



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.



Determinants of Access to Agricultural Extension Services: Evidence from Smallholder Rural Women in Northern Ghana

Abdul-Hanan Abdallah^{1*} and Awal Abdul-Rahaman¹

¹*Department of Agribusiness Management and Finance, University for Development Studies, P.O.Box TL 1882, Tamale, Ghana.*

Authors' contributions

This work was carried out with the involvement of both authors. Author AAR was involved in the design of the survey instruments as well as data collection, while author AHA managed the entries, analyses and the first draft. Author AAR did further editing and the final write-up. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2016/23478

Editor(s):

(1) Ian McFarlane, School of Agriculture Policy and Development, University of Reading, UK.

Reviewers:

(1) Wondimagegn Mesfin, United Nations University - Merit, Netherlands.

(2) Teddy T. Nakanwagi, Makerere University, Kampala, Uganda.

(3) Sanjay Kanti Das, Lumding College, Assam, India.

Complete Peer review History: <http://sciencedomain.org/review-history/13024>

Original Research Article

Received 2nd December 2015
Accepted 8th January 2016
Published 20th January 2016

ABSTRACT

Aims: To provide empirical evidence on the determinants of access to extension services in Northern Ghana.

Study Design: Cross sectional.

Place and Duration of Study: Kumbungu and Sagnarigu Districts of the Northern region; Builsa North and Pusiga Districts of the Upper East; Wa West and Jirapa-Lambussie Districts of the Upper West and Tain and Nkoranza South Districts of the Brong Ahafo regions. The study was conducted in the 2012/2013 cropping season.

Methodology: We employ a logistic regression model on a data from 320 women which was obtained by multi-stage sampling procedure.

Results: Our results show that the major determinants of extension access include the square of

*Corresponding author: E-mail: abdallahabdulhanan@gmail.com;

age, farm size, group membership, time spent on the farm and access to fertilizer.

Conclusion: Our results thus, confirmed the importance of the personal and household attributes, farm/plot characteristics, socio-economic and institutional factors in accessing extension services. We therefore call for formation of women's groups to improve their access to extension services.

Keywords: Extension access; logistic regression model; Ghana.

1. INTRODUCTION

Agriculture is the backbone of Ghanaian economy as it plays an important role in contributing to food security, poverty reduction, livelihoods improvement, rural development and the environment. Smallholder farmers represent about 80% of total agricultural production. Majority of these farmers are in the Crop Sub-Sector and are mainly engaged in production of industrial crops (e.g. cocoa, oil palm, coconut, coffee, cotton, kola, rubber, cashew, shea), starchy and cereal staples (e.g. cassava, cocoyam, yam, maize, rice, millet, sorghum, plantain) and fruits and vegetables (e.g. pineapple, citrus, banana, pawpaw, mango, tomato, pepper, okro, eggplant, onion, Asian vegetables) under rain-fed conditions [1]. It is estimated that more than 70% of these farmers produce on 3 acres or smaller and these constitute about 57.6% of the area under cultivation [2]. Also, majority (76.1%) of these smallholder farmers lives in rural areas and depends either directly or indirectly on agriculture [1]. Against this backdrop, growth in the agricultural sector will not only satisfy the persistent demand of the increasing population but will also stimulate higher rates of growth in the economy through forward linkage and backward linkage activities. Notwithstanding, further growth will be spurred as a result of spending incomes earned from all these productive activities. The apparent question is: how can these farmers be supported to improve production?

Clearly, on farm technology adoption which leads to higher levels of output and at the same time ensures environmental sustainability has been the wake-up call by researchers in recent times. The uptake of improved soil and water conservation technologies can be initiated by agricultural extension and rural education.

