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Assessment of socio-economic characteristics that determine farmers' access to agricultural extension services in Eastern Cape, South Africa

Loki, O.[1], Aliber, M.[2] and Sikwela, M. M.[3]

Correspondence author: O. Loki. E-mail: olwethuloki@yahoo.com

ABSTRACT

The study reported on in this paper investigated smallholder farmers' access to extension services. The study sought to distinguish the varying degrees of access to services of smallholder farmers engaged in different production systems, that is, home gardening, field cropping, and livestock production. The study was conducted in Raymond Mhlaba Local Municipality in the Eastern Cape, specifically in two communities, namely Ngcabasa and Phathikhala villages. Research activities included a survey of 100 farmers as well as focus group discussions. Employing logistic regression analysis, the study aimed to understand what influences whether or not a smallholder farmer accesses extension. The study also used various types of comparative statistics (T-test) to assess the implications of access to extension support, for instance for production and farm income. The main findings of the study were that 68% of the farming households interviewed in Ngcabasa and 71% of those in Phathikhala had access to extension services. Farmers who had access to extension had more farm income in both enterprises compared to those who had no access to extension services. From the regression analysis, farmers who were more likely to receive extension support appeared to be those who were older, those with less education, and those farming with livestock.

Keywords: Extension services, Logistic regression, Smallholder farmers, Socio-economic characteristics

1. INTRODUCTION

In South Africa, agricultural extension and advisory services are the most common forms of public sector support for knowledge diffusion and learning (Liebenberg, 2015). Extension and advisory services communicate information to farmers about livestock and cropping techniques, such as which inputs to use and how to use them. Furthermore, extension officers improve managerial skills of farmers by diffusing information on record keeping, financial and

[1] Technical and Compliance Manager, Enterprise African Regional Network, Pretoria, South Africa, Email: olwethuloki@yahoo.com, ORCiD number: 0000-0003-4187-3345
[2] Professor, Department of Agricultural Economics and Extension, University of Fort Hare, Alice, South Africa, Email: maliber@ufh.ac.za, ORCiD number: 0000-0001-8739-0379
[3] Senior lecturer, Department of Public Administration and Economics, Mangosuthu University of Technology, Durban, South Africa, Email: sikwela@mut.ac.za, ORCiD number: 0000-0001-9167-3232

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farm operations, further improving the commercial potential of agricultural production (Conradie, 2016; Hlatshwayo & Worth, 2016; Zwane, 2016).

Recent studies appear to suggest that extension and advisory services face major challenges in the areas of relevance, efficiency, accountability and sustainability (Department of Agriculture, Forestry and Fisheries (DAFF), 2014; DAFF, 2016). Many argue that this is because of limitations of a bureaucratic 'one size fits all' approach of government trying to meet all the various, specialised needs of farmers (Liebenberg, 2015; Uddin, Gao & Mamun-Ur-Rashid, 2016). A number of studies reveal that ever since the bureaucratic changes in policy and agricultural structure in 1994, there is no evidence to suggest any improvements in agricultural extension and the discipline of agriculture in its entirety, but there has been a noticeable decrease (Conradie, 2016; Hlatshwayo & Worth, 2016). This is further aggravated by the poor development or change in their farming output of smallholder farmers who purely depend on extension services for agricultural support (Agholor, 2012).

The overall objective of the study was to investigate socio-economic characteristics that determine whether or not a farmer has access to extension services in Raymond Mhlaba Local Municipality in the Eastern Cape Province.

2 LITERATURE REVIEW

The history of smallholder agriculture in South African is relatively well documented and its foundation and premise is well understood. Farming in South Africa dates back to long before the arrival of Jan van Riebeeck and other European settlers (Thompson, 2000). Farming was the responsibility of both men and women, where men were tasked with the hard work of ploughing and use of oxen-drawn planting, whilst women and children were responsible for sowing, irrigating and harvesting (Liebenberg, 2015). Following the arrival of European settlers, there was a long history of conflict on land acquisition and disempowerment of African farmers began (Terreblanche, 1998; Tihanyi & Robinson, 2011).

