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Analysis of the producers' demographic and socioeconomic characteristics that impact on the access to agricultural extension services in Mozambique

Análise das caraterísticas demográficas e socioeconômicas dos produtores que incidem no acesso aos serviços de extensão rural em Moçambique

Análisis de las características demográficas y socioeconómicas de los produtores que incidem en el acesso a los servicios de extensión agrícola en Mozambique

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Abstract
In the last few decades, the agricultural extension services in Mozambique have been focused mainly on the training and strengthening of producer associations, improved technology transfer, and technical assistance. This study aimed to establish the demographic and socioeconomic characteristics of the producers which impact the access to agricultural extension services. In methodological terms, a logistic regression model was estimated and the variables used were provided by 2010 Agricultural and Livestock Census, also known as CAP- (Portuguese acronym for Censo Agropecuário de 2010). Results showed that despite the universal character of the agricultural extension policy, the distribution of access to these services was very uneven, in terms of variables such as gender and age of the household head, education levels, ability to read, and technology use (irrigation, fertilizers, and pesticides). This information is highly relevant to decision-making, as it can guide future improvements in the services, both in terms of coverage and of quality of the technical assistance.
Keywords: Technical assistance; Extension services; Producers; Access.

Resumo
Nas últimas décadas o foco dos serviços de extensão rural em Moçambique tem sido orientado principalmente no treinamento, fortalecimento de associações de produtores, transferência de tecnologias melhoradas e assistência técnica. O objetivo desta pesquisa é de estabelecer quais as características demográficas e socioeconômicas dos produtores que incidem no acesso aos serviços de extensão rural no país. Em termos metodológicos foi estimado o modelo de regressão logística e foram usadas variáveis provenientes do Censo Agropecuário de 2010 conhecido por CAP 2010. Os resultados revelam que, pese ao caráter universal da política de extensão rural, a distribuição do acesso a esses serviços é bastante desigual, em relação as variáveis como gênero do chefe do agregado familiar, idade do chefe do agregado familiar, escolaridade, género do chefe do agregado familiar, saber ler, uso da tecnologia (rega, fertilizantes, pesticidas). Estas informações são muito relevantes para a tomada de decisão, na medida em que podem orientar o aprimoramento dos serviços, tanto em termos de cobertura e qualidade dos processos de assistência técnica.
Palavras-chave: Assistência técnica; Serviços de extensão; Produtores; Acesso.

Resumen
En las últimas décadas, el enfoque de los servicios de extensión rural en Mozambique se ha orientado principalmente hacia la capacitación, el fortalecimiento de las asociaciones de productores, la transferencia de tecnologías mejoradas y la asistencia técnica. El objetivo de esta investigación es establecer las características demográficas y socioeconómicas de los productores que inciden en el acceso a los servicios de extensión rural en el país. En términos metodológicos, se estimó um modelo de regresión logística basado en las variables del Censo Agropecuario 2010 conocido como CAP 2010. Los resultados muestran que el acesso a los servicios de extensión rural es bastante desigual, especialmente en relación com variables como género del jefe de hogar, edad del jefe de hogar, educación, género del jefe de hogar, saber leer, uso de tecnología (riego, fertilizantes, pesticidas). Esta información es muy relevante para la toma de decisiones, ya que puede orientar la mejora de los servicios, tanto en la cobertura como en la calidad de los procesos de asistencia técnica.
Palabras clave: Asistencia técnica; Servicios de extensión; Produtores; Acceso.

1. Introduction

Mozambique is an essentially agrarian country in which 75% of the population practices agriculture as their main economic activity. However, from the 36 million hectares (ha) of arable land available, only 10% is currently in use, from which 90% belongs to the smallholder farmers that cultivate an average area of up to 2ha (Ministry of Agriculture [MINAG], 2011), Portuguese acronym). According to Uaiene (2015), from the 3.3 million total explorations, around 99.8% are predominantly smallholder farmers and in total contribute to the production of 99.7% of the food consumed.

