Pelita Perkebunan 40(2) 2024, 205–220
DOI: 10.22302/iccri.jur.pelitaperkebunan.v40i2.606
ISSN: 0215-0212 / e-ISSN: 2406-9574

Cocoa Farmers' Perception Regarding the Effectiveness of Cocoa Extension Services in the Bia West District, Ghana

Kassim Somed[1)], Patrick Appiah[1)], Enoch Kwame Tham-Agyekum[1*)], Fred Ankuyi[1)], John-Eudes Andivi Bakang[1)], Maxwell Toah Asiamah[1)], and Anthony Appiah[1)]

[1)]Department of Agricultural Economics, Agribusiness and Extension,
Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana
[*)]Corresponding author: ektagyekum@knust.edu.gh
Received: 4 April 2024 / Accepted: 3 July 2024

Abstract

Agricultural extension services play a crucial role in enhancing the productivity and sustainability of farming practices, particularly in developing regions. In the Bia West District, cocoa farming is a vital economic activity, heavily reliant on the support and guidance provided by extension agents. This study analysed cocoa farmers' perception on the effectiveness of agricultural extension services in the Bia West District. Data for the study was collected from 400 cocoa farmers through multistage sampling technique. Data was analysed using both descriptive and inferential statistics. The results reflect a prevailing awareness among the majority of cocoa farmers (over 90%) concerning the efficacy of agricultural extension agents operating in the area. Farmers perceived a positive impact on information dissemination and timeliness (mean = 4.08), and knowledge and skills enhancement (mean = 4.03). Employing a probit model, age (1%), engagement in off-farm activities (10%), and the age of cocoa farms (1%) emerged as significant factors that influenced farmers' perception of the effectiveness of the agents. The three key challenges faced by farmers in accessing extension services included inadequate Community Extension Agent (CEA) visits, trust issues, and communication barriers.

Keywords: Perception, effectiveness, cocoa farmers, extension services

INTRODUCTION

Extension activities play a crucial role in the agricultural sector by facilitating the transfer of knowledge and technology from research institutions to farmers. Its primary objective is to enhance the productivity and livelihoods of farmers (Ehsan *et al*., 2022; Amponsah-Doku *et al*., 2022). Extension employs a variety of strategies to assist disadvantaged farmers in improving their operations and incomes by providing practical advice and resources (Chilemba & Ragasa, 2020).

Agricultural extension and outreach programmes in developing countries typically assume that scientists create the knowledge, extension packages and spreads it, and farmers adopt it (Norton & Alwang, 2020; Danso-Abbeam *et al*., 2018), resulting in a lack of tailoring to farmers' needs. Hence, farmers experience low crop yields, increased waste, slowed market efficiency, and reduced income (Rickards *et al*., 2018). There are also challenges, such as excessively large areas of operation without providing any logistic support, a lack of regular training for updating knowledge of extension workers, a lack of

research findings appropriate to the condition of farmers' fields, low status and morale of extension staff, and duplication of services by various development organisations (Abate *et al*., 2023; Danso-Abbeam *et al*., 2018). However, agricultural extension services play a crucial role in transforming agriculture by creating and disseminating timely information to farmers (Gebrehiwot, 2015).

The task of disseminating information to the targeted farmers falls to community extension agents (CEAs). In order to improve rural communities' quality of life and encourage sustainable development, CEAs work with farmers (Bandiera *et al*., 2023). They typically work with government entities, non-governmental organisations, or community-based groups, disseminating knowledge, offering training, and promoting community participation and organisation. CEAs are essential in raising agricultural production and encouraging environmentally friendly farming methods (Cole & Fernando, 2020; Donkor *et al*., 2016). They mostly collaborate directly with farmers to offer guidance on the finest agricultural techniques, such as soil management, crop selection, pest control, and irrigation. They also provide information on market prospects, finance availability, and other resources. CEAs work in communities using a participatory approach, which encourages them to take charge of their development processes. This strategy entails collaborating with local leaders, performing needs analyses, and including the community in the planning and execution of development activities (Fernando, 2021; Maria & Kondylis, 2018).