A number of Acts and reforms were introduced by the then government, but arguably the one Act that drew a vivid line between white and black landholding and prohibited any transactions for the purchase, hire or acquisition of land to black people is the Natives' Land Act of 1913. This Natives' Land Act and other reforms that were established did not just widen the dualistic gap that existed between smallholder and large scale farming in South Africa, but virtually demolished a once thriving African farming sector. Furthermore, the segregation of the African farming sector is the source of many of the problems we face in agriculture today.

To this day, in post-colonial and apartheid regimes, black smallholder farmers are conflicted with a number of challenges that impede not only their production, but sustainability and contribution to food security and the country's Gross Domestic Product (GDP) (Pienaar, 2013). Challenges such as use of less capital in production, lack of access to production inputs, cultivation on small pieces of land, inability to use advanced technology, minimal access to information on potential markets for farm produce, and minimal access to information on

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technologies that can help boost production and profitability remain the differentiating factors between them and large commercial farmers (Abdu-Raheem & Worth, 2012; Ngemntu, 2010; Sikwela, 2013).

As alluded earlier in South Africa, the dualistic structure of agriculture persists. White commercial farmers are thriving and contribute to the country's GDP, while black smallholder farmers still face historical challenges that reduce their contribution to household food security (Aliber & Hall, 2010; Hall & Kepe, 2017). However, the last two decades have seen the smallholder sector receive more attention from agriculture policy makers (Sikwela, 2013). Despite much attention being paid to smallholder farmers, there has not been any development nor change in their farming output. There is evidence from a number of studies that agricultural production and income are not improving amongst the black smallholder population and that most of these farmers are located in marginal areas (Pienaar, 2013; Sikwela, 2013).

After 1994, agricultural extension services were set up to help transition smallholder farmers from the quarry of the colonial and apartheid regimes to a more sustainable sector with commercial prospects. However, it appears to be the case that the agricultural extension and advisory sector is still confronted by a number of inadequacies. It is even asserted in the national policy of extension services that "extension and advisory services face major challenges in the areas of relevance, efficiency, accountability and sustainability" (DAFF, 2014:2). Further evidence in terms of performance of extension services is in the case of smallholder farmers who purely depend on public extension for knowledge and skill. Literature reviewed suggests that there have not been any developments nor change in their farming output. There is evidence from a number of studies to suggest that agricultural production, productivity, farm income and technology adoption are not improving amongst the black smallholders (Ngemntu 2010; Sikwela, 2013).

3. METHODOLOGY

3.1 Study area and data collection

The study was undertaken in two communities in what was known as Nkonkobe Local Municipality, which later became the larger part of Raymond Mhlaba Local Municipality. The two communities were Ngcabasa and Phathikhala villages. The compelling reason for their selection was that the majority of households practice agriculture, both crop and livestock enterprises (Didiza, 2014). The two villages are geographically apart from each other and thrive under different socio-economic and climatic conditions. In the event that the findings from the two villages are similar, the distance between the two villages gives one confidence that the findings are likely applicable to many if not most communities in the area.

The study employed a quantitative research approach as this was important to provide a clear conclusion of the data collected. A purposive sampling technique was employed to select 100 farming households, given the absence of any sampling frame from which farmers could have been randomly selected. The technique permitted the researcher to actively select a sample with qualities and experiences that can enrich the understanding to answer the research question. In

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both communities, households that had evidence of any agricultural activity in their respective homes were interviewed, such as a home garden, recently used fields, or a kraal. A standardised questionnaire was developed comprising mainly of closed-ended questions, but also some open-ended questions. Where necessary, the responses to open-ended questions were coded to allow for their quantification.

A binary logistic model was used to identify what characteristics determine a farmer's access to extension services. The binary logistic regression model was chosen since it allows one to predict the impact of independent variables on a dependent variable. Ten independent variables such as access to land, age of the farmer, and other demographic characteristics were regressed against the binary variable (independent variable) of whether or not the farmer had access to extension services in the previous 12 months. The binary variable yi was defined as follows: Where yi = access to extension services (represented by 0, 1). $yi = 1$ if farmer i had access to extension; $yi = 0$ if farmer i did not have access to extension services. Following the approach by Gujarati (1992), the model was expressed as follows:

Ln ((P(Y = 1|x))/1-P(Y = 1|x)) = α + β1*Age + β2*Gender + β3*Level of education + β4*Employment status + β5*Household size + β6*Agric income + β7*Farming Systems+ β8*Field cropping + β9*Livestock production + β10* Farming for HH consumption + Ri+$\mathcal{E}t$.

