirit on Efficiency

The impact of entrepreneurship measured by positive psychological capital on technical efficiency was estimated using a robust Ordinary Least Squares (OLS) because of its characteristics of being unbiased and consistent estimator (McDonald, 2009). The impact of perceived farmers' positive psychological capital on the level of technical efficiency can be determined by establishing the relationship between the estimated average scores derived from Likert scaling of responses for each farmer's psychological capital and the computed technical efficiency scores. Following Bravo-Ureta and Rieger (1990), Bravo-Ureta and Pinheiro (1997) and Padilla-Fernandez and Nuthall (2001), the second step estimates the relationship between the dependent variables (technical efficiency), and farmers goals and the different farm/farmer characteristics. An OLS regression is performed and Durbin-Watson statistic is estimated to determine the extent of autocorrelation problem (Obi and Chisango, 2011). The linear model for individual farmer is estimated as:

$$T.E = \beta_i X_i + e_i \qquad (1)$$

Where $T.E$ =technical efficiency scores; X_i is a vector of explanatory, β_i = Coefficients and e is the error term. Empirically, to estimate the relationship between technical efficiency, and perceived farmers' psychological capital and key socio-economic variables, the multiple linear OLS model used generated technical efficiency scores as a dependent variable regressed against the total average scores of farmers' psychological capital (i.e. the item scores or farmers' psychological capital measured using the Likert scale) along with the other explanatory variables. The linear model is estimated as shown below for each farmer.

$$Y = \beta_0 + \beta_1 HUSHDSZE + \beta_2 AGE + \beta_3 FARMSIZ + \beta_4 FERTKILO + \beta_5 LABWRKDY + \beta_6 YRSSCH + \beta_7 YRSORGMEMB + \beta_8 SELF\text{-}EFFICACY + \beta_9 RESILIENCE + \beta_{10} OPTIMISM + \beta_{11} HOPE + e \quad \text{......}(2)$$

Where Y	=	Technical efficiency scores
E	=	Error term
β_0	=	Constant (intercept)
$\beta_1 \ldots \beta_{25}$	=	Regression coefficients
HUSHDSIZE	=	Household size
AGE	=	Age of the household head
FARMSIZ	=	Farm size for maize (ha)
FERTKILO	=	Amount of fertilizer used (kg)
LABWRKDY	=	Work-days of labour used
YRSSCH	=	Years spent in school (Human Capital)
YRSORGMEMB	=	Years of organizational membership (years)
SELF-EFFICACY	=	Self-confidence level of farmers
RESILIENCE	=	Failure tolerability of farmers
OPTIMISM	=	Need to success of farmers
HOPE	=	Will to succeed spirit of farmers

Results

General characteristics of the households and farmers psychological capital

Table 1 summarizes the characteristics of the studied households. The descriptive analysis revealed an average yield per hectare was 1016.3kg. The average yields was obtained by using 170.4kg of fertilizer, farm size of 1.3 ha and work-days of labour of 4.3. The mean household size was 5.7 (S.D=2.37) with minimum and maximum of 2 and 6 respectively. The results confirm that, the bigger the household size, the more its supply of family labour and less the cost of hiring labour. The study results are consistent with the findings of earlier studies (Collinson, 2000) that a larger household size tends to supply family labour for farming and as a result lowers the cost of hiring labour which may be expensive. The average age was 53 years with the minimum and maximum of 36 and 89 years respectively.

This indicates that farming in the area is chiefly practiced by older people. This can be attributed to the fact that, younger household heads migrate to Mthatha, Durban, Cape town and other surrounding cities to have better employment opportunities and sources of income other than farming.

The present finding is consistent with the finding of Jacinta Lemba et al., 2011 that younger and more educated populations are more likely to migrate to urban centres in search of non-farm employment opportunities which offer a higher and more stable income. These empirical results also agree with an observation by Beniam et al. (2004) that, the older a farmer gets, the more experienced he or she is. It was observed that older farmers appeared to be more efficient than younger farmers due to the good managerial skills they have learnt over time (Essilfie et al., 2011) and also their efficiency in resources and certain agronomic practices (Beniam et al., 2004). The results show a mean of 3.01 years of organizational membership and standard deviation 2.99 with minimum and maximum of 0 and 10 respectively. Farmers affiliated to organizations better access extension services than non-members.