Agricultural extension does not only serve as a source of information on new technologies for farming communities but also ensures access to improved technologies and contributes to

improving the welfare of farmers [1]. It serves as a channel through which farmers' challenges could be identified for research and formulation of agricultural policies to the benefit of rural communities. The above potencies of agricultural extension make it necessary for every farmer to access the services. The question is whether farmers are really accessing the services provided by extension especially rural women in Northern Ghana? Since much literature has not been documented on the factors that influence the smallholder women farmers' access to extension services, this paper seeks to provide a clear picture of the determinants.

1.1 Literature Review

Different factors determine the access of extension services by farmers. These factors are broadly categorized into personal and household attributes, farm/plot characteristics, socio-economic and institutional factors [3]. Education, age and household size constitute the personal and household attributes. Studies that sought to establish the relationship between education and access to extension services in most cases relate it to years of formal schooling. Most studies [4] and [5] found that education creates a favourable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices and has been observed to have positive effects on extension access. For instance, [4] found that among male heads, those with at least primary education are more likely to get visits from or initiate visits to providers of extension services.

The effect of age on extension access is found to be limited (see for instance [4]). However, other studies such as [6] have included it in the adoption of technologies and found age to be negative while others on the contrary, found age to positively influence adoption [7]. Household size is another variable that forms part of the personal and household attributes. For these variable [4] found that female heads with more male members in their household and assets in the form of land and livestock are more likely to

be visited or to initiate visits to extension service providers.

Farm size and local rights area have been considered under farm/plot characteristics. In addition to household size, the other factors that were found to significantly affect access to extension services by [4] include wealth indicators such as land size and livestock holdings, distance to market, and location dummies. Those with larger land size in the household and shorter distance to market were more likely to have access to agriculture-related information through different channels.

The local rights area which is a proxy for location of farm has not been included in any extension studies. However, [8], [6] and [3] tested the significance of this variable in their adoption studies and found it to exhibit a significant but negative relation.

The socioeconomic and institutional factors include off-farm income, credit access, contacts with extension, group membership, distance to input store/market, and labor cost. Again, the effect of these variables on extension access is yet to be known.

It is obvious from the forgoing discussion that few studies have been conducted across the world on extension service access and this result in scanty literature on the specific factors that influence access to modern agricultural extension services especially among women in Ghana. This is a serious gap that must be bridged if the problem of low access to extension services among women farmers is to be addressed and agricultural productivity improved.

2. METHODOLOGY

2.1 Area of Study

The study is conducted in four regions of Ghana including Brong Ahafo, Northern, Upper West and Upper East. These four regions of Ghana together make up about 57.5% of the country's total land area with a total population of 6,459,926 representing 26.7% of the country's total population. Of the total population in the area, women population takes about 79.5%. A maximum temperature of about 42°C is recorded in the Northern part occurring towards the end of the dry season but 32°C is recorded in Brong Ahafo region. The rainfall distribution is uni-modal in the Northern part of Ghana (i.e.

Northern, Upper West and Upper East regions) giving a single growing season of 180 to 200 days with an annual mean of 1,100 mm but bi-modal in Brong Ahafo region which has an annual rainfall of 1,197 mm.

2.2 Sampling Method and Sample Size

A multistage sampling technique was used to select 320 respondent maize farmers for in depth interviews during the 2012/2013 cropping season. In the first stage of sampling, four regions including Brong Ahafo, Northern, Upper West and Upper East were purposively selected from the ten regions of Ghana. In the second stage, two districts (one of them being a district where Action Aid Ghana is operating) were then randomly selected from each region. This includes Kumbungu and Sagnarigu in the Northern region; Builsa North and Pusiga in the Upper East Region; Wa West and Jirapa-Lambussie in the Upper West and Tain and Nkoranza South in the Brong Ahafo region. Simple random sampling procedure was again employed in the third stage to select two communities from each district and from which 20 women were also randomly sampled from each community to get a total of 40 respondents for each district and this represented the final stage. Each region had a sample size of 80 respondents, thus a total of 320 maize households for the four regions of Ghana. Table 1 presents a list of sampled districts and the number of women selected in each district for the study while Table 2 presents the sample districts and communities selected.

