PRODUCER PERCEPTIONS AND WILLINGNESS TO PAY FOR AGRICULTURAL EXTENSION SERVICES IN ADA EAST DISTRICT OF GHANA

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ABSTRACT

Agricultural extension delivery in most developing countries is confronted with numerous challenges that hamper effective service delivery. The challenges, mainly budgetary in nature, have led to calls for cost-sharing in the delivery of agricultural extension services to farmers. However, there is not sufficient empirical evidence that supports the preparedness of producers to pay for extension services in most developing countries. Also, farmers' readiness to pay for agricultural extension services will depend on their perceptions of the effectiveness of the extension system. Relying on survey data, this study combined contingent valuation method (CVM) with Tobit modeling to estimate smallholders' willingness to pay (WTP) for agricultural extension services (AESs) in Ada East District of Ghana. Majority of the respondents (90.6%) indicated willingness to pay for AESs. Producers expressed willingness to pay GH¢190 for agricultural extension services for the cropping season. WTP was influenced by farmer's age, farm size, farm income, and marital status. Producers were generally dissatisfied with agricultural extension service delivery. Hence, efforts to promote privatization of extension service must take into account measures to enhance the quality of service delivery and frequency of visits.

KEY WORDS

Agricultural extension, contingent valuation method, perceptions, Tobit model, willingness to pay, Ghana.

Agriculture is the mainstay of many sub-Saharan African countries and contributes immensely to employment creation, poverty reduction, food and income security. Sustainable rural development in Africa depends largely on the performance of the agricultural sector which is a major contributor to poverty alleviation strategies in poor countries. Notwithstanding the notable contribution of agriculture, transformation in the sector has been rather slow, resulting in slowdown in agricultural growth resulting in poor economic performance of many African countries including Ghana. Agricultural transformation in Africa is dependent on disseminating the required information at the right time to producers who are key actors in the agricultural sector. This assertion is supported by Asiedu-Darko (2013) in his study on agricultural extension delivery in Ghana. Thus, the need for an effective agricultural extension system in Ghana and other developing countries cannot be over-emphasized. Agricultural extension is crucial in raising farmers' level of technical knowhow resulting in higher level of productivity. Agricultural extension is particularly important for rural development in less developed nations because agricultural production is pivotal to rural livelihood (Temesgen and Tola, 2015). Regarding the impact of extension on peasant agriculture, Anang *et al.* (2020) identified extension service as a contributor to farm income and technology adoption in northern Ghana.

In Ghana, agricultural extension is largely a public service carried out by agricultural extension agents (AEAs) in the department of agriculture in the district assemblies (local government unit). Historically, agricultural extension in many developing countries has been perceived as a public good. Farmers were regarded as poor who needed state support in the form of services such as extension advice and farm subsidies. However, in recent times, there is increasing demand on agricultural extension to effectively meet the needs of

producers with regards to production and linkage with markets (Rivera and Sulaiman, 2009). Ali et al. (2008) observed that globally, there are attempts to privatize agricultural extension delivery by public institutions due to ineffectiveness. Notwithstanding this realization, efforts at privatizing agricultural extension services (AESs) has not achieved the desired result in many developing countries such as Ghana. The need for commercialization of AESs has become more imperative nowadays in the face of shortage of extension personnel and lack of access by smallholders to extension services especially in rural areas.

Private extension service is regarded to be demand-driven and cost-effective, hence expected to lead to service quality and efficiency. Farmers desire improved entrepreneurial knowledge, improved access to input and output markets. This makes the market for private extension service a likely option in the face of current challenges facing public extension services in many developing countries. However, just like any private good, consumers' WTP is important for the development of an efficient private extension market. According to Parkinson (2009), successful privatization of agricultural extension hinges on farmers' demand for the services of private extension service providers as well as producers' capacity to afford such services. This assertion is reiterated by Kidd *et al.* (2000) who noted that the only way to successfully commercialize AESs is when there is willingness on the part of producers to patronize these services at a fee. Van Crowder (2000) further differentiated between producers' WTP and their ability to pay, stressing that the determination of fee structures must factor in the latter. Ajayi (2017) demonstrated that farmers' ability to pay for AES in Nigeria was positively related to their WTP. Farmers' lack of surplus financial resources is therefore a critical factor in privatization of AESs among the rural poor.