The average level of education was 8.6 (S.D=6.28) years of schooling with a minimum of 0 and maximum of 20 years. This suggests that the level of education of the sample was low with many farmers not having managed to complete secondary education. These findings are in support of Bembridge (1988), who indicated that education levels of smallholder farmers are generally low in South Africa. Educated farmers are able to apply better farming methods, utilize input efficiently and also better placed to try newer forms of farming. The result presented show averages of the scores from the four measures for positive psychological capital. Self-efficacy was scored the highest with a mean of 3.6 (S.D=0.51) followed by failure tolerability (resilience) and hope scoring an equal mean of 3.58 (S.D=0.50). The least scored psychological characteristic is optimism (mean= 3.47, S.D=0.50) with the minimum and maximum score of 3 and 4 respectfully.

Table 1: Description of households' characteristics of sampled farmers as used in the DEA and OLS model

Variables	Description	Min	Max	Mean	Std. Dev.
Yield (Kg)	Maize yield (bags/ha)	250	5200	1016.25	721.99
Age	Age of the farmer (yrs)	36	89	52.83	9.13
Years in school	Education level (years)	0	20	8.61	6.28
Household size	Size of the household	2	16	5.72	2.37
Fertilizer usage (kg)	Fertilizer used per ha	0	300	170.42	91.78
Work-days of labour	Hired and family labour	0	14	4.28	2.67
Years of org. member	Years of membership	0	10	3.01	2.99
Farm size	Farm size per farmer	1	13	1.31	1.17
Self-efficacy	Self-confidence	2	4	3.60	0.509
Resilience	Failure tolerability	3	4	3.58	0.496
Hope	Will to succeed	3	4	3.58	0.496
Optimism	Need to succeed	3	4	3.47	0.501

Source: Field survey (2013).

Technical Efficiency of Maize Farms

Table 2 gives the frequency distribution of the maize farms based on CRS and VRS technical efficiency estimates obtained by DEA method. Out of 120 maize farms studied, 18 farmers under CRS and 52 farmers under VRS were highly efficient within 0.91-1. Results further show 43 farmers under CSR and no farmer under VRS operating below the efficiency score of 0.41. The greatest efficiency score was found to be 1 and lowest to be 0.12 under CRS while greatest and lowest were 1 and 0.62 under VRS. The results showed a mean technical efficiency of 0.89 under VRS. This indicates that if the average farmer in the sample was to achieve the technical efficiency level of its most efficient counterpart, then the average farmer could realize 11 percent cost savings. This indicates that there was an amount of technical inefficiency in maize production.

The observed difference between CRS and VRS measures further indicate that some of the farmers did not operate at an efficient scale and improvement on the overall efficiency could be achieved if the farmers adjusted their scales of operation until it reaches the level where it is only inefficient under CRS conditions. From then on it can increase technical efficiency only by changing the technology (Lemba et al., 2012).

Table 2: Frequency and percentage distribution of technical efficiency estimates of maize producers

Technical efficiency range	**CRS-TE**		**VRS-TE**	
	Frequency	**Percent**	**Frequency**	**Percent**
≤0.20	4	3.3	-	-
0.21-0.30	18	15	-	-
0.31-0.40	21	17.5	-	-
0.41-0.50	20	16.7	-	-
0.51-0.60	14	11.7	-	-
0.61-0.70	15	12.5	4	3.3
0.71-0.80	6	5	27	22.5
0.81-0.90	4	3.3	37	30.8
0.91-1.00	18	15	52	43.3
Total	120	100	120	100
Minimum	0.12		0.62	
Maximum	1.00		1.00	
Mean	0.54		0.89	

Source: Model results 2013

The OLS result of the determinants of technical efficiency (TE)

Given the difference in efficiency levels among farm units, it was appropriate to determine why some producers can achieve relatively high efficiency whilst others were technically less efficient. Variation in the TE of producers may arise mainly from farmers' entrepreneurial spirit level and other factors as socio-economic and institutional characteristics. The parameter estimates for the efficiency model presented in Table 3 suggest a number of factors which may explain part of the variation in observed efficiency levels.