Generally speaking, ever since the process of Independence, Mozambique's government alleges that the agricultural sector is in full growth. Otherwise, different scientists have argued that, regardless of such discourse, little has been made in practice to truly strengthen this sector. Mosca (2011) shows that productivity levels were higher before Mozambique's independence when compared to the current scenario, and affirms that in reality, agriculture has never been deserving of the government's attention.

Amongst the countless challenges faced by smallholder farmers, the lack of access to rural extension services stands out with major implications related to low production and productivity levels, especially in the main food crops (Cunguara et al., 2018). Founded in 1987, in a Mozambican context, agricultural extension is defined as the set of information or technical assistance, training, education, capacity building of farmers to increase their productivity and family income (MINAG, 2007). Considering the role of the agrarian sector in the country's economy, agricultural extension has a major significance in government policies.

Nevertheless, Mozambican government agencies recognize the low coverage of access to rural extension services and its impacts on low production and productivity in the country. Mozambique's Ministry of Agriculture, based on 2010 Agricultural and Livestock Census, points out that, although public extension services cover all of the country's districts, they still assist only 11% of households, at a rate of 1:230 (one extensionist for two hundred and thirty producers) (MINAG, 2011).

Such rates are exceedingly low when compared to international recommendations. As stated by Marassiro et al. (2020) , the country has an approximate deficit of 16.000 extensionists needed to assist all of the households, considering the United Nations Food and Agriculture Organization (FAO) recommendations. In the same way, comparing the current access rates to other countries, it is possible to observe the undeniable low coverage. In Brazil, for example, extension services have reached roughly 43% of small properties, as found in the 2006 Agricultural Census (Rocha Junior et al., 2019).

In temporal terms, the access to rural extension services in Mozambique has significantly decreased in the last few years. According to Cunguara et al. (2018), in 2015, less than 4% of households received extension visits, amounting to under half the 2002 rate (13.5%). To reverse this scenario, the Mozambique Government and its partners have been taking concrete actions through key strategic instruments such as the Strategic Agrarian Development Plan (PEDSA 2011-2017, Portuguese acronym), the National Extension Master Plan (2007-2016), and the Integrated Technology Transfer Program (PITA, Portuguese acronym). These policy instruments are considered to be essential to the dissemination of technological options within the productive chains, through the expansion of the extension services' network.

Thus, among several initiatives, the Mozambique Government, through the Ministry of Agriculture and Rural Development (MADER, Portuguese acronym) and in the SUSTENTA project, launched in May 2020 a hiring campaign for 2.158 extension workers to promote and improve the agricultural activity's performance. The project increased the national extension network to 4.001 extensionists, of which 550 were supervisors and 3.451 were technicians. This information highlights the authorities' understanding of the critical role agricultural extension services play in increasing production and improving family income.

The low access rates have been pointed out by specialized literature as responsible for a decline in the probability of improving agricultural productivity. Technically supported producers have greater chances of adopting modern technologies

and increasing production (Feder et al., 1985; Pattanayak et al., 2003; Peixoto, 2009; Swanson, 1984). Existing literature also emphasizes other access problems tied to shortages in extension services regarding its ability to meet the demands of a quite heterogeneous producer population.

Arias et al. (2013), in a study conducted in Haiti, have found that training programs influence the chances of access to extension services. Abdallah et al., (2016) in Ghana, demonstrated that, beyond socioeconomic factors and personal aspects, property and institutional characteristics also increase the probabilities of access to extension services. Whith the aim of determining the profile of producers who receive extensión services in Peru, Barrantes-Bravo et al. (2017), found that an agricultural surface larger than 5 ha, associationism, and acess to credit are the factors most frequently related whith acess to extension services. Rocha Junior et al. (2019) in Brazil, have found, from the National Survey by Household Samples (PNAD, Portuguese acronym), that socioeconomic profile, productive characteristics, and the farmer's location significantly impact the probability of technical assistance use.