In moving from a public good to a private good, there is the need to make AESs relevant and attractive to farmers. This is because agricultural extension is a major strategy for rural development, which is expected to help producers to identify their challenges, find remedies to them, and take necessary action (Anaeto *et al.* 2012). The ultimate aim of AES is to improve productivity and incomes of farmers (Kassem, 2014). Farmers' perceptions about the effectiveness and impact of AESs are therefore important in achieving a robust extension system since they are major stakeholders and end-users of any extension programme.

Usually, farmers are blamed for not adopting innovations introduced by agricultural extension workers, without much consideration of the effectiveness of the extension delivery system itself. Logistical constraints, low motivation of extension staff, high extension worker to farmer ratio, among others, have been cited as challenges to AES delivery in most less developed countries. All these challenges have implications for extension service delivery, farmer satisfaction with the extension system, and the resultant effect on farmers' productivity and farm income.

Abraham *et al.* (2012) observed that the principal source of agricultural information for fish farmers in Kwara State, Nigeria was fellow farmers while extension agents were fifth in the ranking. This result highlights challenges with the extension system as pertains in many developing countries. Improper design of extension programs and messages have been identified as some of the challenges confronting effective extension delivery in Ghana and many developing countries (Anang *et al.*, 2020). The relevance and benefits of extension programs and services to farmers have been found to stimulate an interest to pay for these services (Ajayi, 2006; Farinde and Atteh, 2009). AES must therefore be designed with farmers' preferred needs in mind to make them attractive and acceptable.

The questions which come to the fore, which are the motivation for this study, include the following: (1) what are producers' perceptions about the effectiveness and impact of AES on their farming activities? (2) are Ghanaian smallholders willing to pay for AESs, and if so, what amount? Answers to these questions are relevant to improve extension service delivery as well as inform policy makers on the modalities to transition from a public extension system to a privatized, commercial system. The overall goal is to improve extension service delivery, accessibility, productive capacity and farm income of farm households.

The study's core objective is to evaluate producers' perceptions and readiness to pay for AES in Ada East District of south-eastern Ghana. The study intends to achieve the

following specific objectives: (1) to evaluate framers' perceptions of the effectiveness of AESs; and (2) to evaluate producers' willingness to pay for AES.

LITERATURE REVIEW

WTP for Agricultural Extension Services. Smallholders in developing countries depend to a large extent on public agricultural extension services as their source of agricultural information. The importance of public agricultural extension services to smallholders can therefore not be overemphasized. However, challenges in accessing AES by smallholder farmers is an increasing phenomenon, with the call for private extension services (fee-based services) gaining momentum in recent years (see Uddin *et al.*, 2016). Farmers perceive agricultural extension as a public good and have not developed a penchant for private extension which comes at a cost. Efforts at introducing private extension services will make extension a private good and hence more demand-driven as against the current supply-driven nature of agricultural extension in most developing countries including Ghana. It is in this light that policy makers in developing countries are exploring ways to make private extension service delivery operational to enhance access to extension services. To realize this goal, there is the need to fully understand producers' WTP for extension and their perception of AES delivery in general.

A number of studies on willingness to pay for AESs in less developed countries can be found in the existing literature (see Ajayi, 2006; Foti *et al.*, 2007; Ozor *et al.*, 2013; Spencer *et al.*, 2018; Uddin *et al.*, 2016). Studies have shown that WTP for AESs is positively related to farm income as well as relevance of the program and services to farmers in Nigeria (Ajayi, 2006; Farinde and Atteh, 2009). According to Uddin *et al.* (2016), farmers' WTP for agricultural extension in Bangladesh is conditioned on the quality of service. Farmers' income from agriculture, farming experience, and years of schooling were found to have significant influence on WTP for extensions services. The authors further revealed that 81% of farmers indicated willingness to pay. A study in Zimbabwe by Foti *et al.* (2007) also showed that higher income from agriculture enhanced WTP. Authors such as Foti *et al.* (2007) and Oladele (2008) identified farm size as a variable influencing WTP for agricultural extension in Zimbabwe and Nigeria, respectively. Ajayi (2017) noted that WTP for agricultural extensions services is related to age, annual income, gender of the farmer, farm size, participation in organization, ability to pay, attitude towards extension agents as well as farmers' assessment of the extension activities.

