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Determinants of smallholder farm household decision to access agricultural support services in Malawi

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Abstract

Agricultural support services such as extension, functional markets, loan facilities and farmer participation in associations, farmer clubs or cooperatives are considered vital for improved farm level production and development of the agricultural sector. Using cross-sectional data generated by ARDEP project in 2011 from a sample of 596 smallholder farm households drawn from 11 districts across Malawi through a multi-stage random sampling technique, this paper employed a multivariate probit technique to model simultaneous interdependent smallholder farm household decisions to access agricultural support services namely extension, membership to a farmer club and access to loan facilities. The study results revealed that key determinants of farm household decision to seek and access the agricultural support services in Malawi included age of household head, marital status, household size, ownership of a bicycle and radio, growing of hybrid maize and cash crops and farmer's expectation to improve socioeconomic status through access to the support services. Policy implications and recommendations are drawn based on the study findings and conclusion.

Keywords: Agricultural Support Services, Multivariate Probit, Smallholder Farmer, Malawi

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1. Introduction

Globally, most rural communities depend on agriculture and/or agriculture-related activities for their livelihoods and improved welfare. National economic growth in most sub-Saharan African countries including Malawi, continues to be highly dependent on agricultural production. For enhanced agricultural production, the provision of agricultural support services which include access to agricultural extension, functional markets, loan facilities and participation in farmer associations such as farmer clubs and/or cooperatives are considered as vital for improved agricultural production and development of the agricultural sector. The data used in this paper focused on three of the mentioned agricultural support services namely, access to extension services, loan facilities and farm household participation in farmers' clubs.

Several studies including the works of Picciotto and Anderson (1997), World Bank (2000), Eicher (2003), World Bank (2003), Ngomane (2006), Anderson (2007) and Zwane (2012) have shown that agriculture extension mainly plays a role of increasing food production, disseminating the benefits of technological improvements in farming to a wider clientele of farmers and empowering farming groups. Extension is also deemed as a means to liberate smallholder farm households from poverty by ensuring sustainability in the agricultural production, catalysing development in the farming communities, serving as an agency of empowerment and collaboratively linking between research and the farmers (David and Samuel, 2014). Agricultural extension improves farmers' access to information and awareness of the available new technologies before the farmers can consider adopting them (Dossi, 2003). In the wake of climate change, farmers who have significant contacts with extension tend to have an increased awareness of changing climatic conditions and the various farm management practices aimed at adapting to climate change (Nhemachena and Hassan, 2007). Such farmers are likely to exhibit increased farm level resilience to climate change shocks. Shaped by the national agricultural development goals, the role of agriculture extension generally, includes achieving national food security, improving rural livelihoods, and empowering natural resource management (Swanson and Rajalahti, 2010). In Malawi, agricultural extension is touted to play an important role in rural agro-based national development as it facilitates innovations and adoption processes that eventually contribute to improved productivity, household food security and income; it also enables farmers to participate in profitable income generating farm enterprises for improvement of their livelihoods (Malawi Government, 2012). However, recent published reports indicate that there is very limited access to agricultural extension services in Malawi. Estimates by National Statistical Office (NSO) indicate that in 2005 only 13% of Malawi's agricultural households accessed extension services and advice (Agunga and Manda, 2014).

Farmer clubs play a significant role in the improvement of smallholder agriculture in general. It is easier for farmers who belong to a farmer club to organise resources as a team in order to achieve a common goal than on individual basis. In the smallholder farming setup, farmer clubs function as micro-level agricultural cooperatives or associations; they help farm households to find reliable markets and negotiate for better prices. Farmer clubs also facilitate easy access to farm inputs and group loans, as well as sharing useful information for production, management and processing of farm enterprises. Membership to farmer clubs

enables farmers to capitalize on economies of scale in seeking extension and other farm productivity enhancing services at reduced cost (Ndoro et al., 2014). Through farmer clubs, extension service providers manage to reach a large number of target beneficiaries at a minimum cost of delivery. Surprisingly, despite the numerous benefits that accrue to farmers through affiliation to farmer clubs, in Malawi membership to such an important grouping by smallholder farmers tends to be erratic and at most very low. Using data from second Integrated Household Survey (IHS2), with a usable sample size of 1133 smallholder burley tobacco farming households in rural Malawi, club membership was found to be 22.7% of the sample (Chirwa, 2009). Some recent related studies have shown that about 35% of the smallholder farm households claim membership with farmer clubs in Malawi (Maonga et al., 2015).