In Mozambique's case, a major part of the studies that discuss agricultural extension is focused on the observation of determinants of the adoption of improved technology. Relevant studies on this matter include Zavale et al. (2005), which researches the adoption of improved maize seeds; Mazuze (2004), that investigates the adoption of orange-fleshed sweet-potatoes; Cavane et al. (2015) who interpreted and synthesized studies of the determinants of agricultural technology adoption; Come et al., (2017), which analyzes the determinants of the adoption of improved varieties' matuba maize.

In contrast, there are fewer studies that investigate access to agricultural extension services considering the producers' socioeconomic and demographic characteristics. This serious gap must be overcome, especially taking into account the available 2010 Agricultural and Livestock Census data, which represents valuable sources mostly unexplored in the academic field. This research aims to establish what are the producers' demographic and socioeconomic characteristics that have an impact on the access to rural extension services in Mozambique. More specifically with the intention to:

a) Correlate demographic characteristics that affect access to agricultural extension services, such as age, education level, and gender of the household head;

b) Correlate demographic characteristics that affect access to agricultural extension services in terms of credit, land use, and technology; and

c) Identify the producers' demographic and socioeconomic characteristics that impact access to rural extension services based on a logistic regression model.

At first, it is usually assumed that the access to rural extension services is universal, but this research's hypothesis suggests that this access is unequal and that producers' demographic and socioeconomic characteristics exert a significant influence on this matter. To answer the question at issue, a logistic regression model was estimated to identify which variables had more weight in the construction of the producers' demographic and socioeconomic profiles. Data from 2010 Agricultural and Livestock Census was used.

The current article is structured in five (4) sections. This brief introduction, which figures as the first section, brings information on the problem, relevance, hypothesis, research questions, and objectives. The subsequent section (2) introduces the methodological procedure used in the research. The thirty section highlights and discusses key findings. Finally, the fourth section brings the main conclusions and implications on public policies. Such information is highly relevant to decision-making for future improvements in the technical assistance processes offered by the public sector.

2. Methodology

2.1 Data source

The data used on the development of the present article derived from 2010 Agricultural and Livestock Census, also known as CAP 2010 (Portuguese acronym), which is the most recent one. At this point, it is important to clarify that the Census itself does not take into account other important aspects such as social capital, for example.

The data gathering was executed in two phases by the National Statistics Institute (INE, Portuguese acronym) in partnership with the Ministry of Agriculture and the technical and financial aid of the United Nations Food and Agriculture Organization (FAO). A modular methodology, which consists of ensuring representation at the district level, was employed. The sample encompassed a total of 3.500 large farms and 35.020 medium and small farms, this last set being the focus group of the present study. This choice in the group is because it constitutes the extension services' main target and represents the majority of those involved in agricultural activity.

2.2 Logistic Regression Model application

Most of the studies interested in analyzing technical assistance determinants employed a range of statistical techniques, especially probit and logit regression models. According to Feder et al. (1985) , in practical application both are quite similar, the main difference being in the fact that in probit the conditional probability reaches 0 or 1 faster, whilst the logit presents a denser distribution on both extremities. In this regard, Guajarati & Poster (2011) reaffirm that both models are similar enough that the reasons for choosing one over the other are scarce, but in practical terms, the logit model is the most used for its mathematical simplicity.

Given the variables' nature, in this case qualitative, an analysis based on logistic regression was chosen. This choice in the model is justified by the fact that it shows flexibility in interpretation, is of easy operation, and, in addition, allows identifying the weight of each explanatory variable and its significance. Thus, the model's equation was defined as:

$$E(Y \mid x) = \pi(x) = \frac{e^{\alpha+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+.\beta_5 x_5+\ldots+\beta_p x_p+\mathrm{e}}}{1+e^{\alpha+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3\beta_4 x_4+\beta_5 x_5+\ldots+\beta_p x_p+\mathrm{e}}} \quad \text{Equation (1)}$$

Where:

π- is the actual proportion of producers that received technical assistance for particular values of independent variables x_1, x_2, x_3... x_p.