Table 1 provides descriptions of each of the explanatory variables and how they relate to the dependent variable (access to extension services). The units of measurement of the explanatory variables are provided in the second column and the expected outcome (relationship between variables) is provided in column four.

Table 1: Descriptions of explanatory variables and their hypothesised relationships to the dependent variable

Explanatory variable	How it is measured	Hypothesis	Expected outcome
Age	Years (categorical)	Extension officers are more inclined to visit older farmers with the aim of bringing new technologies (Bester, 2008).	+
Gender	0 = female 1 = male (dummy)	Extension officers are biased towards male-headed households (Makara, 2010).	+
Level of education	0 = no education 1 = primary 2 = secondary 3 = tertiary	Educated households do not see the need or use of extension officers (Dlova, 2001).	-
Employment status	0 = unemployed 1 = employed (dummy)	Employed households do not see the need for farming and perspective of extension officers towards employed households is that they do not have time for farming (Tshuma, 2009).	-

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Household size	Number of household members	An extension officer may visit a household with only one person in it. And extension officer may visit household with more than one person.	-
Agricultural income	Sum of cash income from crop sales and from livestock sales	Farmers who get income from their farm operations would insist on getting extension services (Ngemntu, 2010: Sikwela, 2013).	+
Home gardening	0 = do not practice home gardening 1 = practice home gardening	Extension officers do not visit farmers who practice home gardening.	-
Livestock Farming	0 = do not practice home livestock farming 1 = Practice livestock farmer	Extension officers visit livestock farmers only and livestock farmers make use of advice from extension officers.	-
Field Cropping	0 = do not practice home field cropping 1 = practice field cropping	Extension officers do not visit farmers who practice field cropping and field crop farmers do not make use of extension officers.	-
Farming for HH consumption	0 = Farming is not mainly for HH consumption 1 = Farming is mainly for HH consumption	Extension officers visit food security farmers.	+

Source: Field survey (2016)

3.2 Statistical analysis (T-tests)

Comparative statistics in the form of t-tests were employed in this study to further understand the impact and relationship extension services has on smallholder farmers. These tests were conducted on the agricultural income of farmers who had access versus those who did not have access to extension services. The analysis investigated the differences in income margins in both enterprises (crop and livestock) and whether or not those differences could have happened by chance or as a result of having access to extension services.

4. RESULTS AND DISCUSSION

The section looks at the empirical results of the study, paying specific attention to the performance of farmers who had access to and made use of extension services in both areas.

4.1 Demographic information of farmers in the study area

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According to Statistics South Africa (StatsSA) (2016), demographic characteristics of households are essential when analysing economic data because such factors influence the households' economic behaviour. Household demographical information is based on the characteristics of persons within that particular household that describes the epidemiology used to characterise the population at risk (StatsSA, 2016). The study examined the farmers in terms of gender, marital status, age, level of education, household size, total income, and farmers' access to extension services. The demographical information of the farmers will be discussed below with the use of Table 2.

Table 2: Demographics of respondents at the two study sites

Explanatory variables	**Ngcabasa village**		**Phathikhala village**		**Average % for the two study areas**
	N	%	N	%	
Gender					
Male	21	42	35	70	56
Female	29	58	15	30	44
Age					
0-20	4	8	5	10	9
21-40	11	22	15	30	26
41-60	18	36	20	40	38
> 60	17	34	10	20	27
Education					
No education	7	14	15	30	22
Primary	13	26	15	30	28
Secondary	24	48	17	34	41
Tertiary	6	12	3	6	9
Marital status					
Single	14	28	14	28	22
Married	25	50	22	54	52
Divorced	3	6	2	4	5
Widowed	8	16	7	14	15

Source: Field survey (2016)

As demonstrated in Table 2, on average, 56% of the respondents were male and 44% were female. This is in contradiction with a number of surveys that indicate female dominance in the agricultural sector as a common phenomenon in communal areas of South Africa (StatsSA, 2016). Age was one of the significant variables to determining the access of farmers to extension services among farming households. Table 2 shows the age distribution of farmers in Ngcabasa and Phathikhala village.