Access to loan creates a probable atmosphere of enlarging capital base to venture into various agribusiness enterprises, expand ongoing enterprises as well as mitigating hardships when they arise in various farm business undertakings. With affordable credit farmers tend to increase financial resources and their ability to meet transaction costs, improve farm management practices and access markets (Nhemachena and Hassan, 2007). An increase in availability and amount of institutional credit to agriculture enables farmers to access and expand the use of high productivity farm inputs such as fertilizer, pesticides and hybrid seed in the short run, and capital tools and implements including tractors, ploughs, irrigation equipment and draught animals in the long run (Narayanan, 2015). Thus, credit is very important for agricultural productivity (Saleem and Jan, 2011); and it increases technical efficiency in the resource use on the farm (Ayaz et al., 2011). On one hand, credit enables a farmer to improve efficiency by moving to a production possibilities frontier otherwise envisaged unattainable with the prevalent resource bundle; on the other hand, loan facilities could enable the farmer to move on and shift to a superior production frontier through productivity improvement (Narayanan, 2015). Credit also enhances agricultural production and contributes positively to gross domestic product (GDP) of the agro-based economies (Sial et al., 2011; Sogo-Temi and Olubiyo, 2004). However, like the preceding agricultural support services, access to institutional formal farm credit by smallholder farmers tends to be highly problematic in many sub-Saharan African countries including Malawi. Although credit facilities are considered as an engine to propel cash crop production, a biofuel study on smallholder farmers across Malawi found that only 4.6% of the sampled farm households had access to agricultural loans for a diversity of uses in addition to farming (Maonga et al., 2015).

Most studies have focused on the role of agricultural support services in enhancing smallholder production and livelihoods and how the services can be improved to benefit smallholder farm households. In order to make the agricultural support services more effective and responsive to the needs of the smallholder farmers, the aspect of participation by the farmers has to be entirely considered into the agricultural support services system. This entails provision of answers to the question of what factors influence farmers to decide whether or not to access the agricultural support services? Using a Multivariate probit model this paper attempted to answer the above question by analysing the socioeconomic factors that influence smallholder farm households' decision to access extension services, loan facilities and affiliate with farmer clubs in Malawi.

2. Methodology

2.1. Data sources

The paper uses cross-sectional data which were collected between May and October 2011 from smallholder farm households through a survey conducted in 11 districts across all Agricultural Development Divisions in Malawi. The study was organized by the Agricultural Research and Development Programme (ARDEP) funded project titled "Investigation of the potential of small-scale biofuel production in employment and income generation, environmental rehabilitation and socioeconomic development in Malawi"- project number ARDEP/002/07/2007.

Data collection was done through a desk study and field survey approaches. The desk study mainly involved a review of documents on extension, farmer clubs and farm loan studies in Malawi and the sub-Saharan African region in order to identify gaps in the literature. Checklists, discussions and interviews were conducted with key informants from relevant organizations including Ministry of Agriculture and Food Security, National Association of Smallholder Farmers in Malawi, Farmers Union of Malawi and a number of non-governmental organizations working in the agricultural sector in Malawi.

The survey component of the project involved collection of primary data at farm household level by oral interviews using a semi-structured questionnaire. Data were also collected through observational methods on relevant agricultural parameters such as presence of road networks, agro-market facilities and information centers in the rural areas. The field survey covered four districts (Chikwawa, Neno, Thyolo and Machinga) in the Southern Region of Malawi. In Central Region, the survey was conducted in Dedza, Kasungu, Lilongwe, Nkhota kota and Salima districts while in the Northern Region, Mzimba and Karonga districts were surveyed. The study had targeted smallholder farmers because they constitute a majority (more than 85%) of farmers in Malawi. A farm household was considered as a focal point in the study because in rural economies a household is treated as a decision-making unit (Maonga et al., 2015). A total of 596 smallholder farm households were interviewed and this formed the sample size of the study that was drawn from the 11 districts in Malawi through multi-stage (four stages) sampling procedure. One household was dropped during data cleaning exercise because it portrayed serious outlier problems in most variables. Therefore, the usable sample was reduced to 595 smallholder farm households. In the first three steps, districts, Extension Planning Areas, traditional authorities and villages were sampled from within the agricultural production zones.