B_1, β_2, β_3,... βp, denote the regression coefficients associated with independent variables x1, x2, x3... xp.

α- is the constant term

e- is the error term

Therefore, due to the transformation on the equation (1), the logistic regression switches to a linear equation presented as:

$$\operatorname{logit}\left[\pi(x)\right] = \log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \ldots \beta_p x_p + \mathrm{e} \quad \text{Equation (2)}$$

2.2.1 Description of the Model's Explanatory Variables

The selection of variables presented in Table 1 for the construction of the logistic regression model is based on the variables exhibited on the Census's survey.

Dependent variable: takes the value 1 when received technical assistance and zero otherwise.

Table 1 - Description of model's explanatory variables.

Independent Variable's name	**Variable type**	**Description**
Demographic characteristics		
Gender of the household head (x_1)	Dummy	1= male 0= otherwise
Age of the household head (x_2)	Continuous	Number of years
Literacy (x_3)	Dummy	1= yes 0= otherwise
Education of the household head (x_4)	Categorical turned Dummy	1 if head has some schooling 0= otherwise
Socioeconomic characteristics		
Participation in associations (x_5)	Dummy	1= yes 0= otherwise
Access to credit (x_6)	Dummy	1= yes 0= otherwise
Technology adoption (x_7)	Dummy	1= yes 0= otherwise
Land tenure (x_8)	Dummy	1= yes 0= otherwise

Source: Authors based on the variables exhibited on the Agricultural and Livestock Census.

In addition to the logistic regression model and the descriptive statistics, the *Chi-square* test was also used to correlate the producers' profile variables to the technical assistance and to verify the degree of association. The data were analyzed with the statistical package STATA13.

In this research, we will interpret access to technical assistance as the meaning quantity of visits, not their quality. Therefore, the Uaiene (2015) definition, which deals with access to agricultural extension services measured in terms of the percentage of households with access to extension officer visits, both from private and public sectors.

Next in Table 2, we present an overview of the main theoretical and empirical contributions related to the determinants associated with the access to extension services and the most statistic methods.

Table 2 - Summary of studies of determinants associated with the access to extension services, according to most used statistical method and variables.

		Research Details			
Author(s) and year	**Study Location**	**Statistical method**	**Data source**	**Dependent variable**	**Independent variable**
Diego Arias, Juan Leguia and Abdoulaye Sy (World Bank, 2013)	Haiti	Probit Regression	Agricultural Census 2008-2010	Has used at least one type of extension service	Education level Gender (male or female) Training program Area size Crops
Adauto Júnior, Jacy Freitas, Francisco Cassuce and Silvia Costa (2019)	Brazil	Probit Regression	National Household Sample Survey (Pesquisa Nacional por Amostras Domiciliares – PNAD in Portuguese)	Has received technical assistance in the last year	Age *Per capita* income Education level Gender (male or female) Skin color (white or non-white) Status about the property (owner, settler, assignee, lessee, partner or others) Production purpose (only for subsistent consumption, exclusively commercial or consumes only part of the production) Involvement of one or more temporary employees Involvement of one or more permanent employees Country region (North, Northeast, Central-West region, Southeast, South) Main purchaser of the production (direct sale to the consumer, to a company, cooperative, intermediary, government, landowner, or another buyer)
Abdallah and Adul Rahaman (2016)	Ghana	Logistic Regression	Survey for 320 farmers	Likelihood of women accessing extension services	*Per capita* income Education level Property size Monthly income Producer experience Association member Time spent in farming Knowledge on improved seeds Frequency of the extension officers' visits Access to credit Labour Distance from the input stores Maize yield

Source: compilation of authors from various sources.