CEAs play additional educational roles in addition to their primary obligation to provide farmers with pertinent information that is useful and applicable to their industry. These roles involve influencing farmers' acceptance of change and influencing them to adopt it (Norton & Alwang, 2020). They empower farmers and their families by giving them knowledge, skills, and positive attitudes. They offer farmers the opportunity to obtain and apply practical knowledge to address the challenges they face in their daily farming activities (Cole & Fernando, 2020). However, despite the important role that community extension agents' play in diverse rural communities, there is growing concern that the services are not reaching their intended beneficiaries and that the effectiveness of agricultural extension services in supporting cocoa farmers remains uncertain (Danso-Abbeam *et al*., 2018).

Several studies that investigated the effectiveness of extension services have also explored factors influencing efficiency (Maoba, 2016; Komba *et al*., 2018; Ramesh *et al*., 2019; Maguire-Rajpaul *et al*., 2020; Talib *et al*., 2018). Somanje *et al*. (2021) looked at how farmers in Ghana and Zambia felt about the effectiveness of agricultural extension services. They found that regular meetings, the demand for services and productivity, and the rate of technology adoption are the most important things that affect the relationship between agricultural extension officers and farmers. Antwi-Agyei &Stringer (2021) conducted a study on how to improve the effectiveness of agricultural extension services in supporting farmers to adapt to climate change. Jamil *et al*. (2015) designed a study to assess the effectiveness of extension advisory services for the farming community in Bhimber district of Azad Jammu & Kashmir. Maake & Antwi (2022) examined farmers' perceptions of the effectiveness of public extension and advisory services, as well as associated factors.

Despite this, there has not been much research on the factors that influence the effectiveness of agricultural extension services specifically provided by CEA in the Bia West District, Western North Region. Therefore, this study aims to fill this gap. The specific objectives are to determine farmers' level of awareness of the effective-

ness of CEAs; to assess farmers' perceptions of the effectiveness of agricultural extension service delivery by CEAs; to identify the factors that influence farmers level of awareness of the effectiveness of extension services by CEAs; and to identify the challenges faced by farmers in utilising the extension services of CEAs.

MATERIALS AND METHODS

Study Area

The Bia West District, located in Ghana's Western North Region, was originally part of the larger Bia District. However, on June 28, 2012, they separated a portion of the district to form the Bia East District, renaming the remaining area the Bia West District. The district assembly's capital city is Sefwi Essam, situated in the northwest of the Western North Region. It has a total land area of 1,342 km^2 with a population of 115,881 (GSS, 2021). It is located between latitude 6°292'2.43" N and longitude 3°42' 58.83" W. The region is renowned for its abundant agricultural resources. The Bia, the district's central river, provides water for fishing and farming. Bia National Park, a sizable forest reserve in the district, is a biodiversity hotspot and home to a number of rare and endangered plant and animal species.

Research Design

We used a quantitative approach in this research to gather and analyse the data. The quantitative approach involves using well-structured questionnaires to assess cocoa farmers' perceptions regarding the effectiveness