Table 2 shows that the overall majority of respondents (36% in Ngcabasa and 40% in Phathikhala) fall within the age range of 41-60 years. This shows that older men and women are the ones taking care of daily farming activities (StatsSA, 2016). Moreover, youth involvement in farming appeared to be limited in Ngcabasa and that the age range of above 60 years were found to be higher than that of 20-40 years. Another important determinant to access

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extension services was education. Table 2 shows farmers had their highest proportions in secondary education, 48% for Ngcabasa and 34% for Phathikhala.

These findings suggest that households in both study areas are able to read and write (literate), which according to the literature has a positive effect on their farming activities (Stats SA, 2013). When it came to marital status, the findings in Table 2 indicated that 50% in Ngcabasa and 54% in Phathikhala were married, and in agriculture being married has its advantages. For example, if one of the partners falls ill, operations in the field or garden will not stop as the other partner will continue while the other recovers (Tshuma, 2009).

4.2 Access to extension services in the study area

Table 3 presents the results on the access of extension services in the two communities. The findings portrayed in Table 3 show that 68% of farmers in Ngcabasa and 72% in Phathikhala had access to extension services, whilst 32% and 28% of households respectively denied having any form of access to extension services.

Table 3: Farmers access to extension services in the study area

Explanatory variable	**Ngcabasa village**		**Phathikhala village**	
	N	**%**	**N**	**%**
Access to extension	34	68	36	72
No access to extension	16	32	14	28
Extension visits				
Weekly	2	5.88	5	13.89
Monthly	4	11.76	8	22.22
Quarterly	9	26.47	7	19.44
Annually	19	55.88	16	44.44
Extension Quality				
Very poor	15	44.12	12	33.33
Poor	9	26.47	16	44.44
Neutral	2	5.88	3	8.33
Good	4	11.76	4	11.11
Very good	4	11.76	1	2.78

Source: Field survey (2016)

According to Table 3, the main challenges cited by farmers was the frequency of extension visits, and the quality of the services when the officials were on the site. According to farmers, the frequency of extension visits were inconsistent, and Table 3 shows that the majority (38% Ngcabasa and 32% Phathikhala) of those visits occurred on an annual basis. The perceived quality of extension services provided was one of the important factors and out of the 68% of households who had access in Table 3, only 11.76% said extension officers were either good or very good. In Phathikhala, of the 72% who had access to extension services, only 14% found extension to be good or very good. Both groups indicated that the quality of the services received ranged from poor to very poor and that they were not satisfied with the quality of

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extension services. This is in line with the argument made by Hlatshwayo and Worth (2016) that the quality of extension officers was found to be poor and unsatisfactory in most rural areas of South Africa.

4.3 Empirical results of the logistic model

Table 4 displays the results from the logistic regression. From the 10 variables fitted in the logistic model, five variables had a significant influence on identifying the characteristics that are associated with whether or not farmers had access to extension services. Age, education, home gardening, field cropping and livestock production had a significant influence on whether a farmer has access to extension services. The McFadden R-squared value is only 25%, however, the number of cases correctly predicted by the model is 80%, suggesting a reasonably powerful model. The likelihood ratio Chi-square test allows us to reject the all-slopes-zero null hypothesis at below the 1% significance level.

Table 4: Results of the logistic regression analysis of respondents in the study area

	Coefficient	***Std. Error***	***Z***	***p-value***	
Constant	−2.264	2.105	−1.0758	0.2820	
Age	0.053	0.026	2.0175	0.0436	**
Gender	−0.107	0.669	−0.1603	0.8726	
Level of education	−0.789	0.471	−1.6747	0.0940	*
Employment status	0.699	0.727	0.9618	0.3361	
Household size	0.191	0.179	1.0607	0.2888	
Agricultural income	2.1e-05	2.4e-05	0.8510	0.3948	
Home gardening	−1.307	0.685	−1.9091	0.0562	*
Livestock farming	−1.557	0.729	−2.1373	0.0326	**
Field cropping	1.378	0.835	1.6512	0.0987	*
Farming for HH consumption	1.213	0.832	1.4587	0.1447	
Notes: *statistically significant p<0.1, **statistically significant p<0.05 Number of observations = 100 McFadden R-squared = 0.255395 Number of cases correctly predicted = 80.0% Likelihood ratio test: Chi-square(10) = 24.0784 [p = 0.0074]					

4.3.1. Age of household head

Table 4 indicates that the age of household head had a positive influence on extension services and that the older the farmer, the more likely he or she was to receive extension services. The hypothesis was that extension officers were more inclined to visit older farmers with the aim of improving their indigenous knowledge with new technologies.