2.3 Characterization of Mozambique's case

Extension services in the county are regulated by the National Extension Master Plan (2007-2016), which is the guideline considered to be a standard reference for the provision of extension services with interventions based on the service offer and the producer's demands.

According to Gêmo and Davis (2015), agricultural extension in Mozambique is divided into two major axes, which are namely, the colonial and the post-independence periods. Created in 1987, Mozambican extension services are considered to be one of the newest on a continental scale, behind countries such as Zambia, Malawi, and Tanzania. In the 1987-1992 time period, regarded as a settlement phase, the extension services' mission was to provide information to producer associations.

However, the implementation of these services during the mentioned period was severely affected by the civil war, which lasted for about 16 years (1976-1992).

As stated by Marassiro et al. (2020), the signature of the peace agreements between two political forces, the Mozambique Liberation Front (Frente de Libertação de Moçambique – FRELIMO in Portuguese) and the Mozambican National Resistance (Resistência Nacional de Moçambique – RENAMO in Portuguese), paved the way for the revitalization and geographical expansion of extension services into district governments, and relied heavily on the presence and help of Non-Governmental Organizations (NGOs).

As of the year 2000, the introduction of the Unified Extension Service System, which consisted of the integration of technical staff at a district, provincial and central level, enabled the structuring of a pluralistic service, with an approach directed toward producers. There are two lines of intervention for extension services, namely, public and private, the last one being oriented towards the fostering of cash crops. From these interventions, the producers learned new cultivation techniques, pest and disease management, and conservation and storage, as well as received improved seeds and input market (MINAG, 2007).

Regarding these extension methods, it is known they are used in a combined way, mixing individual, group and mass media. There are also Farmer Field Schools (FFS) widely spread in the Philippines and Indonesia, which have large acceptance in Mozambique, the Junior Farmer Field and Life School, field days, results in demonstration plots, on-farm trials, courses, experience exchanges between producers, workshops, brochure publications, research reports, national and international conferences, and radio programs (Cavane et al., 2015).

The national policy for agricultural extension in the country is oriented towards universal access, and for this reason, the government has been focusing on reforms to improve these services' dynamics in quality and quantity to respond to producers' necessities.

There is a lot of criticism regarding the functioning of the agricultural extension services. Authors such as Cunguara et al. (2018) found that, except for 2006-2007, the number of extensionists in Mozambique has been showing a growth tendency, but this evolution is not reflected in terms of coverage. Still, according to these authors, between 2002 and 2005 the total of households that received technical assistance reached 15%. However, from 2006 up to 2015 there has been a decreasing tendency and less than 4% of households received a visit from an extension agent.

In regards to the spatial distribution of agricultural extension services, data from the National Directorate Agrarian Extension (DNEA, Portuguese acronym) in 2019 indicated that the more populous provinces in the country, namely Zambezia and Nampula, gather a higher concentration of extension agents (288), while the city of Maputo, which has less agrarian activity, counts on a reduced number of agents (39) (Marassiro et al., 2020).

In terms of coverage, according to Uaeine (2015) based on the Integrated Agricultural Survey (Inquérito Agrícola Integrado in Portuguese) (2012), the provinces of Tete (with 9,4%) and Sofala (10,2%) were the ones that presented the highest rates in rural extension services' coverage in the country. This can be explained due to the existence of a private network of extension services that operate in the regions of Nampula, Zambezia, and Niassa, with an interest in fostering cash crops such as tobacco and cotton.

3. Results and Discussion

3.1 Relation Between Producers' Socioeconomic and Demographic Characteristics and Technical Assistance

Overall, the research expected the existence of an association between the variables regarding the producers' profile and their access to technical assistance. The results in Table 3 below indicate a significant statistical relevance of 5% between the 6 analysis categories and the access to technical assistance.

Table 3 - Results of correlations between producers' demographic and socioeconomic characteristics and technical assistance.