Previous studies (e.g. Obi and chisango, 2011; Aye and Mungatana, 2012) and the present one attempted to investigate the effect of some factors (determinants) influencing the technical efficiency of farmers using the ordinary least square (OLS). The results of the OLS model are presented in Table 3. The table shows the estimated coefficients, standard error, t-value and the significant levels (p-values). According to Gujarati (1992), coefficient values measures the expected change in yield for a unit change in each independent variable, all other independent variables being equal. The sign of the coefficient shows the direction of influence of the variable on the OLS. The results showed an adjusted R^2 value of 0.680 and point to the fact that, at least, 68 percent of the variations in maize yield are explained by the variation of the independent variables predicted and estimated to affect yield and technical efficiency. The closer the Adjusted R^2 values to 1, the better the fit of the estimated regression line. According to Kisaka-Lwayo and Obi (2012), the less explanation of the relationship between the dependent and explanatory variable results (low R^2 value) is mostly related to discrete choice models.

The results display the estimates for the OLS regression to explain the socio-economic factors and institutional characteristics influencing the technical efficiency of maize producers. The results indicate that, of the 11 variables included in the model, only 6 showed significance (i.e. fertilizer quantity, farm size, years of schooling, household size, labour usage and hope level of farmer). Farm size showed positive and the most important variable influencing technical efficiency of farmers in the area. The positive sign indicates that an increase in farm size is expected to increase technical efficiency. This result contradicts earlier findings that, the smaller the farm size, the easier it is for smallholder farmers to manage the farm well (Salau et al., 2012). However, the result is consistent with the result of the findings of Peterson (1977) in the Corn Belt States in the USA, which indicated a positive influence of farm size on technical efficiency. The present results indicate that farmers with larger farms make better use of economies of scale and have the opportunity to be efficient in production. Fertilizer showed positive and significant factor which indicate that the use of this factor was profitable and as such a unit increase in this inputs will eventually result in an increase in maize output of the farmers. This result confirms the findings of Geta et al., 2013 who established a positive and significant effect of fertilizer on maize yield and showed that farmers who apply higher rates of chemical fertilizer receive higher maize yield. Therefore, increasing the level of fertilizer use would significantly increase maize productivity. Labour was significant and positive with respect to efficiency. This result confirms the findings of other studies (e.g. Geta et al., 2013) that increase man-days of labour use will lead to an increase in farmers' efficiency indicated in production. Household size is positive and significant at 1 percent level, which makes it the one of the most important variables. This means that household size is positively related to technical efficiency and that an increase in household size will results in an increase in farmer's technical efficiency and vice versa. As a result, it eases the labour constraint faced by most smallholder farms. The result of the present study is consistent with the findings of Dimelu, et al. 2009 that large household size is a source of labour for most farm operations. Earlier literature (e.g. Essilfie, et al. (2011) on the other hand disagree with the present finding and claims that large household size increases the population pressure on the farmers' limited resources due to increase in household spending on health, food, education, clothing etc and thereby reducing the timely operation of farming activities. This implies that, household size provides access to family labour which is an important catalyst for increasing yield and technical efficiency.

The estimated coefficient of schooling years is negative and statistically significant at 1% and it contradicts with the finding of Oyewo et al. (2009) that farmers with more years of formal education tend to be more technically efficient in maize production, presumably, due to their enhanced ability to acquire technical knowledge, which makes them closer to the frontier output.