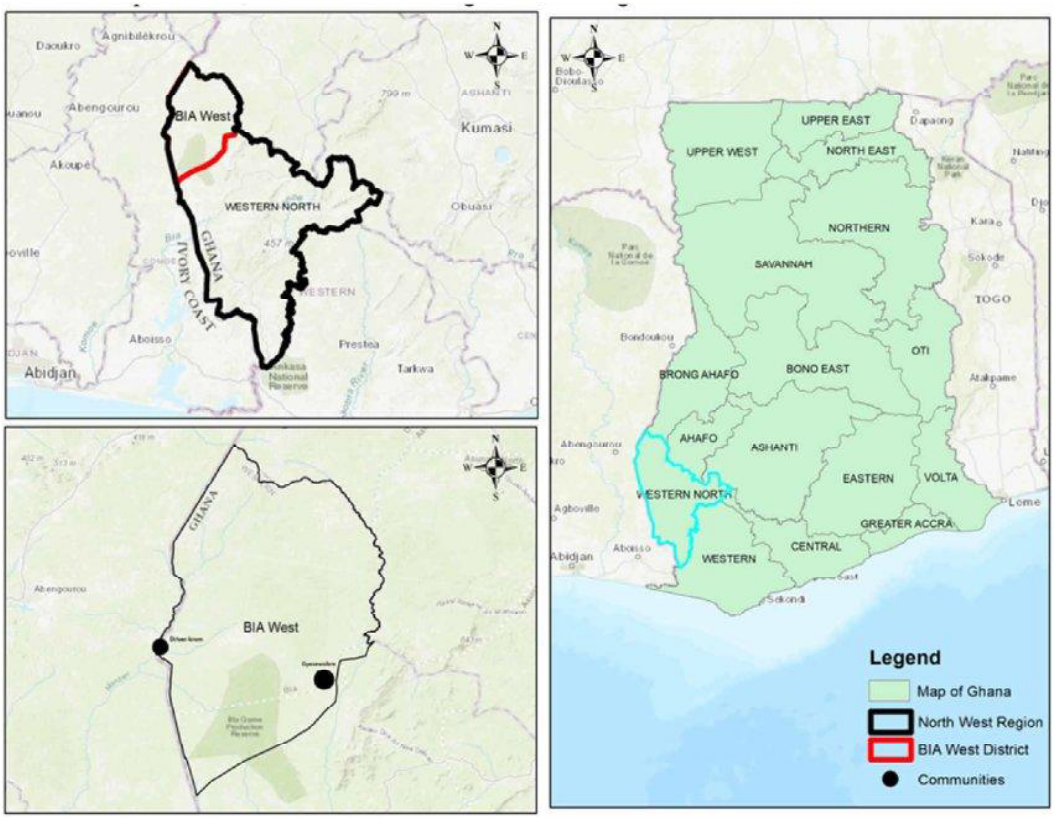

Figure 1. Map of study area

of agricultural extension services provided by CEAs. By utilising a quantitative research strategy, the study aims to facilitate the analysis of numerical data and examine the relationships between the dependent and independent variables (Williams, 2006). In this research, employing a quantitative approach not only facilitates the analysis of numerical data and the testing of relationships between variables, but also enables the identification of statistical significance. This approach enhances the reliability and generalizability of the findings, contributing to a better understanding of cocoa farmers' perceptions regarding the effectiveness of agricultural extension services provided by CEAs.

Sampling Technique

Kenton (2020) indicated that a population is a well-defined group of objects or individuals from which a sample is drawn based on their level of characteristics. The target population for this study is cocoa farmers in the Bia West District. The population of cocoa farmers in the Bia West District is 29,496. The sample size refers to the specific number of participants selected from the target population for a study. The sample size for this study was determined by a population of 29,496 cocoa farmers. We used Yamane's proposed formula, since we knew the population of cocoa farmers. Therefore, 400 cocoa farmers were interviewed for this study.

We employed a multistage sampling method in this study to systematically and effectively collect data from cocoa farmers in the Bia West District. We chose this approach to ensure a representative sample that could provide reliable insights into farmers' perceptions of agricultural extension services. We used purposive sampling in the first stage to select communities within the Bia West District based on their level of cocoa production. This non-probability sampling technique involved deliberately choosing specific communities with high levels of cocoa production. The selection criteria were based on data from the Cocoa Board district office, which provided detailed information on cocoa production levels across different communities. By focusing on these high-production areas, the study aimed to gather data from areas where the impact of agricultural extension services would be most relevant and observable.