In the last sampling stage, households were sampled from a list of villages using simple random and proportional probability sampling techniques. In this case, villages with higher population and greater number of households than others proportionately had a relatively higher representation in the overall sample of the study. The actual sample was drawn based on random tables sourced from District level Agriculture Offices. A series of oral interviews took place between trained enumerators and the household head and/or spouse using the semi-structured questionnaire. The survey also employed focus group discussion approaches in the collection of primary data at randomly selected sites with groups of smallholder farmers ranging from 8 to 15 in number; this was a triangulation technique aimed at getting a qualitative

flavor necessary to substantiate the quantitative data collected through the semi-structured questionnaire. Key informant interviews were conducted with purposively selected stakeholder representatives of organizations involved in smallholder agriculture and rural livelihood improvement at district level.

2.2. Empirical model used in data analysis

The study used multivariate probit model to analyze the major and significant socioeconomic factors with a likelihood to influence smallholder farm households to access agricultural support services in Malawi. Considering the fact that the study focused on the analysis of factors that simultaneously affect farm household's decision to access three different agricultural support services (EXTENSION, CLUBMEMBER and LOAN from formal lending institutions), it was imperative to use a model with multi dependent variables. The use of a univariate technique such as a probit analysis on each of the three agricultural support services individually as functions of a common set of explanatory variables was avoided because the approach tends to have shortfalls related to biases caused by ignoring common factors that might be unobserved and unmeasured but affect farm household decision to access the support services in question. In addition, independent estimation of individual discrete choice models does not account for the relationship between joint decisions to access different complementary support services. By neglecting such common factors the univariate probit model ignores potential correlations among the unobserved disturbances in decision making by smallholder farm households to access the agricultural support services; this leads to inefficiencies in the estimates and statistical biases (Lin, et al., 2005; Belderbos, et al., 2004; Golob and Regan, 2002 cited in Nhemachena and Hassan, 2007).

Alternatively, the study could have used a multinomial logit (MNL) model. However, the MNL technique was not considered because it would pose difficulties in the interpretation of the effects of the explanatory variables on smallholder farm household decision to access each of the three agricultural support services. Furthermore, the multinomial logit tends to be limited in its usefulness by the property of independent irrelevant alternatives (IIA) (Nhemachena and Hassan, 2007).

After noting the limitations of the preceding models, a multivariate probit model was deemed to be appropriate for this study because it estimates several correlated binary outcomes jointly. The observations in this study were cross sectional and data were collected from the same households. It was assumed that the observations were independent and mutually exclusive. Assuming the dependent variables are three sets A, B and C, it is inevitable that the elements that are contained in set A are those also contained in set B and set C, therefore, giving us the intersection (U) of A, B and C. This means that a set of variables that define household decision to access agricultural extension also determine the same household decision to join farmer club and seek loan facilities from formal lending institutions, respectively. Characterised by a set of binary dependent variables y_i^*, the multivariate probit model used in this study is presented as:

$$y_i^* = x'\beta_i + \epsilon_i,\ i = 1, 2, \ldots n \qquad (1)$$

$$y_i = 1 \text{ if } x'\beta_i + \epsilon_i > 0, \text{ Otherwise, } y_{i*} = 0 \text{ if } x_i\beta_i + \epsilon_i \leq 0$$

In equation (1) x is a vector of independent (explanatory) variables, $\beta_1, \beta_2, \ldots \beta_n$, are conformable parameter vectors and $\epsilon_1, \epsilon_2, \ldots \epsilon_n$ are random error terms that are distributed as multivariate normal distribution with

zero means, unitary variance and an $n \times n$ simultaneous correlation matrix $R = [\rho_{ij}]$, with density $\varphi(\varepsilon_1, \varepsilon_2, K, \varepsilon_n; R)$. "The likelihood contribution for an observation is the n-variate standard normal probability" (Nhemachena and Hassan, 2007); this is presented in equation (2)

$$\Pr(y_1,\ldots y_n \mid x) = \int_{-\infty}^{(2y_1-1)x'\beta_1} \int_{-\infty}^{(2y_2-1)x'\beta_2} \ldots \times \int_{-\infty}^{(2yn-1)x'\beta n} \phi(\varepsilon_1,\ldots\varepsilon_n; Z'RZ)d\varepsilon_n \ldots\ldots d\varepsilon_2, d\varepsilon_1 \quad (2)$$

From equation (2) we note that Z = diag[$2y_1$ – 1,..., $2y_n$ – 1]. The maximum likelihood estimation maximizes the sample likelihood function, and represents a product of the probabilities shown in equation (2) across sample observations. Computing the maximum likelihood function using multivariate normal distribution demands multidimensional integration. There are a number of recommended simulation methods for approximating the maximum likelihood function with the Geweke-Hajivassiliou-Keane (GHK) simulator (Geweke et al., 1997; Hajivassiliou et al., 1996; Belderbos et al., 2004; cited in Nhemachena and Hassan, 2007).