Spence *et al.* (2018) identified the complexity in moving to a user-pay extension system in Malawi and identified the key role that private service providers play in meeting the needs of farmers. Farmers' WTP for extensions services has also been shown to be related to what they perceive to be their needs with regards to farming (Budak *et al.*, 2010; Oladele, 2008).

There is paucity of research on willingness to pay for AESs in Ghana and this study seeks to fill that void. The few studies available include Ackah-Nyamike (2003) who observed that 82% of their respondents indicated willingness to pay for AESs. The preferred mode of payment revealed that 53% of producers are willing to pay with their crop harvest while 47% preferred payment in cash.

Contingent Valuation Method (CVM). Contingent valuation is the preferred approach for estimating willingness to pay. The CVM has been demonstrated to be the most common of the available methods for monetary valuation of services, such as extension delivery, due to its applicability in varied situations (Borzykowski *et al.*, 2017). In a hypothesized scenario, individuals are requested to give the amount they would willingly pay for a service or whether they would agree to make payment or suggest bid amount for the service. The method is useful when there is no real market or actual consumer expenditure to use for the valuation (Boyle, 2017).

There are diverse elicitation formats in acquiring respondents' WTP using CVM. These include the open-ended question, the game of bidding, and the dichotomous choice approach. The open-ended format is the simplest format in CVM. With the open-ended question format, respondents are requested to give the amount they would willingly pay for a

service. In this case, no specific bid amount is presented to the respondent. In the bidding game format, an individual is asked if he or she is willing to pay a specific amount of money for the service. If the response is “yes”, he or she will be asked the same question for an increased bid amount, and increased bid amounts are asked constantly until the respondent says “no”. Likewise, if “no” is the response to the initial bid amount, decreased bid amounts are constantly asked until the respondent says “yes”. The problem with this format is that the estimated WTP tends to have correlation with the initial value, which is called starting point bias (Mitchell and Carson, 1989).

There are two procedures under the dichotomous choice approach. The first procedure is the single-bounded dichotomous choice (SBDC) approach, where an individual is presented with a proposed amount for the service and asked to indicate willingness to pay. Here, the individual either agrees to pay the proposed amount or not. The approach is assumed to have less bias because respondents have no motivation to strategically bias their answers toward the desired outcome (Borzykowski *et al.*, 2017).

The second procedure is the double-bounded dichotomous choice (DBDC) approach, which has some similarity to the SBDC approach. The initial amount presented to the bidder is called the initial bid price. A higher bid is presented to individuals who express willingness to pay the initial bid price. The bid price is adjusted upwards by a fixed proportion until the individual expresses unwillingness to pay. Similarly, a lower bid price is presented to individuals who express unwillingness to pay the initial bid price. The DBDC approach provides elaborate information and decreases the need for a large sample size compared to that which is needed when using the single-bounded dichotomous choice (Borzykowski *et al.*, 2017).

METHODS OF RESEARCH

Ada East District is situated in south-eastern Ghana, specifically in the Greater Accra Region. It has Ada Foah as the district capital. Ada East district is part of the coastal savannah zone with an average annual rainfall of 800mm. The district is noted for the cultivation of pepper, tomato, water melon, cassava, onion, carrot and okra. Some farmers also engage in rearing of cattle, sheep, goats and pigs while others engage in fishing and fish processing.

Identification and selection of farmers for the study was done using multi-stage sampling. First, eight (8) communities were randomly selected to take into account geographical spread of farmers. This was followed by a random selection of 20 farmers from each community to provide a total of 160 respondents. Questionnaires were administered to farmers using face-to-face interviews. The enumerators aided the process by translating the questions into the local dialect for persons with low literacy.

