

# Factors Influencing Rain-Fed Agricultural Land Abandonment in Mngquma and Mbashe Municipalities, Eastern Cape



Mzuyanda Christian, Phiwe Jiba, Mdoda Lelethu

**Abstract** Agriculture is one of the imperative segments in the South African economy and it remains the imperative sector for livelihood generation. However, it has been observed that farmers are gradually giving up agriculture in favor of non-agricultural activities. This paper examines the factors influencing agricultural land abandonment in Mngquma and Mbashe Municipalities in Eastern Cape Province. Surveys of 158 semi-structured field interviews were conducted to capture household characteristics, location and farming practices in the study areas. The findings show that limited access to funding, level of education, household size and farming experience seem were the main factors influencing abandonment of rain-fed agricultural land. Another notable reason for agricultural land abandonment was the lack of resources such as storage facilities, transport and access to lucrative markets. Therefore the study recommended that government policies should go beyond supporting primary production and focus also on value adding activities. One of the findings indicated that these areas are dominated by older people (55 years). The study also recommended that focus should be directed on more manageable small plots for older people to increase food production.

**Key words:** Rain-fed, Agricultural land, Abandonment, Probit regression, Eastern Cape

## I. INTRODUCTION

Agricultural land remains an important economic and social asset for both rural and urban areas in South Africa [1]. As an economic asset, land remains the major source of employment and livelihood. As a social asset, land is a source of socio-cultural identity and the basis for the construction of families and ethnic groups. As important as it is, agricultural land has been abandoned in some parts of the Eastern Cape and KwaZulu Natal over the years [2]. In addition, under-farming also appears to be evident in the more disturbed communal areas of other provinces across the country.

According to Andrew *et al* [2], the process of land abandonment in the former homelands of Transkei began in the 20<sup>th</sup> century and accelerated in the 1960s and 1970s. A wide range of possible reasons for land abandonment has been given by different authors throughout the literature. These include shortage of labour to male absence in the household, too much domestic responsibilities by female farmers and issues of urbanizations.

Another explanation provided is that the low yields obtained as a result of prolonged droughts, longer dry spells, limited water availability, degraded soils and low farming techniques [3]. Sadly, it has been projected that the South African population is expected to grow from 59 million to about 82 million by 2035 [4] [5]. This basically means that, in order to feed the projected increase of persons, food production has to be increased also under social, climatic and land use constraints [6]. The one viable approach to this is to revive the unused land to full production accompanied by efficient use of complementary resources such as improved technology while at the same time reducing environmental impact. Previous studies indicated that agricultural land has been treated as a phenomenon involving negative and positive effects [7] [8] [9]. Other study indicated that climate change, soil erosion and reduced water yield of catchment are some of the most conspicuous issues that have been addressed in Africa while in Europe it is a foremost ecological hazard to the European regional assembly, as an extensive region has been pretentious by agricultural land abandonment [10] [11]. The above mentioned studies were based in countries like Spain which has high land use heterogeneity due to its topographic and climatic spatial variability and a long and complex human history. In view of the fact that there is insufficient evidence of factors influencing the agricultural land abandonment in South Africa, the study aims to analyze factors influencing rain-fed agricultural land abandonment in Eastern Cape. The study is focused on communal areas of Mngquma and Mbashe municipalities.

## II. MATERIALS AND METHODS

### A. Study areas

Two areas of Amathole District in Eastern Cape were identified for the purpose of the study. These two areas were chosen because of the bulk of land laying fallow and abandoned. The first study area is Mngquma municipality which consists of three towns namely: Nqamakhwe, Butterworth and Centane.

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The three villages are under different village heads but they all fall within the jurisdiction of one chief – chief Nkosi Zanokhanyo Bikistha. The population size is about 252 39 people [12]. The agricultural potential of Mmquma is enriched by diverse climatic conditions, which promote farming for various agricultural enterprises. The main enterprises include livestock (cattle, sheep and goat) and crop (maize and various vegetables) under irrigation.

Communities in this area are living under extreme poverty, highly dependency on grants and high unemployment. Farming is believed to be the main source of their livelihood. The second area is Mbashe which consist of three towns namely: Elliotdalle, Willowvale and Idutywa. The municipality is located in the North Eastern part of Amathole District. The main administrative office of the area is situated in Idutywa [13]. The municipality has a population of 254 909 and unemployment rate of 42% [14]. About 40% households rely on agriculture for their livelihood.