4.3.2. Level of education

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According to Table 4, the level of education had a negative coefficient relationship to extension services, which suggested that the higher the level of education of the farmers, the more unlikely they are to see the need for extension services. The hypothesis was that educated farmers do not see the need for or use of extension officers with the view that they can use their own knowledge (education) and do their own farming.

4.3.3. Home gardening

According to Table 4, home gardening proved to be a significant variable/characteristic in determining access and making use of extension services.

4.3.4. Field cropping

According to Table 4, field cropping proved to be a significant variable in determining access and making use of extension services. Farmers who practiced field cropping appear to make use of advice from extension services.

4.3.5. Livestock production

Table 4 indicates that practicing livestock production was a significant characteristic for use of extension services. Therefore, farmers who practice livestock production only are likely to have access to extension services.

4.3.6. Impact of extension services

The study employed two types of comparison, firstly, where farmers were compared on the basis of whether or not they made use of the extension services they had access to. The second comparison was based on "*the before and after situation of extension service"*; that is to say comparing their current interaction with extension services versus when they had no access to extension services.

4.4. Agricultural income

Table 5 shows the results of the comparative statistics (T-test) employed in this study. These t-tests were conducted on the agricultural income of farmers who made use of extension services they had access to and those who did not. The results show that those who made use of the extension services they had access to had higher margins on income received compared to those who did not, and this was the case for both enterprises. Farmers in Ngcabasa were able to sell their cash crops and make money, although households had no reliable nor stable market, they

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were able to make an annual income of R11 067, while those who decided against the use of extension services made an annual income of R4852. Farmers in Phathikhala who had access to extension services managed to receive an average annual income of R10 480, while those who did not use extension services managed R10 271.

Table 5: Results of the t-test for difference of means of respondents in study area

	Average annual income from crops (R)		**t-test for difference of means**
	without extension	with extension	
Ngcabasa (n=35)	4 852	11 067	t Stat: -2.121 Prob (1-tail): 0.021
Phathikhala (n=22)	10 271	10 480	t Stat: 0.016 Prob (1-tail): 0.494
Average annual income (crops)	6 187	10 741	t Stat: -1.730 Prob (1-tail): 0.045
	Average annual income from livestock (R)		**t-test for difference of means**
	without extension	with extension	
Ngcabasa (n=49)	3 375	4 224	t Stat: -0.627 Prob (1-tail): 0.267
Phathikhala (n=39)	1 687	2 500	t Stat: -0.344 Prob (1-tail): 0.366
Average annual income (livestock)	2 893	3 333	t Stat: -0.365 Prob (1-tail): 0.358

Source: Field survey (2016)

Farmers who practiced livestock farming were also investigated and the findings suggested that with extension services, farmers were able to sell products like milk, meat and wool. In Ngcabasa, livestock farmers who made use of extension services had an average annual income of R4224 and in Phathikhala an annual income of R2500. Farmers who decided against the use of extension services managed an average annual income of R3375 in Ngcabasa and R1687 in Phathikhala respectively. More than 90% of households in both villages acknowledge the contribution the monetary returns have on their lives, highlighting that they use the money to buy groceries and other needs relevant to them. Less than 10% said that they save the money to buy seeds and pesticides for the next season.

5. CONCLUSION

The study was inspired by a desire to understand what determines a farmer to receive extension services, and the implications for the agricultural performance amongst smallholder farmers in Raymond Mhlaba Local Municipality in the Eastern Cape Province. The study concluded that households had some form of access to extension services, however, many of these farmers were dissatisfied with the frequency of visits and quality of service received from extension officers. Households felt that more could have been done to improve their farming activities if there was a closer working relationship between farmers and extension staff. From the

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regression analysis, farmers more likely to receive extension support appeared to be those who are older, those with less education, and those farming with livestock. According to the responding farmers who receive extension, there is a significant improvement in their yields as compared to when they had no access to extension services. Comparisons between farmers receiving extension support to those not receiving it also suggest that extension is effective in improving productivity and farm profitability.

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