CVM can be either open-ended or close-ended. With the open-ended format, individuals are simply requested to indicate how much they would willingly pay for extension services. The close-ended format however can take a single-bounded (SBDC) or double-bounded (DBDC) format. With the SBDC format, respondents indicate their willingness to pay GH¢X for AESs. The response is dichotomous requiring a “yes” or “no” answer. With the DBDC format, individuals are presented with the choice whether they would agree to pay for AESs. For a “no” answer, there is no further question; but if the response is “yes”, the individual is requested to indicate willingness to pay GH¢X price premium for extension services (the initial bid). The dichotomous response (yes or no) from the initial question is followed by another question with a dichotomous choice. A respondent who responds “yes” to the initial question will be asked again if she/he is willing to pay GH¢Y price premium which is higher than the initial price premium, GH¢X. The potential response for the second question is also dichotomous (yes or no). Conversely, a respondent who responds “no” to the initial question will be asked whether he/she is willing to pay GH¢Z price premium which is below the initial premium, GH¢X. The potential answer for this question is either “yes” or “no”. Depending on whether the response is “yes” or “no”, a higher or lower bid is presented to the respondent (based on a proportionate increase or decrease in the initial bid amount),

until the respondent has no inclination to pay a higher or lower bid than the amount that she/he has indicated a willingness to pay. Based on the responses, five potential outcomes can be derived from the DCDB format. Assuming we represented the initial bid with β_I , lower bid with β_L and upper bid with β_U , then the potential outcomes will be given as follows:

Zero WTP: Respondents unwilling to pay for AESs. Respondents are referred to as zero WTP bidders.

No-No WTP: Respondents who express willingness to pay additional cost for extension services but lower than the initial and lower bid. Respondents are referred to as lowest WTP bidders.

No-Yes WTP: Respondents who express willingness to pay additional cost for AESs between the initial bid and the lower bid. Respondents are referred to as lower WTP bidders.

Yes-No WTP: Respondents who express willingness to pay additional cost for AESs between the initial bid and the upper bid. Respondents are referred to as moderate WTP bidders.

Yes-Yes WTP: Respondents who express willingness to pay additional cost for AESs beyond the initial bid and the upper bid. Respondents are referred to as higher WTP bidders.

Farmers' perceptions of the effectiveness of AESs were analyzed using descriptive statistics (percentages, frequencies and tables). A 5-point Likert scale was constructed to measure how producers perceived the effectiveness of AESs. Summary statistics such as means and standard deviations for the various perception statements were obtained and reported.

The main approaches in the literature for estimating the factors determining producers' WTP for extension services are the binary probit (or logit) and censored Tobit models. For example, the probit model was used to assess factors influencing WTP by authors such as Budak et al. (2010) and Mwaura et al. (2010) while the Tobit model has been used by Shausi et al. (2019) and Uddin et al. (2016). There are other authors such as Uddin et al. (2016) and Temesgen and Tola (2015) who used the logit model instead of the probit model to assess WTP. The estimation approach to use is dependent on whether the response variable is dichotomous or censored. For dichotomous dependent variables, the probit or logit model is suitable, while for censored data, the Tobit model is appropriate.

The dependent variable in this study is censored hence a Tobit model was adopted to identify the factors determining actual amounts producers expressed willingness to pay, which was elicited using the DBDC format. The Tobit model is appropriate for this analysis because some of the WTP values are censored at zero (0) for those unwilling to pay.

The Tobit model can be expressed as a latent variable model. Suppose we represent the amount that farmers are willing to pay by y_i . A latent (unobserved) continuous dependent variable y_i^* is linearly related to a set of independent variables, x_i as follows:

$$y_i^* = \beta x_i + v_i, v_i \sim N(0, \sigma^2) \quad (1)$$

Where: β represents a vector of unknown coefficients and v_i represents the random error. The relationship between the observed variable y_i , and the latent variable is defined as follows.