**B. Sampling procedure**

A multistage sampling was used in the selection of the study population. At the first stage, Mmquma and Mbashe municipality were purposively selected. The reason for selecting these areas is that these two municipalities make up the largest agricultural households within Amathole Districts. The municipalities combined consist of 62 Wards (31 Wards in each). Three wards were randomly selected from each unit at the second stage. The third stage involved the simple random selection of two villages in each ward. A cross-sectional household survey was therefore carried out in selected villages. A total of 158 farming households were visited for data collection.

**C. Data collection**

Primary data was collected using both qualitative and quantitative methods. Data was collected through a single-visit farmer survey and a household survey using a structured questionnaire. This was done in the form of face to face and self-administered questionnaire between 2017/2018 seasons. The questionnaire was first pre-tested with 10 farming households to determine its effectiveness and validity. Feedback from the pre-testing exercise enabled the researchers to identify questions that were confusing to respondents and those that could lead to bias answers. The questionnaire was then revised, improved, finalized and ready for distribution by researchers and enumerators.

**D. Data analysis and variables**

Data entry, data cleaning, management of missing data and descriptive analysis were done using STATA software for examination and interpreted for both qualitatively and quantitatively. The study made use of descriptive statistics such as means, ordinary deviation, and occurrence distribution to capture smallholder farmer’s features. Thereafter, probit model was used to examine the factors influencing agricultural land abandonment by farming households in Mmquma and Mbashe.

**E. Analytical Framework**

This study adopted the Probit model to factors influencing agricultural land abandonment by farming households in

Mmquma and Mbashe. The method has been used for instances where the calculation of the existence or lack of a consequence established on standards of an agreed forecaster variables required. Chauke et al. [15] stated that Probit regression measurement is used mostly to estimate likelihoods relations for all of the autonomous variables in the model. The Probit regression model is suitable to a wider variety of exploration circumstances than discriminate examination. The word “Probit” represents the ordinary logarithm of the probabilities (log likelihoods) which stipulates the likelihood of declining interested in one of two groups on specific flexible of concentration [16]. The regression scrutiny comprises two distinct substitutes and at this case, land abandonment by farmers is a qualitative reliant on variable where it takes the values 0 and 1, which is binary.

In this paper, two choices existed and accessible, specifically “abandoned land” or “not abandoned” a twofold regression was established up to explain Y =1 for a state anywhere the farming has been abandoned and Y =0 for otherwise. This can be measured as follows:

$$p(Y = 1) = \frac{e^{\beta x}}{1+e^{\beta x}} \dots\dots\dots 1$$

$$p(Y = 0) = 1 - \frac{e^{\beta x}}{1+e^{\beta x}} = \frac{1}{1+e^{\beta x}} \dots\dots\dots 2$$

Where:

Calculation (2) is the lower answer level, that is, the prospect that wool abandons their land; this will be the likelihood to be demonstrated through the probit technique by settlement. Together, the calculations illustrate the effect of the probit alteration of the likelihoods proportions which can otherwise be symbolized as:

$$\log it [\theta(x)] = \log \left[ \frac{\theta(x)}{1-\theta(x)} \right] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots\dots\dots + \beta_n X_n \dots\dots 3$$

Besides thus permitting its approximation as a linear model for which the ensuing descriptions apply:

Θ = probit alteration of the likelihoods ratio; = the intercept term of the model

β = explanatory variables exhibited and

Xi = forecaster variables.

The previous processes were possible within the STATA. In relative to Calculation (3), the examination created the odds relations exhausting the supreme probability technique. The probit regression in this study can be stated as follows:

$$Y_1 = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \dots\dots + U_n \dots\dots\dots 4$$

Where:

Yi (land abandonment) = the reliant on variable distinct as the admission to abandonment by farmers = 1 and 0 otherwise, α = constant and capture of the equation

β = slope of the discrete predictor (or instructive) variables demonstrated

X i = forecaster variables.

U<sub>n</sub> = correction error term.