In order to derive policy implications, marginal effects of the policy variables are used. The marginal effect indicates the effect of unit change in each explanatory variable on the dependent variable. In this study, the marginal effect of a variable is the effect of a unit change of this variable on the probability P(Y = 1|X = x), *ceteris paribus*. The marginal effect of the explanatory variables on the likelihood to influence smallholder farm household decision to access each of the three different agricultural support services are expressed as:

$$(Yi=1|xi)/\partial xi = \partial E(Yi|xi)/\partial xi = \varphi(x_i'\beta)\beta \quad (3)$$

In equation (3), Y_i is the outcome, and x_i the independent (explanatory) variable in question; E is the likelihood that a farm household would decide to access a given agricultural support service, $\varphi(.)$ is the standard univariate normal cumulative density function, β is the vector of the model parameters (Hassan, 1996). The study estimated a robust model that computes robust standard errors in order to solve the problems of heteroscedasticity.

2.3. Definition and theoretical description of the variables

The dependent variables denoted by ($Y_{i=1, 2, 3}$) represent whether or not a farm household decided to access extension services and/or join membership to farmer clubs and/or seek loan facilities from formal lending institutions in Malawi. Such decisions are influenced, positively or otherwise, by a number of factors including farm household socioeconomic characteristics, institutional and others beyond the farmer. Table 1 presents the definitions and descriptive statistics (means and standard deviations) of both dependent and explanatory variables used in the multivariate probit analysis.

2.3.1. Age

Farmers' age on access to agricultural support services was thought to have mixed effects. Initially, a farmer's interest to access agricultural support services would increase with age because of experiencing benefits from farming. However, with time, older farmers display a negative effect on technology adoption including

access to agricultural support services. Indeed, older farmers become more reluctant to change (Bocquého et al., 2011). This study hypothesized access to agricultural support services to increase with age up to a certain age limit.

2.3.2. Sex

The sex of household head was examined from gender perspective. Therefore, the effect of gender of household head on access to agricultural support services was analyzed from the viewpoint that men and women play different economic roles on the farm. Theoretically, it is expected that more women would participate in the agricultural support services when the content of agricultural extension messages, issues promoted at farmer clubs as well as the available loans are about improvement in food production because compared with men who are more interested in cash crop production women tend to be more concerned with attainment of household food security. This study therefore, hypothesized the variable SEX to have mixed or indeterminate effects on smallholder farm household decision to access agricultural support services.

Table 1. Variable definition and descriptive statistics

Variables	Definition	Expected effect	Mean	Std. Dev.
Dependent variables				
EXTENSION	Access to agricultural extension services (1 = yes, 0 = otherwise)		0.39	0.49
CLUBMEMBER	Household is affiliated to farmer clubs (1 = yes, 0 = otherwise)		0.35	0.47
LOAN	Household gets agricultural loans from formal money lending institutions (1 = yes, 0 = otherwise)		0.05	0.27
Independent (explanatory) variables				
AGE	Age of household head (years)	±	41.41	16.06
SEX	Sex of household head (1 = female, 0 = male)	±	0.51	0.50
MARITALSTATUS	Marital status of household head (1 = married, 0 = otherwise)	+	0.84	0.56
EDUCATION	Highest level of education of household head (years)	±	5.11	3.53
HOUSEHOLDSIZE	Number of people in the household (persons)	+	5.21	2.24
BICYCLE	Household possesses a bicycle (1 = yes, 0 = no)	+	0.59	0.49
RADIO	Household possesses a radio (1 = yes, 0 = therwise)	+	0.69	0.46

DISTANCETOMARKET	Distance to agricultural produce market more than 5 km (1 = more than 5 km, 0 = otherwise)	-	0.38	0.48
LANDHOLDSIZE	Household's landholding size for agricultural production (acres)	+	2.87	4.44
HYBRID	Household grows hybrid maize varieties (1= yes, 0 = otherwise)	+	0.76	0.42
CASHCROP	Household grows cash crops (cotton, tobacco, tea) (1 = yes, 0 = otherwise)	+	0.21	0.42
FERTILIZER	Household uses inorganic fertilizer on the farm (1 = yes, 0 = otherwise)	+	0.86	0.34
SOCIOECONOMIC	Household's perception of socioeconomic gains by accessing agricultural support services (1 = yes, 0 = otherwise)	+	0.79	0.41

2.3.3. Marital status

Being married was hypothesized to have a positive influence on household decision to access agricultural support services. Unlike a single-headed household, married couples tend to share ideas and jointly engage in decision-making processes including sharing of roles and responsibilities whenever necessary. For instance, one partner can represent the household in development related sessions including those on agricultural activities for the benefit of the whole family while the other is engaged in activities deemed equally important to the household well-being.