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0, \\ 0 & \text{if } y_i^* \leq 0, \end{cases} \quad (2)$$

The empirical Tobit model for the amount that producers are willing to pay is presented as follows:

$$y_i^* = \beta_0 + \sum_{k=1}^9 \beta_k x_{ik} + v_i \quad (3)$$

where x_i denotes the variables influencing the amount respondents are willing to pay, β_k represents unknown coefficients, while v_i denotes random errors.

The independent variables for the WTP model included sex, age, marital and educational status, farming experience, farm size, annual farm income, participation in off-farm work and number of extension visits. The variables were chosen based on *a priori* expectation and the extant literature (see Ajayi, 2017; Uddin et al., 2016; Mabe et al., 2014; Ozor et al., 2013; Oladele, 2008). Education, farming experience, farm size, income from farming and number of extension visits are expected to enhance WTP, while the direction of influence of age and sex are indeterminate. Education, farming experience and access to extension improve human capital and exposure to improved methods of production, hence WTP for extension. An increase in farm income is expected to enhance ability to pay while respondents with larger farms are expected to have greater demand for agricultural information to enhance production, hence higher WTP. Also, WTP for extension is expected to increase with participation in off-farm work through the income effect.

RESULTS AND DISCUSSION

Characteristics of the Sampled Farmers. Majority of the respondents were female farmers (Table 1), indicating high female participation in tomato farming in the study area. The farmers had average age of 43 years with 75% having obtained formal education. Respondents had mean household size of 7 members and farmed an average of 3 acres of tomato. Average annual income of the respondents was GH¢11,089 with average farming experience of 16 years. Also, 45% of the respondents engaged in off-farm work while 67% owned the land on which they farmed. Farmers had on average one extension visit, indicating that farmers are poorly served by the extension system. This result is corroborated by Anang et al. (2020) in a survey of small-scale producers in northern Ghana. The low access to extension services in Ghana is further buttressed by Abdallah and Abdul-Rahaman (2016). The respondents indicated willingness to pay GH¢190 for extension, with highest stated amount of GH¢500.

Table 1 – Description of Variables

Variable	Measurement	Mean	S. D.
Amount farmers are willing to pay	Ghana cedi	0	500
Sex of farmer	1 for male; 0 otherwise	0.338	0.474
Age of respondent	Years	43.42	12.29
Educational status	Dummy: 1 for educated; 0 otherwise	0.750	0.434
Marital status	Dummy: 1 for married; 0 otherwise	0.825	0.381
Tomato farm size	Acres	3.434	2.644
Farm income	Ghana cedi	11089	17403
Off-farm work	Dummy: 1 for yes; 0 otherwise	0.450	0.499
Farming experience	Years	16.34	11.65
Number of extension visits	Number	0.675	1.267

S.D. indicates standard deviation. 1 Ghana cedi = US\$ 0.19.

Elicitation of WTP. Elicitation of WTP was carried out using the DBDC contingent valuation method. As shown in Table 2, 9.4% of the respondents expressed Zero WTP. In other words, they represent farmers unwilling to pay for AESs. Respondents who expressed No-No WTP constituted 11.9% of the sample. This represents those unwilling to pay the initial bid price of GH¢200, as well as the lower bid price of GH¢100, except an amount lower than the lower bid price. Furthermore, 20% of farmers expressed No-Yes WTP, representing those who expressed willingness to pay an amount between the initial bid price of GH¢200 and the lower bid price of GH¢100. Also, 33.7% indicated Yes-No WTP, indicating those willing to pay an amount between the initial bid price of GH¢200 and upper bid price (GH¢300). Finally, 25% indicated Yes-Yes WTP, representing those who expressed willingness to pay the upper bid price of GH¢300 or more.

Table 2 – Elicitation of WTP Using the DBDC Contingent Valuation Method

Variable	Frequency	Percentage
Zero WTP	15	9.4
No-No WTP	19	11.9
No-Yes WTP	32	20
Yes-No WTP	54	33.7
Yes-Yes WTP	40	25
Total	160	100

Distribution of Final Bid Price for Extension Services. Table 3 provides the responses regarding the amount producers are willing to pay for AESs.