Variable	Category	Family household member that received technical assistance		
		No	Yes	Significance
Gender of the household head	Female	10,502 (97.10%)	314 (2.90 %)	0.000
	Male	26,857 (94.27%)	1,633(5.73 %)	
Literacy	Illiterate	18,228 (96.40 %)	681 (3.60 %)	0.000
	Literate	19,131 (93.79 %)	1,266 (6.21 %)	
Age of the household head	Under the age of 18	124 (97.64%)	3 (2.36 %)	0.000
	18-35 years	13,310 (95.64%)	607 (4.36 %)	
	36-60 years	18,057 (94.38%)	1,075 (5.62 %)	
	Over 60 years	5,868 (95.73%)	262 (4.27 %)	
Household members received credit	No	36,912 (96.34%)	1,402 (3.66 %)	0.000
	Yes	447 (45.06%)	545 (54.94 %)	
Land tenure	No	34,563 (95.02%)	1,813 (4.98%)	0.000
	Yes	1,120 (92.33%)	93 (7.67%)	
Family Household member is part of an association	No	36,447 (96.23%)	1,428 (3.77 %)	0.000
	Yes	912 (63.73%)	519 (36.27 %)	
Education level	None	15,291 (96.54%)	548 (3.46 %)	0.000
	Primary	17,998 (94.34%)	1,079 (5.66 %)	
	Secondary	3,097 (93.31%)	222 (6.69 %)	
	Technical professional	736 (92.00%)	64 (8.00 %)	
	Superior education	237 (87.45%)	34 (12.55 %)	

Source: Authors.

As illustrated in Table 3, the gender, literacy, age, and education level of the household head, as well as access to credit, land tenure, and participation in an association have a direct relationship to the access to technical assistance. For us, all of those characteristics are more fundamental to promote the access of those services and is very effective to respond to the demand of extension services. Similarly concerning demographic and socioeconomic characteristics, several authors consider the influence in the access to agricultural extension services.

The results obtained also corroborate whith Barrantes-Bravo et al. (2017), who found that socioeconomic characteristics (associationism, and acess to credit) are the factors most frequently related with acess to extension services in Peru.

Abdallah et al., (2016), while examining the access to extension services determinants for women in Ghana, verified that socioeconomic variables (credit and associations) and personal variables (education and gender) have a positive effect on rural extension access. This authors indicated that participation in an association exerts a significant influence on the access to agricultural extension services, seeing as encompassing several members is easier, and generally many associates maintain permanent contact with the technical staff both in the private and public sectors.

Specifically in Mozambique, extensive literature has emphasized that producers with credit restrictions have difficulties in obtaining technical assistance. Authors such as Cunguara et al., (2011), in their research in Mozambique, have found that credit has been a source of social inequalities regarding access to technological packages, especially since it is common for extension officers to mostly approach families regarded as wealthy.

Similarly, it was sought to examine the relation between the technological component and technical assistance to the level of significance of 5% (Table 4).

Table 4 - Results of correlations between the technological component and technical assistance.

Variable	**Category**	**Family household member that received technical assistance**		
		No	**Yes**	**Significance**
Uses irrigation	No	33,768 (95.63%)	1,542 (4.37%)	0.000
	Yes	1,915 (84.03%)	364 (15.97%)	
Uses pesticide	No	34,867 (95.64%)	1,588 (4.36%)	0.000
	Yes	816 (71.96%)	318 (28.04%)	
Uses fertilizers	No	34,697 (96.00%)	1,446 (4.00%)	0.000
	Yes	986 (68.19%)	460 (31.81%)	

Source: Authors.

The results in Table 4 clearly show that the use of technology (irrigation, pesticides, and fertilizers) has an association with the access of technical assistance (sig 0.000<5%).