2.3.4. Education

Like age, education was hypothesized to initially have positive effect on household decision to access field level agricultural support services such as extension, affiliation to farmer clubs and seeking loan facilities. Thus, education as a variable was included in this paper because it was assumed that educated farmers have a better chance to acquire more information leading to improved understanding of farm enterprise management; they are also relatively better informed about availability of agricultural extension services, benefits of farmer clubs and access to affordable loans. Education also increases the farmer's knowledge about available opportunities including sources of funding and may influence participation in agricultural related economic ventures (Anang et al., 2015). However, in the context of Malawi, field experience has shown that highly educated farm household heads seldom attend field level extension sessions organized by agricultural extension officers. Having a broader information base, such farmers get different types of

agricultural information by reading magazines and various other publications; they can also directly consult the agricultural extension officers both in public and private domain.

2.3.5. Household size

Like marital status, having a large household means increased division of roles and responsibilities. A big household stands a greater chance to be represented in various agricultural sessions for the benefit of the entire family than a small household. This study therefore, expected household size to have positive effect on decision to access all the three agricultural support services.

2.3.6. Bicycle

To have a bicycle was hypothesized to influence household's decision to access agricultural support services positively. The attainment of a bicycle acts as an incentive for a household to strive to achieve even more. From field observation, farmers with bicycles tend to be much more eager to attend agricultural extension meetings, travel long distances to participate in farmer gatherings as well as seeking loan facilities due to lessened mobility challenges than those without bicycles. That being the case, accessing agricultural support services becomes part and parcel of the farmer's day-to-day activities.

2.3.7. Radio

A farm household that possesses a radio as an asset tends to acquire more information about agriculture than a counterpart household without a radio. A radio serves as a mode of agricultural related service delivery. Through the radio a farmer gets to know how other farmers elsewhere in the country and beyond who are organized in farmer groups such as farmer clubs have benefited from farming. The radio also offers information about availability and sources of various types and mechanisms of credit opportunities that can be used in the agricultural production. Therefore, this study expected radio ownership to have a positive effect on smallholder farm household decision to access agricultural support services for ascertaining and validating the received information.

2.3.8. Distance to market

Where a farm household was to grow cash crops whose market is far away, long distance to agricultural market was thought to have a negative effect on the household decision to access agricultural support services. Lack of readily available markets for agricultural produce discourages farmers from growing potentially high value crops. Therefore, such farmers lack adequate justification to access agricultural support services on crops that have no markets within accessible locations.

2.3.9. Landholding size

Landholding size was measured as the total land that farmers used to produce different types of crops. This study expected landholding size to influence household decision to access agricultural support services

positively. With a large farm size a household manages to diversify land use decisions including having multiple farm enterprises, cropping systems and patterns (Maonga et al. 2015). These prompt the household to seek more and varied farm management advice from different sources including the studied agricultural support services.

2.3.10. Hybrid

Farmers who grow hybrid maize require proper knowledge and skills on production and management, as well as enough financial resources to purchase inputs such as seed and fertilizer. It was therefore, hypothesized that growing hybrid maize would positively influence a farmer's decision to seek agricultural extension services, affiliation to farmer clubs and search for opportunities to get loans for farm activities.

2.3.11. Cash crop

Like with hybrid maize, the study hypothesized that farmers growing cash crops would be more willing to access agricultural support services including extension, club membership and loan facilities in order to improve management of their farm enterprises and boost household income. Therefore, the variable was deemed to have positive effect on farmers' decision to access agricultural support services in general.

2.3.12. Fertilizer

This study asserts that households that use inorganic fertilizer will be interested to participate in agricultural support services. Through agricultural extension, they would want to acquire knowledge and hands-on practical experience on correct use and proper application of the fertilizer on the farm. Again, through extension and club membership farmers who grow cash crop would be able to get information about sources of funding or seek loan opportunities to purchase fertilizer. Therefore, the variable was expected to have positive influence on farm household decision to access the studied agricultural support services in Malawi.