F. Data

**Table 1: Hypothesised influential factors of formal market participation**

Variables	Description	Unit of measurement
Dependent variable		
Agricultural land abandonment	1 if a household abandoned agricultural land, 0 otherwise	Dummy
Independent variables		
AGEH	Age of household head	Continuous
Sex	Sex of household head	Categorical
MRT	Marital status of household head	Categorical
HSIZE	Household size	Continuous
LSZ	Land size	Continuous
NYFE	Level of education	Continuous
ANFI	Level of income	Continuous
FLG	Farmland area geographic	Categorical
CA	Credit access	Categorical
OWNL	Ownership of Livestock	Continuous
EOW	Farming equipment ownership	Categorical
AEXT	Access to extension services	Categorical
FEXP	Farming experience	Continuous

**III. RESULTS AND DISCUSSION**

**i. Demographic characteristics of farmers in the study area**

Demographic characteristics are imperative when it comes to understanding farmers and households living conditions

and practices so that one can be well informed of the study area. Table 2 outlined demographic and socio-economic characteristics of farming households, they are important to understand the and factors influencing agricultural land abandonment in the household level.

**Table 2. Demographic and socio-economic characteristics of farming households in Mnquma and Mbhashe**

Characteristic	Description	Frequency	Percent
<b>Marital status</b>	Single	31	19.62
	Married	88	55.70
	Divorced	4	2.53
	Widowed	53	22.15
<b>Sex</b>	Male	<b>91</b>	<b>42</b>
	Female	<b>67</b>	<b>58</b>
<b>Farm land area</b>	Mnquma	<b>77</b>	<b>48.73</b>

	Mbashe	<b>81</b>	<b>51.27</b>		
<b>Access to credit</b>	Yes	<b>40</b>	<b>25.32</b>		
<b>Access to extension service</b>	Yes	<b>39</b>	<b>24.68</b>		
<b>Access to equipment</b>	Yes	<b>124</b>	<b>78.48</b>		
		<b>Mean</b>	<b>Std dev.</b>	<b>Min</b>	<b>Max</b>
<b>Level of education</b>	Number of years at school	3.1	2.01	1	14
<b>Household size</b>	Number of persons	6.6	2.4	2	15
<b>Land size</b>	Land in Ha	0.69	0.51	0.12	2.5
<b>Age</b>	Age (years)	55.4	15.0	22	85
<b>Farming experience</b>	Years of involvement	32.1	16.4	1	70

The results showed that the mean average age of farmers was 55 years, which basically means that the majority of household heads participate in farming are old people. The maximum age of household heads was 85 years, (71%) were male participant. These findings suggest that agricultural activities in the rural areas are mostly practiced by older people. These results are in line with smallholder Community Survey, which reported an average age range of 45-54 years [17]. Furthermore, Zantsi [18] found similar findings about land reform beneficiaries. Table 2 also show that most households were headed by females (57%) compared to male farmers with 42%. The high number of female in farming because are the ones taking care of the households as male migrated to cities. These results agree with Chitsa [19] that farming is practiced mainly by females as men's' are migrating to cities to work on non-farm industries. This is not far fall with the literature [20]. Education is a vital force to reckon with in effective farming household performance and could inform on how best a new technology is adopted. Data was collected from farmers interviewed on their level of education and the results presented in Table 2 above. The results showed that the average mean average for a number of years spent in school was 3 and ranging from 1 to 14 years.

Table 2 showed that the overall farming experience is 32 years and ranged between 1 and 70 years. The results also noted that only 7 percent of farmers had 70 years of experience in farming. Most of experienced household heads, were able to get more productivity of crops by timely sowing of crops, avoid flood irrigation hence saving water and balanced use of fertilizers on account of their experience. The results indicated that every household had access to land either for crop or livestock production. Table 2 also indicated that the households in the study area own between 0.69 Ha to 2.5 Ha of land with a standard deviation of 0.51ha. In South Africa, agricultural extension services are the most common forms of public sector support for knowledge diffusion and learning. The concept of extension services sector involves agricultural experts, who teach improved methods of farming in both livestock and cropping enterprises, demonstrate innovations, and organize

farmer meetings and markets. In addition, smallholder farmers are the primary beneficiaries. The results in Table 2 indicated that out of all the surveyed farming households, only 25 percent had access to extension services

**ii. Distribution of farmers by land acquisition**

Distribution of land is very crucial for households as they derive livelihoods through land ownership, especially agricultural practices. Table 3 displays a clear picture as to how the land is acquired in the area. The results show that the majority of women (80%) inherited land from their grandfathers, followed by local authority (13%), is the government (4%) and only (3%) indicated that they bought the land.