Data were collected from both primary and secondary sources. The primary sources of data were obtained using semi-structured questionnaire and interview schedules. Semi-structured survey questionnaires, covering issues relating to household, farm and institutional characteristics, knowledge and access of farm inputs and extension service among other livelihood dimension were administered to the women in households. Therefore, findings which will reflect in this study are the respondents' subjective viewpoints. In cases where there appear to have discrepancies between respondents' perceptions and the reality of extension issues on the ground, the reader is reminded that such discrepancies usually exist because respondents may be uninformed or misinformed regarding the issues being investigated. The household surveys were complemented by focus group discussions at

Table 1. Sampled Districts and respondents

Northern	No. of women	Upper East	No. of women	Upper West	No. of women	Brong Ahafo	No. of womens
Sagnarigu (Operational area)	40	Pusiga (Operational area)	40	Jirapa-Lambussie (Operational area)	40	Tain (Operational area)	40
Kumbungu (non-operational area)	40	Builsa North (non-operational area)	40	Wa West (non-operational area)	40	Nkoranza South (non-operational area)	40
Total	80		80		80		80

Table 2. Sampled Districts and communities

S/N	Region	Actionaid operational area		Non-actionaid operational area	
		District	Community	District	Community
1	Northern	Sanarigu	Wayamba Katariga	Kumbungu	Kahanfeihi Yili Yelpeil Naa Yili
2	Upper East	Pusiga	Maritinga Pusiga Natinga	Builsa North	Balanza Kori
3	Upper West	Jirapa	Tampala UI-Kpong	Wa West	Samanbo Tanina
4	Brong-Ahafo	Tain	Kwame Tintin	Nkoranza South	Ayerede

REFLECT circle levels. The focus groups discussed issues bordering on women’s access to extension services, access to land, gender roles in agriculture and crop choices Discussions were also held with opinion leaders notably Assembly men, community women leaders also known as “Mangasias” and Opinion leaders. Opinion leaders’ consultations were intended to help the team explore alternatives for dealing with extension service access of the various communities. Secondary sources of data was collected from textbooks, journals, seminar papers and conference papers, reports from Ministry of Food and Agriculture (MoFA), publications, and internet resources.

2.3 Analytical Model

Factors influencing access to agricultural extension services can be estimated using the Probit or Logit models especially when the dichotomous nature of the dependent variable is taken into consideration. Logit and probit models translate the values of the independent variables (X_i), which may range from -∞ to +∞ into a probability for (Y_i) which ranges from “0” to “1” and compel the disturbance terms to be

homoscedastic. This makes selection between the two models very sticky as both models provide equally efficient parameters. The forms of probability functions depend on the distribution of the difference between the error terms associated with a particular choice. The probit and logit models assume the existence of an underlying latent variable for which a dichotomous realization is observed [9] and [10], thus given the model:

$$Y_i^* = \beta_0 + \sum_{j=1}^k \beta_j X_{ij} + \epsilon_i \dots \dots \dots (1)$$

Where Y_i^{*} is a latent variable (not observable) and what is observed is a dummy variable Y_i defined as:

$$\begin{cases} 1 & \text{if } Y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \dots \dots \dots (2)$$

In order to estimate the probabilities of women access to extension services or non-access in this study, the logit model was used since the results are similar with probit. The Logit model is therefore specified as:

$$\text{Log} \left(\frac{P_i}{1 - P_i} \right) = \sum \beta_j X_{ij} + \varepsilon_i \dots \dots \dots (3)$$

The probability that a farmer has access to agricultural extension service is denoted as $P = P[Y = 1]$ and the probability that a farmer has no access to agricultural extension service is denoted as $P = P[Y = 0]$. Thus P_i represents conditional probability that a farmer has access to extension service while $(1 - P_i)$ denotes conditional probability that a farmer has no access to extension service. β_j s are vectors of coefficients to be estimated; X_{js} are vectors of explanatory variables and ε_i is the error term.