2.3.13. Socioeconomic

When farm households perceive realization of positive socioeconomic benefits through improved farming, chances are high that they would be eager to access agricultural services with high potential to increase farm level productivity. Thus, the variable was hypothesized to positively influence smallholder farm household to access the agricultural support services.

3. Results and discussion

Table 2 presents the coefficients and marginal effects of multivariate probit model that was used to explain factors that influence smallholder farm household's decision to access agricultural support services in Malawi. The chi-square results show that the likelihood ratio statistics are highly significant ($p<0.01$),

meaning that the model has a strong explanatory power. The results are discussed based on the interpretations of the marginal effects.

Age of household head (AGE) was found to have a positive effect on farmer's decision to participate in farmer club as an agricultural support service. Significant at 5% ($p<0.05$) a year's increase in age of household head would increase the probability of the household to become an active member of farmer club by about 0.83%. This can be explained by the fact that as one grows old there is an increased sense of maturity and responsibility as well as the urge to belong to and be recognized in society. This drives the household to participate in various development activities and get affiliated with community level programs including those related to agriculture in a quest to improve household's socioeconomic status.

Household head's marital status (MARITAL STATUS) was one of the significant factors ($p<0.01$) found to have an effect on farm household decision to access agricultural support services. Descriptive statistics show that about 84% of the sample were married (Table 1). At 1% level of significance, being married was found to have a high probability to influence a smallholder farm household not to access agricultural extention services. The study revealed that households with married couples were 27.44% less likelikely to access extension services than their unmarried counterparts. This was contrary to expectation whereby being married would enhance a sense of shared responsibilities between couples in a household. This finding could be explained by the fact that with marriage comes increased responsibilities and joint decision making. Therefore, though in rare cases, when one partner disapproves of attending certain activities, the other tends to comply in order to maintain solidarity at household level and avoid unnecessary family wrangles.

HOUSEHOLDSIZE was a significant socieconomic factor at 5% level of significance ($p<0.05$), influencing smallholder farm household decision to join farmer clubs. The result showed that an increase in household size by one member would raise the probability of the household to become a club member by about 5.45%. This is so because of sharing of roles that comes with an increase in the number of household members. When household members attain an economically active age group ($\geq 15 \leq 65$), a relatively large household tends to spread roles and responsibilities assigned to its members in undertaking tasks deemed to potentially uplift the welfare of the entire household.

Table 2: Multivariate probit coefficients and marginal effects

Variables	EXTENSION		CLUBMEMBER		LOAN	
	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects
AGE	-1.14e-05	0.00002	0.00779**	0.00829**	0.00737	0.00748
	(0.00358)	(0.00357)	(0.00359)	(0.00358)	(0.00649)	(0.00651)
SEX	-0.154	-0.15363	-0.133	-0.14976	0.0294	0.02065
	(0.118)	(0.11823)	(0.118)	(0.11738)	(0.222)	(0.22246)
MARITALSTATUS	-0.275*	-0.27444*	-0.0850	-0.09244	-0.0252	-0.03084
	(0.150)	(0.15025)	(0.117)	(0.11846)	(0.253)	(0.25543)
EDUCATION	-0.00706	-0.00697	0.0198	0.02163	0.00253	0.00331

	(0.0165)	(0.01654)	(0.0169)	(0.0168)	(0.0314)	(0.03151)
HOUSEHOLDSIZE	0.0265	0.02655	0.0541**	0.05452**	0.0325	0.03216
	(0.0243)	(0.02426)	(0.0241)	(0.0241)	(0.0445)	(0.04417)
BICYCLE	0.267**	0.26790**	-0.000785	0.02199	0.573**	0.59585**
	(0.123)	(0.12264)	(0.124)	(0.12378)	(0.256)	(0.25592)
RADIO	0.142	0.14032	-0.0565	-0.07017	-0.581**	-0.61013**
	(0.138)	(0.13778)	(0.138)	(0.13798)	(0.256)	(0.25513)
DISTANCETOMARKET	0.0732	0.07419	0.0763	0.07255	0.159	0.16033
	(0.113)	(0.11349)	(0.116)	(0.11503)	(0.220)	(0.22049)
LANDHOLDINGSIZE	0.00515	0.00510	0.0150	0.01453	-0.0217	-0.01742
	(0.0118)	(0.01182)	(0.0145)	(0.01474)	(0.0460)	(0.04434)
HYBRID	-0.140	-0.14013	0.310**	0.28850**	0.856**	0.86939**
	(0.133)	(0.13264)	(0.139)	(0.13828)	(0.350)	(0.34939)
CASHCROP	0.478***	0.47750**	0.326**	0.32960**	0.363	0.34234
	(0.137)	(0.13726)	(0.139)	(0.13868)	(0.250)	(0.25011)
FERTILIZER	0.245	0.24470	0.184	0.18371	0.521	0.52451
	(0.169)	(0.16903)	(0.170)	(0.16977)	(0.432)	(0.43)
SOCIOECONOMIC	-0.0132	-0.01355	0.170	0.15219	-0.756***	-0.77687**
	(0.139)	(0.13891)	(0.143)	(0.1428)	(0.229)	(0.22814)
Constant	-0.580*		-1.615***		-2.997***	
	(0.326)		(0.326)		(0.714)	
Observations	595	595	595	595	595	595
Log likelihood	-824.08815		-824.08815		-824.08815	
Wald Chi2(39)	93.96		93.96		93.96	
Prob>Chi2	0.0000		0.0000		0.0000	
Likelihood ratio test of rho21 = rho31= rho32 = 0: Chi2(3) = 15.092						
Prob>Chi2 = 0.0017						