It is important to underscore that knowledge on the use of technology (*How to knowledge*), such as irrigation, fertilizers, and pesticides, is consistent with and determinant to the access to technical assistance, especially if this kind of knowledge demands an insight on the advantages and disadvantages of the implementation of such technology. However, this can also be explained by Cavane & Donovan (2011), who consider that this knowledge be disseminated among producers, it could stimulate technology implementation and, therefore, increase the demand for technical assistance.

It was then sought to explore the weight of each variable on the access to technical assistance using the logistic regression model (Table 5).

3.2 Analysis of the demographic and socioeconomic characteristics of producers with access to technical assistance

After estimating the logistic regression model, the analysis provided the following results:

Table 5 - Logistic regression model results.

Variable name	Odds ratio	Std. err.	Z	p>|z|	[95% conf.	Interval
Gender of the household head	1.549107	.1049516	6.46	0.000	1.356478	1.769091
Age of the household head	1.005898	.0016592	3.56	0.000	1.002651	1.009155
_Education_1 (Primary)	1.310589	.1066004	3.33	0.001	1.117459	1.537097
_Education_2 (Secondary)	1.476615	.1703855	3.38	0.001	1.177736	1.851343
_Education_3 (Technical professional)	1.757666	.2935938	3.38	0.000	1.266937	2.438473
_Education_4 (Superior)	2.64261	.7009007	3.66	0.000	1.571334	4.444241
Literacy	1.228728	.0960691	2.63	0.008	1.054154	1.432213
USESIRRIGATION1	1.197481	.1017684	2.12	0.034	1.013746	1.414518
USESPEST1	2.153385	.2075864	7.96	0.000	1.782648	2.601222
USESFERTIL1	-	.5837376	21.61	0.000	5.60486	7.904354
OWNSTITLE	.811043	.1037672	-1.64	0.102	.6311589	1.042195
_const	.0165236	.0016815	-40.32	0.000	.0135358	.0201708
Number of obs = 37589 *LR chi2(11) = 1409.05* *Prob > chi2 = 0.0000* *Log likelihood = -6835.445* *Pseudo R2 = 0.0934*						

Source: Authors.

About the variable 'gender of the household head', it was observed that being male, compared to being female, increases the chances of receiving technical assistance by 55%, a difference which is statistically significant at 5%. This way, the main hypothesis in vast literature that men have more probability of having access to technical assistance compared to women was confirmed. This result was not surprising since 65% of men benefit from technical information from several sources, with emphasis on agricultural extension services. Generally speaking, for almost the entire world, socially constructed roles of men and women shape inequalities regarding access to the main socioeconomic benefits. There is also the question of the constructed sociocultural roles that create access barriers for women.

Similar results were obtained by Uaeine (2015) in Mozambique. Regarding the proportion of families which received extensionist visits per sex, Uaeine (2015) considers that the Mozambican customary law places men in charge of productive resources, while women are relegated to the background. As an example, in 2015 around 16% of the households headed by men received extensionist visits, against only 10.9% of those led by women.

In contrast, Arias et al. (2013) in Haiti have found that there are no statistically significant differences between both groups regarding access to extension services, which is justified by the demand for the services and the frequency of the officers' visits.

In turn, the variable 'age of the household head' reveals that with each extra year of age, the chances of accessing technical assistance raise by 0.59%, which is in direct contrast to most of the existing literature. This highlights the need for reservation when taking definitive conclusions regarding that. However, the hypothesis that younger producers tend to look for technical assistance, mainly because they have a higher level of formal education than those of age, was not confirmed in the research. According to empirical research, effects may vary from negative to positive and the results are inconclusive. The

results obtained also corroborate whith, Abdallah et al., (2016), even without categorically affirming this, have also approached this subject with reservations, pointing out that older farmers benefit from agricultural extension services up to a certain age, especially when they are experienced, with a high level of human capital and easy access to credit. In contrast, Ragasa et al. (2013), have found a negative correlation, in other words, the higher the age, the lower the probability of access to extension services.