3. RESULTS AND DISCUSSION

Table 3 presents the description and summary statistics of the variables included in the regression estimations. Post estimation indicates there were no problems relating to multicollinearity as the predicted variance inflation factors of all the variables were found to be less than 10. The average age of a farmer is about 41 years with 10 years of experience. The level of education among farmers was low, considering the mean schooling years of 3. An average household in the area consists of 7

members with only about 4 people working on an average of 3 acres of land. However, less than 2 bags (149.59 Kg) are realized from the farm at the end of the season. The average monthly income of the farmer was found to be GH¢51.22. About 37% of the farmers belong to famers associations with 15% having access to agricultural credit. Also, about 92% lack knowledge of improved seeds and 86% apply fertilizer on their farms. The average number of visits made by extension agent is 0.21 and the average distance from the farm to input store is 2.67 Km.

3.1 Determinants of Women Access to Agricultural Extension Services

The logistic regression results are presented in Table 4. The results indicate a reasonable degree of uniformity regarding the sign of the parameter estimates and statistical significance at 1%, 5% or 10%.The estimated Pseudo R-squared value is low (37%), but overall significance of the model is satisfactory, as reported by the Chi-squared value. The chi-squared value was significant at 1%, implying that all the variables jointly determine the dependent variable.

Table 3. Summary definition of variables

Variable	Definition/Measurement	Mean	Standard deviation
Age	Number of years	40.56	10.09
Education	Years spent in formal schooling	3.05	4.03
Household Size	Number of people	7.47	6.07
Monthly income	Amount in Ghana Cedis (GH¢)	51.22	51.36
Farming Experience	Years in farming	10.32	9.52
Farm Size	In acres	2.94	1.75
Group Membership	Dummy (1 if the farmer is a member of a group and 0 otherwise)	0.37	0.48
Time spent on-farm	In hours	5.28	2.15
Knowledge of improve seeds	Dummy (1 if the farmer have knowledge of improve seeds and 0 otherwise)	0.92	0.94
Knowledge of fertilizer	Dummy (1 if the farmer have knowledge of fertilizer and 0 otherwise)	0.86	0.35
Frequency of extension visits	Number of visits by extension agent	0.21	0.67
Credit	Dummy (1 if the farmer access credit and 0 otherwise)	0.15	0.35
Distance to input store	In kilometers	2.67	3.96
Labour	Number of people used	3.66	3.87
Yield of maize	In kilograms	149.59	429.37

Source: Result from data analysis (2012)

Table 4. Maximum likelihood estimation of the factor that influence access to agricultural extension services

Variable	Coefficient	Standard error	Z
Constant	-5.5287	1.7146	-3.22***
Age	-0.9400	0.7511	-1.25
Age square	0.0020	0.0011	1.91*
Education	-0.0785	0.0699	-1.12
Household Size	0.0908	0.0721	1.26
Monthly income	0.0015	0.0060	0.26
Farming experience	-0.0731	0.0413	-1.77*
Farm size	0.5450	0.2479	2.20**
Group membership	3.5541	0.8926	3.98***
Time spent on-farm	0.3228	0.1581	2.04**
Knowledge of improve seeds	0.3161	0.2891	1.09
Knowledge of fertilizer	1.4716	0.7300	2.02**
Frequency of extension visits	0.1874	0.8821	0.21
Credit	0.9035	1.0084	0.90
Distance/proximity to input store	0.0854	0.1252	-1.69*
Labour	0.0347	0.0702	0.49
Yield of maize	0.0854	0.0598	1.43
Number of observations		320	
LR χ^2 (16)		76.44	
Probability χ^2		0.0000	
Pseudo R^2		0.3743	
Log likelihood		-63.89893	

*, ** and *** are levels of significance at 10, 5, and 1%, respectively.