We employed proportional sampling in the second stage to determine the number of respondents to select from each community. This method ensured that the number of respondents from each community was proportional to the size of its cocoa farming population. The process involved identifying the total number of cocoa farmers in each selected community, followed by a proportional allocation to determine the sample size of respondents from each community. This approach took into account the diverse cocoa farming populations across different communities, guaranteeing a sufficient representation of larger communities in the sample. We used simple random sampling in the third stage to select individual cocoa farmers from each community for the study. Every cocoa farmer within the selected communities had an equal chance of inclusion in the sample thanks to this probability sampling method. A list of cocoa farmers in each community was compiled, and individual farmers were randomly selected using a randomization technique, such as drawing names or using a random number generator. By employing simple random sampling, the study minimise selection bias, ensuring that the sample was representative of the entire population of cocoa farmers in each community.

Table 1 presents the number of cocoa farmers that was selected from each of the cocoa farming communities under investigation.

Table 1. Distribution of respondents by cocoa communities

Community	Total number of registered farmers	Number of respondents
Asuopiri	152	7
Jericho	662	31
New Wenchi	174	8
E.K Manukrom	103	5
Nkrabea	171	8
Asanteman	1290	60
New Papase	1420	67
New Adjofoa	1730	81
Old Adjoafoa	1467	69
Asuontaa	1370	64
Total	8539	400

Source: Author's construct, 2023.

Data Collection Procedure

We collected primary data from cocoa farmers in Bia West District using a structured questionnaire. We collected information from the respondents about their socioeconomic background, their knowledge and opinions of community extension agents, and any difficulties they had using CEA services. The data was collected using a standardised questionnaire. A questionnaire is a tool used to gather information from a big sample. To give respondents the freedom to express their opinions based on sound judgement, the questionnaire will include both open-ended and closed-ended questions.

In the Asamankese Cocoa District, researchers conducted initial piloting for 20 cocoa farmers. The researchers conducted this piloting to test the plan or project before expanding its availability. This facilitated the researcher's evaluation of the question-naire's statements for appropriateness and clarity, the significance of the collected data, the language used, and the validity of the question's contents. The researchers analysed the collected data to gain a clear understanding of the expected results after the study's completion. It directed the researcher in identifying and addressing any discrepancies between the questionnaire and the study's objectives prior to the investigation.

The objectives of the study, ethical implications, as well as the rights of the participants were explained to them before the interactions commenced. Furthermore, each participant was required to give a written consent by signing the informed consent form on the questionnaire.

Data Analysis

Data analysis can be defined as the process of reviewing survey data in order to draw conclusions and judgments. The data was analysed using SPSS version 20 software and STATA. Descriptive (mean, standard deviation, frequency, percentage) and inferential statistics (perception index, probit model, Kendall's coefficient of concordance) were applied.

In order to assess farmers' awareness of the activities of the CEAs, we asked farmers several questions to ascertain whether they are aware or not aware. Frequencies and percentages were used to analyse the data. To assess farmers' perception of the effectiveness of agricultural extension service delivery by CEAs, the perception (effectiveness) index was used to analyse the data. It was done to determine whether farmers have a positive or negative perception. This was done through the use of a five-point likert scale, that is, SA = Strongly agree; A = Agree; N = Neutral; D = Disagree and SD = Strongly disagree (Maake & Antwi, 2022). The mean score of the ranks in the scale is the Perception Index that was calculated from the Five-point Likert scale.

$$P.I = \frac{(f_{SA}x\ 5) + (f_A x4) + (f_N x3) + (f_D x2) + (f_{SD}x\ 1)}{X}$$

Where;
P.I = Perception Index (Mean Index)
f_{SA} = frequency for 'Strongly agree
f_A = frequency for 'Agree'
f_N = frequency for 'Neutral'
f_D = frequency for 'Disagree'
f_{SD} = frequency for 'Strongly disagree'