**Table 3. Distribution of land**

<b>Land distribution</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Inherited	127	80
Local authority	21	13
Government	6	4
Bought	4	3

**iii. Type of Crops grown**

Practicing farming is one of the important activity in this study area because most of these respondents are not working but solely depends on working the land for living. Agricultural land is their main occupation as a result they are practicing farming in their agricultural land. The results in Figure 2 showed crops grown by farmers in the study area and farmers have multiple answers for this section. The study found out that almost 85% of respondents cultivate gardens adjacent to their homestead. These results corroborate what the existing literature says, rural households have not completely abandoned crop production; they have rather left field cultivation and focused on garden cultivation.



The results also indicated that the mainly produced products by households are cabbage (94%), maize (90%) and potato (96%) respectively recorded. All the respondents who claim to be producing in their small gardens have planted all these three crops in the previous production season. The study results found these as the least produced crops, carrots (66%), tomato (57%) and beetroot (16%) in rural areas.

These results are in line with Christian and Mdoda [17] findings that depicted most farmers in surrounding areas of Traskei are producing vegetables in their home gardens for households' purposes.

**Table 4. Crops grown by farmers**

Crops grown	Frequency	Percentage (%)
Maize	142	90
Cabbage	148	94
Potatoes	152	96.
Spinach	136	86
Carrot	105	66
Tomatoes	90	57
Beetroot	26	16

**iv. Factors affecting rain-fed agricultural land abandonment in Mnquma and Mbashe**

The results of the Probit model adopted for the study are presented in Table 3. The Pseudo R<sup>2</sup> indicates that the dependent variables in the Probit regression explained 60% variations in the agricultural land abandonment probability. This simple mean the model fit to estimate the factors influencing the agricultural land abandonment. Estimates from the model fit the data accurately as the Wald Chi-square was significant at (p<0.01). Also, the correlation coefficient between error terms was 0.0000. Among 10 variables included in the model, four were statistically significant at various levels. On one hand, household size,

farming experience and access to funding were the main factors that had a significant effect (p<0.05) on agricultural land abandonment in Mnquma and Mbashe municipalities. Moreover, level of education was found to have a positive influence and significant at (p<0.1).

Although variables such as sex, access to extension service, marital status and level of education were hypothesized to have an influence, they actually had no significant effect on the land abandonment. However the likelihood ratio statistics of 84 suggests that the estimated model is statistically significant at the 10% level and that the pseudo-R<sup>2</sup> value indicates that the equation explains 19% of the variance in agricultural land abandonment.

**Table 3. Probit regression on the factors influencing agricultural land abandonment in Mnquma and Mbashe**

Variables	Coefficient estimate	Standard error	z	P> z	[95% Conf. Interval]	
Marital status	-0.0019037	.1573319	-0.01	0.990	-.3102686	.3064612
Age	-0.0586922	.0192662	0.45	0.002***	-.0290689	.0464533
Household size	0.1518619	.058283	2.61	0.009**	.0376294	.2660945
Education	0.0334818	.0624904	0.54	0.071*	-.0889972	.1559608
Household income	0.0651	0.0362	0.43	0.000***	0.06321	0.142326
Years of farming	-0.0361868	.015532	-2.33	0.020*	-.0666291	-.0057446
Land size	-0.1544029	.238873	0.60	0.045**	-.3237796	-.6125854
Extension service	-0.192118	156.2269	-0.02	0.984	-309.3912	303.0069
Credit access	-0.972664	156.2267	0.03	0.052*	-302.226	310.1714
constant	-0.2671499	.6560202	-1.82	0.068	-1.552926	1.018626
Probit model	Sample size			158		
	LR Chi2 (9) Prob > Chi2			40.65 0.0000		

Log of Likelihood = - 84.0726	$R^2$	0.69	
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Significance level: \* =  $p < 0.05$ ; \*\* =  $p < 0.1$  and \*\*\* =  $p < 0.001$