*Note: Robust standard errors in parentheses / *** p<0.01, ** p<0.05, * p<0.1*

Owning a bicycle (BICYCLE) of which 59% of the sample had at least one (Table 1), was found to have a positive effect on farmer's decision to access two of the three agricultural support services namely, extension and loan. The study revealed that a farm household that owned a bicycle was about 26.79% and 59.58% more likely to make a decision to access agricultural extension and loan facilities, respectively than one without a bicycle. The variable was significant at 5% level of significance ($p<0.05$) in both cases. At farm

household level in Malawi, ownership of a bicycle is considered as a measure of success associated with hard work and progress in asset acquisition and livelihood improvement. As already pointed out, ownership of a functional bicycle eases transportation setbacks and therefore, enables the farm household to access extension services and seize available loan opportunities in an effort to improve farm level agricultural activities for enhancement of household livelihood and wellbeing.

Contrary to expectation, ownership of a radio (RADIO) of which 69% of the sample had at least one, was found to be a significant factor with a negative effect on farm household decision to access a loan from formal lending institutions. Significant at 5% level ($p<0.05$), the result showed that a household with a radio was 61.01% less likely to decide on accessing credit facilities from formal lending institutions for agricultural purposes. According to observations made during fieldwork, in the rural setup in Malawi, radio ownership is considered as a symbol of affluence in the society. Therefore, to a limited extent, there could be a possibility that some farm households with a radio in possession do not have a pressing need for credit facilities for agricultural activities. Rather than using it as a channel for accessing loan opportunities only, such farm households also use the radio as a source of information needed to plan and organize farm activities and marketing aspects of the farm output. Furthermore, through focus group discussions (FGD), the study observed that farm households, which possessed a radio, knew better about negative implications of getting a loan especially regarding payment of exorbitant collateral payable after sale of agricultural commodities. It was also revealed that "through the radio farmers know about other existing opportunities, including off-farm income sources, of improving living conditions at household level; such opportunities enable affected farm households to acquire basic agricultural resources and therefore, reduce the need for the costly credit facilities".

At 5% level of significance ($p<0.05$), growing of hybrid maize (HYBRID) was found to have a positive effect on farm household decision to participate actively in farmer clubs. A farm household that grew hybrid maize was 28.85% more probable to join membership with farmer clubs in the farming communities. Similarly, at 1% level of significance ($p<0.01$), a farm household producing hybrid maize was found to be 86.94% more likely to decide on accessing loan facilities than another household that did not grow hybrid maize varieties. Growing of improved breeds of maize and other crops requires proper technical knowhow and financial capital to finance farm activities including purchases of inputs. This study has shown that hybrid maize was grown by 76% of the sampled farm households in Malawi (Table 1). This coupled with increased emphasis, by the research stations, on the use of improved breeds of maize, relatively more farmers get interested in joining farmer clubs hoping to acquire information through shared experiences on the performance of hybrid maize varieties. Nevertheless, it is widely announced that in order to reap optimum yield with hybrid maize varieties, recycling of seed during farming season must be avoided at all times and that adequate amount of fertilizer must be applied as per research recommendations. Both of these attributes of hybrid maize require that farmers should have some necessary financial backing in order to realize the best from the crop. Unfortunately, non-recycling of seed and the performance of hybrid varieties that is pegged on use of adequate amounts of fertilizer pose some serious cost implications on the majority of cash-strapped smallholder farmers in Malawi. Therefore, in order to abide by these requirements smallholder farmers interested to realize the full benefits of hybrid maize production inevitably find

themselves seeking loan facilities for the purchase of the inputs namely the new (non-recycled) seed and the inorganic fertilizer.