By using the binary probit model, we examined the farmers' perception of effectiveness of CEAs. Perceived effectiveness was measured as a binary response; whether the farmer perceives CEAs to be effective [1 = greater than 2.49] or not [0 = less than 2.49]. The probit model approach was employed in order to investigate the influence of various socio-economic determinants on the effectiveness of CEAs. The probit model is $Y = \alpha_i + X_i\beta_i + \varepsilon_i$ where Y is a dependent variable (perception of effectiveness of CEA). Y denotes a farmers' perception about the effectiveness of CEAs, where Yi = 1 if the respondent perceives the CEA as effectiveness, and Yi = 0 otherwise. Xi is the 1 × K vector of other determinants influencing the farmers' perception of effectiveness, thus, sex (Dummy: Male-1, Female-0), age (Continuous: years), access to credit (Dummy: Yes-1, No-0), education (Continuous: years of schooling), FBO membership (Dummy: Yes-1, No-0), farm size (Continuous: acres), household size (continuous) etc., β is the K × 1 vector of unidentified parameters, and ε_i is the error term.

On the challenges faced by farmers in using the services of CEAs, the Kendall's coefficient of concordance was used. The challenges identified from literature was presented to cocoa farmers and they were required to rank them based of its severity. The identified challenges were ranked from the most pressing to the least pressing using the rank numerals 1, 2, 3 to highest number, 1 = the most pressing challenge and highest number being the least pressing challenge. The challenge with the least total score was ranked as the most pressing while the challenge with the highest total score was ranked the least pressing. The coefficient of concordance was calculated within the range of 0 to 1 using the calculated total rank. A coefficient of 1 represents a complete agreement among respondents to the ranked challenges while 0 represents a complete disagreement to the ranked challenges among respondents.

This formula was used to obtain the Kendall's W;

$$W = \frac{12[\Sigma T^2 - \frac{(\Sigma T)^2}{n}]}{nm^2(n^2-1)}$$

Where;
W = Kendall's Coefficient of Concordance
T = sum of ranks for factors being ranked
m = number of respondents
n = number of factors being ranked

RESULTS AND DISCUSSION

Socioeconomic Characteristics

Table 2 displays the socioeconomic attributes of cocoa growers in the designated research location. The data highlights that male respondents make up the majority, accounting for 56.75%, while females account for 43.25%. In the majority of Ghanaian communities, males assume the role of breadwinners and bear complete responsibility for all assets, as well as providing a larger portion of labor compared to their female counterparts. In addition, males exhibit a higher propensity

for involvement in agricultural activities compared to females (Ankuyi *et al*., 2023). The findings indicate that the largest proportion of participants (68.25%) are in a marital relationship, while singles account for 15.25%, widowed individuals make up 12%, and divorced individuals represent 4.50%. Individuals' marital status significantly influences the functioning of households, influencing the division of work and decision-making processes. Therefore, it is crucial to take into account marital status as a significant socioeconomic determinant. This finding corroborates the findings of Okoffo *et al.* (2016) for Ghana and Levai *et al*. (2015) for Cameroon.

Regarding educational attainment, 23.25% of the participants lack any formal education, indicating a potential need for educational initiatives within the community. Furthermore, a proportion of 25.75% of the population has successfully finished junior high school (JHS), while 15% have completed senior high school (SHS), and 10% have attained tertiary education. These statistics demonstrate the diverse educational levels within the community. This indicates that most of the participants received formal education, which aligns with the findings of Okoffo *et al*. (2016) that the majority of cocoa producers also had formal education. Two-thirds (66%) of the participants possess agricultural land. The assessment of land tenure security and the possibility of agricultural investments