Table 3 – Distribution of Final Bid Price for Agricultural Extension Services

Final bid price (GH¢)	Frequency	Percent	Cumulative
0	15	9.38	9.38
50	19	11.88	21.25
100	25	15.63	36.88
150	7	4.38	41.25
200	36	22.5	63.75
250	18	11.25	75
300	23	14.38	89.38
350	2	1.25	90.63
400	7	4.38	95
450	3	1.88	96.88
500	5	3.13	100

Mean = 190.3; standard deviation = 125.8.

From the results, farmers expressed willingness to pay GH¢190.3 for extension service per cropping season. Those who expressed unwillingness to pay formed 9.4% of those interviewed. Also, 22.5% expressed willingness to pay GH¢200, while 15.6% and 14.4% would willingly pay GH¢100 and GH¢300, respectively. Furthermore, 11.9% of farmers indicated willingness to pay GH¢50 while 11.3% would willingly pay GH¢250. The highest bid price a farmer was willing to pay was GH¢500 and this corresponded to 3% of the farmers. The findings indicate willingness of producers to pay for AESs, which suggests that privatization of extension services could yield positive outcome in Ghana.

Determinants of WTP for Agricultural Extension. WTP for extension services was estimated using a censored Tobit model following similar approaches in the literature. For example, the Tobit model was used to assess factors influencing WTP by authors such as Shausi et al. (2019) and Uddin et al. (2016). The dependent variable for the Tobit model is censored, that is, some of the WTP values are censored at zero (0) for those unwilling to pay for AESs, while the rest are continuous. The double-bounded dichotomous choice CVM was applied to ascertain the actual amounts that producers were willing to pay. The Tobit regression estimates of farmers' WTP are presented in Table 4.

Table 4 – Factors Affecting WTP for AESs

Variable	Coefficient	Std. Error	P-value
Sex of farmer	-12.27	20.34	0.547
Age of farmer	-2.336**	1.133	0.041
Educational status	-34.96	23.74	0.143
Marital status	46.54*	24.53	0.060
Farming experience	-0.355	1.112	0.750
Farm size	9.623***	3.449	0.006
Farm income	0.003***	0.001	0.000
Off-farm work	24.46	19.00	0.200
Number of extension visits	3.648	7.513	0.628
Constant	202.2***	56.69	0.000
Log likelihood	-907.0		
LR chi2(9)	59.00		
Prob > chi squared	0.000		
Pseudo R-squared	0.032		

***, ** and * signify significant at 1%, 5% and 10% level, respectively.

The results indicate that WTP for extension increased with farm size in line with *a priori* expectation. Producers with larger landholdings may be progressive farmers who rely on extension services to maximize productivity and farm profits. The findings agree with Temesgen and Tola (2015) who observed that WTP increased with farm income in Eastern Ethiopia. Another study by Mabe *et al.* (2014) in Savelugu-Nanton Municipal of northern Ghana also indicated that WTP for weather forecast information increased with farm size.

Similarly, WTP for extension increased with farm income which agrees with *a priori* expectation. Producers with higher farm income are anticipated to be more probable to pay more for AESs as opposed to those with lower income. The result agrees with Temesgen and Tola (2015) in their study in Eastern Ethiopia and Ajayi (2017) in a study in Nigeria. Mabe *et al.* (2014) similarly demonstrated in their study in Savelugu-Nanton Municipal of northern Ghana that WTP for weather forecast information increased with on-farm income.

Producer's age was inversely related to willingness to pay. What the result seems to imply is that as farmers get older, they tend to rely more on their personal knowledge and experiences and thus less probable to pay for the services of agricultural extension. The result is supported by Temesgen and Tola (2015) in a study in Ethiopia but at variance with Ajayi (2017) in a study in Nigeria.

Marital status captures the role of intra-household decision-making and was positively related to WTP at 10% level. The result indicates that respondents who are married are willing to pay higher amounts for AESs vis-à-vis the unmarried. Married couples may be able to pool together financial resources to pay for the cost of production such as payment for extension services.