The results show that of the four variables measuring farmers' entrepreneurial spirit, only hope was indicated to be significant at 10 percent. Hope showed a positive sign and implies that as the hope level of farmers increased, their performance in productivity also increases. Farmers' goals which are sometimes referred to as aspirations individuals strive to achieve to maximize utility (Obi, 2012) may be influenced by the hope level of farmers'. According to the table, self-efficacy, resilience and optimism were estimated to be the least effective psychological characteristics with regards to the entrepreneurial spirit of farmers. This finding is consistent with the result of contradicts the work of Khosravipour and Soleimanpour (2012) who ranked optimism and self-efficacy as the most effective psychological capital in entrepreneurial spirit.

Table 3: Multivariate regression (OLS) results

Variable	**Coefficient**	**Std. Err.**	**T**	**P-value**
FERTKILO	1.885	0.590	3.192	0.002***
FARMSIZ	410.660	35.030	11.723	0.000***
LABWRKDY	35.035	20.312	1.725	0.087*
AGE	-6.360	4.923	-1.292	0.199
YRSSCH	-23.764	9.039	-2.629	0.010***
HUSHDSIZE	74.082	17.286	4.286	0.000***
YRSORGMEMB	-13.764	18.248	-0.754	0.452
Selfconf	6.034	80.553	0.075	0.940
Failtole	60.193	84.275	0.714	0.477
Needsucc	104.709	81.067	1.292	0.199
Hope	134.996	80.783	1.671	0.098*
(Constant)	49.574	562.697	0.088	0.930
R-squared		0.710		
Adj R-squared		0.680		
Durbin-Watson		1.93		
F(11,108)		24.012		
P-value		0.000(0.000)***		

Source: Model results. (***, **, * are 1, 5 and 10% significant levels respectively).

Conclusion

This study investigated the technical efficiency of farmers in Mhlontlo local municipality to identify the key positive psychological capital variables and socio-economic factors which influenced their efficiency. DEA (data envelopment analysis) was used to compute the farmers' technical efficiency and OLS to assess the key determinants of technical efficiency among farmers in the municipality. The DEA results showed that farmers from this area had a mean technical efficiency score of 0.62 and 0.89 under CRS and VRS respectfully. The result showed high technical efficiency among farmers in the area but poverty and livelihoods of the people are still low probably due to uneconomic scale of production. The farmers in the area operate with a small-land holdings that output is not sufficient to lift their standard of living. This means that, increase in their scale of production would as well increase their production and improve their standard of living. The analysis of the determinants of the technical efficiency revealed socio-economic variables such as quantity of fertilizer, household size, labour use, years in schooling and farm size as significant and important with regards to farmers' efficiency in the study area.

Recommendations

The recommendations discussed below are made on the basis of the findings of this study. The farmers in this area showed a high technically efficiency in maize production but interestingly continue to experience poverty and food insecurity. This calls for the intervention of both government and non-governmental agencies to assist farmers in this area. The poverty and food insecurity issues may be due to farmers operating on small arable land probably as a result of lack of finance to purchase enough farm inputs including land to increase their scale of production. This will ensure that people in rural areas, specifically small-scale farmers who practice subsistence farming, and are mainly found in the Eastern Cape Province, improve their standard of living. The study encourages policies that will make agriculture credit from government and NGOs available to these farmers in addressing their resource acquisition problems especially farm lands and other important farm inputs such as fertilizer and labour. In addition, sufficient education should be giving to farmers to enable them to make timely decisions on the allocation of farm inputs and general management. Educated farmers are better managers meaning that they produce closer to their production frontier. Also experienced farmers should be encouraged to remain in farming through motivational rewards from government. This will as well encourage the youth to enter or remain in the field of agriculture.

It also recommended that extension officers in the Eastern Cape Department of Agriculture intensify their efforts to assist small-scale farmers to overcome the challenges of the economies scale by supplying basic production factors as fertilizers and seeds and tractor services at a subsidized price. Lastly, concerted efforts aimed at removing the bottlenecks that have constrained effective policy implementation and its accrued benefits in the South Africa agriculture are needed from all the stake holders. There is the need for private sector involvement to fill gaps in input supply and inadequate facilities for haulage of inputs and outputs to facilitate market access in order to provide positive incentive to farmers to expand production.

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