Source: Result from data analysis (2014)

Among the personal and household variables, only age square was found to be significant at 10% and positively related to agricultural extension service access in the study area. Age square is a proxy for old age in this study. This implies that older farmers are more likely to access different types of extension services, but only at a certain age. The result is not surprising because older farmers have comparative advantage in terms of capital accumulated, extension visits and credit worthiness. This perhaps explains why age is not significant. The result is consistent with our a priori expectations and yet contradicts with that of [4] who found the likelihood of access to extension services to decline with age.

Though not significant, the negative sign of the education variable indicates that the probability of accessing extension service is higher among the illiterate women farmers. Farmers who are educated may have a comparative advantage over other farmers in accessing extension services. For instance, in terms of information search, education provides the farmer an opportunity to read and understand manuscripts as well as posters about extension teachings and practices. It also presents the farmer information about any extension program. Our expectation

therefore was that 'education' will have more influence on extension service access. On the contrary, the result means that access to extension services does not require much formal education compared with demand for other services. Perhaps this also explains why the frequency of extension visits is insignificant. The results contradicts with studies such as [11]; [12] and [13]; that argue that, farmers who have better education tend to have greater probability of accepting new ideas than their illiterate counterparts.

Socioeconomic and institutional characteristics such as group membership and distance to input store/market were found to be significant at 1% and 10% respectively. A positive relationship observed between group membership and access to extension services supports the hypothesis that farmer's group can provide him with information about the extension services and the procedure involve in accessing them, thus providing him advantage to stretched out for the services. This finding is consistent with a priori expectation and that of the results of [3].

The inverse relationship between distance to town and the probability of demanding for extension services by households is not

surprising as nearness to major markets decreasing transactions cost [14] and guarantees market participation thereby encouraging the demand for extension services. The result is consistent with the finding of [4] in Ethiopia, who asserted that those with shorter distance to market are more likely to have access to agriculture-related information through different channels.

The impact of farm size has always been positive and in some cases, negative or neutral [15]. In this study, farm size which is under farm/plot characteristics was positively related to extension services and significant at 5%. This implies that the probability of accessing extension services is higher for farmers with large farms. This result is consistent with our a priori expectations and consistent with other studies such as [16-21].

The coefficient of farming experience of the household head is negative with regard to accessing extension services and significant at 1%. This denotes that farming experience retards the farmer access to extension services. This result is unclear, as one would have expected farming experience to hasten the access to services as in the case of age square. The reason may be that household heads with high farming experience took longer time to assess the potential of the services before making informed decisions based on past experiences with services.

Time and more education are needed to influence farmers' access to extension services. Time spent on the farm was therefore another variable found to be positively related to farmers' access to extension services and significant at 5%. This did not come as a surprise as most of the extension services are time consuming and therefore require much time from farmers.

Knowledge of fertilizer was also found to be significant and consistent with our a priori expectation. This is not surprising because extension agents possessed knowledge on how to use modern fertilizer. As part of the efforts to spread this knowledge, they move to rural areas where farmers can easily access them. This thus, increases access to extension services.

4. CONCLUSION

The study was conducted to examine the determinants of smallholder women access to

agricultural extension services in Northern Ghana. Applying logistic regression on cross-sectional data gathered from Northern Ghana, our findings indicate that age square, farm size, group membership, time spent on the farm and access to fertilizer are the main factors that influence access to agricultural extension services. Other factors include farming experience and proximity to input store but these factors were negatively related to extension services. These thus confirm the importance of the personal and household attributes, farm/plot characteristics, socio-economic and institutional factors in accessing extension services.