Assessment of Effectiveness of AESs. Producer perceptions about the effectiveness of AES delivery is essential to WTP decisions. Producers' assessment of the effectiveness of the extension system is presented in Table 5. Several perception statements were included in the analysis taking into account farmers' expectations of the extension system.

Table 5 – Assessment of Effectiveness of Agricultural Extension Services

Perception statement	HS	S	I	D	HD	Mean	S.D.
Farmers' opinion towards frequency of individual farm visits by AEAs	3	4	10	12	131	4.65	0.86
Farmers' opinion towards effectiveness of field visits by extension agents	2	4	11	18	125	4.63	0.82
Effectiveness of office call as an extension delivery method to farmers	3	0	6	41	110	4.59	0.94
Farmers' opinion towards distributions of inputs (improved seeds) by extension agents	1	4	2	48	105	4.58	0.71
Farmers' opinion towards demonstration of new technologies by AEAs	4	6	14	28	108	4.44	0.98
Farmers' opinion about training given by extension agents	3	6	15	39	97	4.38	0.94
Farmers' opinion towards usefulness of information delivered by extension agents	5	12	26	21	96	4.19	1.15
Extent to which farmer is equipped by extension service to advice other farmers	11	27	19	16	87	3.86	1.4
Effectiveness of telephone call as an extension delivery method to farmers	8	11	40	52	49	3.77	1.11
Farmers' satisfaction with extension agents in the distribution of fertilizer coupons	26	31	28	20	55	3.29	1.51

Note: HS = 1 (Highly satisfied); S = 2 (Satisfied); I = 3 (Indifferent); D = 4 (Dissatisfied); HD = 5 (Highly Dissatisfied).

The results indicate that farmers are highly dissatisfied with the frequency of individual farm visits by extension agents, effectiveness of office call as an extension delivery method, distribution of production inputs by extension agents, and effectiveness of field visits by extension staff. The results further indicate that farmers are dissatisfied with training given by extension staff, demonstration of new technologies by extension agents, effectiveness of telephone call as an extension delivery method, usefulness of the extension message, and the extent to which farmers are equipped by extension service to offer advice to other farmers. From the results, farmers were indifferent in their assessment regarding the distribution of fertilizer coupons by extension agents. Overall, farmers were dissatisfied with AES delivery, which is expected to influence their WTP. Elias *et al.* (2016) showed that 39% of their respondents were dissatisfied with agricultural extension service delivery in North

West Ethiopia. According to the authors, farmers' satisfaction with extension is linked to frequency of contact and the perception of benefits from extension.

CONCLUSION

The study assessed farmers' perceptions of AES delivery and WTP for extension. The results indicate that farmers are generally dissatisfied with agricultural extension service delivery. Farmers have a poor perception of the effectiveness of AESs on their production activities. The poor perception of producers about the effectiveness of AESs may be attributed to inadequate extension staff, inadequate extension visits as well as extension methods and messages that are not well-tailored to the needs of producers. Respondents were willing to pay GH¢190.3 for AESs. Producers' age, marital status, size of farmland and income from tomato production were the main determinants of WTP for extension services.

AES delivery is critical to agricultural development in developing economies where most farmers rely on public extension service, which has come under criticisms for being ineffective due to several challenges. Introducing cost-sharing in extension delivery is anticipated to enhance performance and effectiveness but this depends on willingness of producers to pay for the service. Successful introduction of cost-sharing in AES delivery is dependent on how farmers perceive the effectiveness of extension service. Thus, to achieve cost-sharing, there is the need to address the constraints limiting effective service delivery. Attention must be given to the frequency of visits, tailoring extension messages to producers' needs, as well as the provision of training and demonstrations on modern production practices. The establishment of a market for extension services should consider targeting younger farmers, who were willing to pay more for AESs. Similarly, producers with relatively larger farms and higher farm income should be targeted for cost-sharing in extension service delivery as they expressed willingness to pay more for extension.

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