Only those variables that had a significant effect on agricultural land abandonment by farmers in the study area are discussed. Out of 16 independent variables that were used to measuring the influence, only 9 independent variables were found to be significant and do affect agricultural land abandonment in the study area. The variables are explained below. The age of respondents had a negative coefficient and was statistically significant to agricultural land abandonment by farmers. This implies that for every year increase in a farmer's age, the likelihood of farmers' abandoned agricultural land is reduced by 0.059%. These findings agrees with Rajpar et al.[21] findings which specified that elderly farmers showed a traditional attitude toward abandoned their agricultural land in Pakistad as compared to young farmers who were more eager to abandoned and sell agricultural land and give up this for profession. These results suggests that agricultural land is part of tradition and inheritance which elderly people do not want to give up as it is their only gift they have from their forefathers.

The access to funding was statistically significantly and negatively influences agricultural land abandonment by farmers. For a unit increase in access to funding, the odds of a farmer to abandon agricultural land by 0.973%. These results suggest that farmers having access to funding are less likely to abandon agricultural land as they will prefer to invest in the land. Previous studies reported that farmers having access to credit are more likely. However, these findings showed a negative coefficient estimate of access to funding, thus a contradiction with the previous studies

The variable household size had a positive coefficient estimate and significant influence to agricultural land abandonment. This variable was associated with the available labour in a household to carry out agricultural related activities. The results indicated that 1% increase in the number of people in a household will result to 0.152% probability to abandon agricultural land. Household incomes had a positive coefficient and was statistically significant to agricultural land abandonment. The results indicated that 1% increase in the household income will result to 0.065% probability to abandon agricultural land. This implies that farmers with high household incomes tends to abandoned their agricultural land abandonment and focus on the non-farm activities which generate high income.

The variable level of education significantly and negatively influences abandonment of agricultural land. For a unit increase in years spent at school by the household head, the probability of agricultural land abandonment increases by 0.033%. These results suggest that farmers with higher level of education are more likely to abandon agricultural land and move to other high paying sectors. This implies that educated people will migrate to cities as to stay close to their work and leave land idling. Land size has a significant negative impact on the agricultural land abandonment. This

means that small farmers are more likely to sell their agricultural land abandonment and turn to non-agricultural sources of income earning. This implies that a unit increase of 1% in land size will reduce the agricultural land abandonment by 0.154%. The small farm size impedes the effective substitution of labor with farm-machinery, ultimately increasing production costs and decreasing production, and compelling small farmers to seizure to non-farm activities. Surprisingly, farming experience was found to be negatively related with agricultural land abandonment and significant at ( $p < 0.05$ ). These findings suggest that the higher the experience in farming, the probability of abandoning agricultural land decreases by 0.036%. This suggests that experienced farmers tends not keep their farming as they know the value of land and prefers to invest in land than other non-activities.

#### IV. CONCLUSION

In this paper, it was found that a large share of farm land in both Mnquma and Mbashe municipalities is not used for agricultural production as it used to be the case in the olden days. The agricultural land abandonment is not unique to these study areas, but it also cut across the Eastern Cape Province. The study results displayed that that farming is mainly practiced by female farmers with an average age of above 65 years. This means that farming is declining in the study area as majority of young farmers are migrating to cities. The majority of farmers were widowed with a household size of 7 people. Farmers have access to extension services and have access to funding which assisted in operating the farm. The majority of farmers specified that they have access to farming equipment such as government tractors, implement, inputs and draft power. The results show that, over time, agricultural land in the area was significantly reduced, confirming the abandonment of agricultural land in the study area. Agriculture has also been abandoned by farmers as an occupation, due to lack of resources such as storage facilities, transport and access to lucrative markets. The study concludes that socioeconomic and environmental factors are the main factors impeding the agricultural land abandonment in the study area. These factors were access to credit, level of education, household size, land size, household income and farming experience were identified as the major factors influencing the abandonment of rain-fed agricultural land. Therefore the study recommends that government policies should go beyond supporting primary production and focus also on value adding activities. One of the findings indicated that these areas are dominated by older people. Therefore the study recommends that focus should be directed on more manageable small plots for older people to increase food production.

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