Growing of cash crops (CASHCROP) was found to significantly and positively affect the decision of a smallholder farm household to access extension services at 1% ($p<0.01$) and to join farmer clubs at 5% ($p<0.05$) level of significance. The study revealed that 21% of the sampled households had grown at least a crop (either cotton, tobacco or tea). A household that grew cash crops was 47.75% more probable to make a decision to access agricultural extension services and 32.96% more likely to join a farmer club than another household that did not grow cash crops. With the emphasis on agribusiness by the Malawi Government, increased number of smallholder farmers have the knowledge that production starts from market research. Fearing that markets may not be available, smallholder farmers have no option but to attend extension services and farmer club meetings. Through extension services and participation in farmer club activities, smallholder farmers hope to get information on markets for input and output prices, the degree of price volatility in the markets, as well as the commodity attributes that describe demand for the cash crops in the local and/or regional markets. Such information tends to be vital as it guides smallholder farmers to prepare their marketable agricultural commodities well enough to attract better prices during sale. At a farmer club level market information is accessed through marketing subcommittees among others, which are responsible for conducting market research.

Although considered a very important issue by 79% of the sampled farm households, perception and expectation to improve socioeconomic status (SOCIOECONOMIC) through access to the agricultural support services was found to be a significant determinant at 1% ($p<0.01$) level of significance but with a negative effect on smallholder farm household decision to seek loan facilities for agricultural purposes. Smallholder farmers who wanted to boost their socioeconomic status through farming were 77.69% less likely to access loan facilities. Through focus group discussions (FGD), the study found that smallholder farmers understood that "improving socioeconomic status at household level required enough capital to undertake various agricultural activities". Similar to the findings on the effect of radio ownership on access to loan, most of the loan facilities available on the credit market in Malawi are too exorbitant to benefit the majority of poor-resource endowed smallholder farmers. The FGDs also revealed that "in order to avoid trapping themselves in a deeper vicious cycle of poverty through efforts to enhance agricultural production, smallholder farmers tended to be mindful of the fact that improvement in their livelihoods does not necessarily require one to acquire an expensive loan facility but rather by putting the necessary productivity enhancing conditions and mechanisms in place." Thus, improvements in the agricultural input and output markets as well as pricing of agricultural produce that reflects the realities of the market situation and structures could in principle contribute to a sustainable enhancement mechanism of socioeconomic status of a large majority of smallholder farmers.

4. Conclusion and policy recommendations

Using cross-sectional data, this study attempted to analyse the critical and significant socioeconomic factors with a likelihood to influence smallholder farm household decision to access agricultural support services

(agricultural extension, affiliation to a farmer club and access to loan facilities) in Malawi. The study showed that 39% of the usable sample of 595 smallholder farm households had access to agricultural extension services; 35% of the sample belonged to a farmer club and only about 5% had access to loan facilities from formal lending institutions.

The multivariate probit results showed that smallholder farm household decision to access agricultural extension was positively influced by ownership of a bicycle and growing of cash crops, and negatively affected by marital status of household head. Farm household decision to join farmer clubs was found to be positively and significantly influenced by age, household size, growing of hybrid maize and cash crops. The study also revealed that ownership of a bicycle and growing of hybrid maize varieties were positive and significant determinants, while ownership of radio and farmers' perception and expectation to improve socioeconomic status were negative factors with significant influence on smallholder farm household decision to access agricultural loan facilities from formal lending institutions.

Based on the findings, the critical implications of the significant determinants have a strong bearing on the smallholder farmer's quest to improve livelihood and wellbeing by enhancing farm level agricultural performance via the agricultural support services. This study therefore, asserts that in order to encourage more smallholder farmers to access the three support services (extension, farmer club and loan), stakeholders in the agricultural ought to increase their efforts to improve agricultural input and output markets as well as pricing of farm produce that reflects the realities of the market situation and structures in the country. Better marketing systems would increase adoption of hybrid crop varieties as well as the number of farmers growing cash crops, thereby fostering more farmers to seek the agricultural support services. Such efforts would contribute to a sustainable enhancement of socioeconomic status by a large number of smallholder farmers in Malawi.

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