The following recommendations are therefore distilled from the findings:

- i. Government and other rural development agencies should intensify formation of women's groups to improve their access to extension services.
- ii. Government can design and implement special interventions for the resource poor, including the women
- iii. Government and stakeholders can help build capacity of already existing FBOs and Community-Based Organizations (CBOs) to facilitate delivery of agricultural extension services to its members.
- iv. Government and stakeholders can step in to enable access of women in urban agriculture to sustainable land for production. This will enable them develop the interest in extension services.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. MoFA. Agriculture in Ghana, Facts and Figures in 2011, Statistics Research and Information Directorate.
2. Green DAG, Ng'ong'ola DH. Factors affecting fertilizer adoption in less developed countries: An application of multivariate logistic analysis in Malawi. *Journal of Agricultural Economics*. 1993;44(1):99-109.
3. Nkegbe PK, Shankar B, Ceddia GM. Smallholder adoption of soil and water conservation practices in Northern Ghana. *Journal of Agricultural Science and Technology*. 2012;2:595-605.

4. Catherine R, Guush B, Fanaye T, Alemayehu ST. Gender differences in access to extension services and agricultural productivity. ESSP Working Paper. 2012;49:1-16.
5. Boahene K. Innovation adoption as a socio-economic process: The case of the Ghanaian cocoa industry. Thesis Publishers; 1995.
6. Donkoh SA, Awuni JA. Adoption of farm management practices in lowland rice production in Northern Ghana. Global Res. J. 2011;2(6):189-191.
7. Adesiina AA, Baidu-Forson J. Farmers' perceptions and adoption of new agricultural technology: Evidence from analysis in Burkina Faso and Guinea, West Africa. Journal of Agricultural Economics. 1995;13:1-9.
8. Martins O, Obare G, Salasya B. What factors influence the speed of adoption of soil fertility management technologies? Evidence from Western Kenya. Journal of Development and Agricultural Economics. 2011;3(13):627-637.
9. Maddala GS. Limited-dependent and qualitative variables in econometrics. New York: Cambridge University Press; 1983. Peng C, Lee K, Ingresoll G. An introduction to logistic regression analysis and reporting. Indiana University-Bloomington. J. Edu. Res. 2002;96(1):2-14.
10. Abbey A, Admassie A. The role of education on the adoption of chemical fertilizer under different socioeconomic environments. Agricultural Economics. 2004;30:215-228.
11. Doss CR, Morris ML. How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. Agricultural Economics. 2001;25:27-39.
12. Foltz JD. The economics of water-conserving technology adoption in Tunisia: an empirical estimation of farmer technology choice. Economic Development and Cultural Change. 2003;51(2):359-73.
13. Lapar MLA, Pandey S. Adoption of soil conservation: The case of the Philippine uplands. Agricultural Economics. 1999; 21(3):241-256.
14. Akudugu MA. Estimation of the determinants of credit demand by farmers and supply by rural banks in Ghana's upper East Region. Asian Journal of Agriculture and Rural Development. 2012;2(2):189-200.
15. McNamara KT, Wetzstein ME, Douce GK. Factors affecting peanut producer adoption of integrated pest management. Review of Agricultural Economics. 1991;13:129-139.
16. Abara IOC, Singh S. Ethics and biases in technology adoption: The small farm argument. Technological Forecasting and Social Change. 1993;43:289-300.
17. Feder G, Just ER, Zilberman D. Adoption of agricultural innovations in developing countries: A survey. Economic Development and Cultural Change. 1985;33:255-298.
18. Kasenge V. Socio-economic factors influencing the level of soil management practices on fragile land. In proceedings of the 16th Conference of Soil Science Society of East Africa (Eds) Shayo-Ngowi; 1998.
19. Amsalu A, de Graaff J. Determinants of adoption and continued use of stone terraces for soil and water conservation in an Ethiopian highland watershed. Ecological Economics. 2007;61(2-3):294-302.
20. Bekele W, Drake L. Soil and water conservation decision behavior of subsistence farmers in the Eastern Highlands of Ethiopia: A case study of the Hunde-Lafto area. Ecological Economics. 2003;46(3):437-451.
21. Ersado L, Amacher G, Alwang J. Productivity and land enhancing technologies in northern Ethiopia: Health, public investments, and sequential adoption. American Journal of Agricultural Economics. 2004;86(2):321-331.

© 2016 Abdallah and Abdul-Rahaman; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/13024>