In regards to the variable 'Education of the household head,' it can be observed that having some degree of education compared to no education raises the likelihood of access to technical assistance, with a statistical difference of 5%. This corroborates with the vast literature, but it is important to not fall into a comfort zone for that reason because only since 40.28% of the household head do not have any formal education, and around 37.35% of these completed only primary school. It is possible to establish from the Table that the ability to read alone increases the probability of receiving technical assistance by 23%. Therefore, the hypothesis tied to most studies that claim to have at least the primary level of education or knowing how to read increases the probability of receiving technical assistance was verified. Similar results were found by Ragasa et al. (2013) and Rocha Junior et al. (2019).

According to Ragasa et al. (2013), a study conducted in Ethiopia, have demonstrated that by at least primary education, the probability of receiving or voluntarily seeking technical assistance rises. Rocha Junior et al. (2019), in Brazil analyzing this connection, identified that extra five years of formal education imply a higher likelihood of access to technical assistance, justified by the willingness to search for information and the feeling of easily fitting into the technology transfer and dissemination environment created by the respective extension services.

In agreement with the research hypothesis, it was verified that the use of technology (irrigation, fertilizers, and pesticides) comparatively to the non-use, increased the probability of receiving technical assistance by a significant difference of 5%. In this case, as illustrated in the Table, the use of fertilizers deserves special attention, considering that the levels of adoption of this specific technology in the country are low. However, this can also be explained by Cunguara and Moder (2011), who consider that it is common practice for the agricultural extension officers to approach wealthier households, which can adhere to these packages more easily.

About the variable 'land tenure' a statistically insignificant coefficient was found on the model. Then again, empirical evidence on the connection between land tenure and technical assistance is scarce in Mozambique. According to Jorge (2020), several studies carried out in the country point out that few families possess the legal documentation that proves their right to land tenure, which can hamper access not only to technology but to extension services altogether. However, in this analysis about variables ' participation in an association ' and 'acess to credit', were removed in the model due to inconsistencies.

Finally, the explanatory power of the model is relatively low and reveals that 9.34% of the total variation is explained by the relation between the independent variables and the dependent variable when considering the number of independent variables in the model. As reported by the *Chi-square* value (Prob > chi2= 0.0000) the significance of the model is satisfactory.

4. Conclusion

The study was carried out to establish which factors influence the access to agricultural extension services in Mozambique and, according to the results, the conclusion is:

In Mozambique, the number of extensionists has shown a trend towards growth, but this increase does not reflect on the services' coverage, that is to say, these services' reach continues to be low and has decreased significantly. It is shown, however, that the producers' lack of access to agricultural extension services is not their wrongdoing, but rather the current extension programs' policy, which lacks sufficient coverage to support agricultural producers' demands.

With the logistic regression model's estimation, there is verified evidence that, unlike the variable property title, the variables gender, age, literacy, education level and technology use (irrigation, fertilizers and pesticides) impact the probability of accessing agricultural extension services in a consistent and significant way. However, there should be reservations regarding the variables age and schooling. In other words, these services show a tendency of being concentrated in a certain category of producers, namely male heads of households, individuals that know how to read, and are involved in some production chains associated with technified agriculture. Consequently, it can be stated that rural extension programs can contribute to the deepening of inequalities between producer groups, due to the favoritism of male individuals, who present schooling advantages and already have had contact with modern production technologies. The policies of agricultural extension should, therefore, consider the most vulnerable groups' demands, both in quantitative and qualitative terms, to ensure an increase in economic productivity and quality of life for rural populations. The technical assistance processes should take into consideration underserved areas and groups to extend its coverage, as well as improve its pedagogical strategies to allow a more horizontal dialogue with groups characterized with high social vulnerability.

We suggest to carrying out similar studies that incorporate variables such as sources of information, participation in an association, land use, and credit, given the weight they represent, as well as depth research that problematizes the connection between social capital in terms of coverage and of quality of the technical assistance.

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