Table 2. Socioeconomic characteristics of respondents

Discrete variables	Frequency		Percentage (%)	
Sex				
Male	227		56.75	
Female	173		43.25	
Marital status				
Single	61		15.25	
Married	273		68.25	
Divorced	18		4.50	
Widowed	48		12	
Level of education				
No formal education	93		23.25	
Primary school	64		16	
Junior high school	103		25.75	
Senior high school	100		15	
Tertiary	40		10	
Land ownership				
Own land	263		65.75	
Others	137		34.25	
Access to credit				
Yes	142		35.50	
No	258		64.50	
Access to extensions				
Yes	285		71.25	
No	115		28.75	
Off-farm activity				
Yes	312		78	
No	88		22	
Continuous variables	Mean	Std. dev	Min	Max
Household size	6.73	3.82	1	14
Farming experience (years)	17.17	9.24	1	55
Age of farmer (years)	49.33	12.69	19	90
Age of the cocoa farm (years)	23.94	13.57	1	61
Farm size (ha)	3.43	2.12	0.40	11

Source: Field survey, 2023.

heavily relies on land ownership. Approximately 65% of cocoa farmers lacked access to loans. A lack of financing access may limit farmers' ability to improve productivity and invest in their fields. This discovery is supported by Kehinde & Ogundeji (2022). Furthermore, a significant proportion of cocoa farmers (71.25%) indicated that they possess the means to avail themselves of extension services. The study by Ankuyi *et al*. (2023), which found that a sizable portion of cocoa farmers have the means to obtain extension services, supports this conclusion. Approximately 78% of the farmers surveyed are involved in non-agricultural endeavours. Engaging in off-farm activities to diversify revenue sources can serve as a smart method for farmers to control risks.

The average cocoa grower's household size is approximately seven (7). This finding is consistent with the findings of Denkyirah *et al.* (2017) and Ankuyi *et al*. (2023), which indicated that the average household size of farmers is seven (7). The average farming tenure for cocoa farmers was 17.17 years, ranging from a minimum of 1 year to a maximum of 55 years. These findings suggest that the participants possess diverse levels of expertise, with certain individuals having been involved in cocoa cultivation for a considerable duration. Farmers are typically 49 years old. These findings indicate that the cocoa farmers in the research region were older than the age range of 15–35 years, which aligns with the findings of Wongnaa *et al*. (2021) and Ankuyi *et al*. (2022). Cocoa plantations in the research region have a mean age of around 24 years, ranging from one (1) to 61 years. These findings indicate that a substantial number of cocoa plantations in the study region have been functioning for a considerable period of time. The extended duration of cocoa cultivation operations may suggest a notable degree of stability and sustainability. On average, the respondents have 3.43 ha of land.

Awareness of CEAs Activities

The data presented in Table 3 highlights the level of awareness among cocoa farmers regarding the activities of Community Extension Agents (CEAs) in various aspects of cocoa farming. The findings indicate that farmers are well aware of the role of CEAs in promoting sustainable farming techniques. Specifically, 92.3% of respondents are aware that CEAs actively support cocoa farmers in adopting practices that are environmentally sustainable and beneficial for long-term productivity. This indicates that the majority of farmers recognize the efforts made by CEAs to instil good agricultural practices in their farming routines.

The study also reveals that 94% of farmers acknowledge receiving the latest knowledge on cocoa cultivation from CEAs. This high percentage reflects the effectiveness of CEAs in updating farmers with current and improved farming techniques, which is essential for enhancing cocoa production. The ability of CEAs to provide up-to-date information plays a significant role in modernising farming practices and improving overall yields (Komba *et al*., 2018). A substantial 92.3% of respondents are aware that CEAs help cocoa farmers overcome challenges and increase productivity. This awareness underscores the practical support CEAs provide, which includes addressing specific issues faced by farmers and offering solutions that lead to higher productivity. Such assistance is vital in helping farmers tackle everyday farming obstacles and optimise their output (Maoba, 2016). To address the issue of inadequate visits by Community Extension Agents (CEAs), it is essential to expand the workforce and optimise scheduling strategies. By hiring more CEAs, the workload on individual agents can be reduced, allowing for more frequent and consistent visits to cocoa farmers. This increase in interaction will ensure that farmers continuously receive

up-to-date knowledge and practical support, helping them to adopt improved farming techniques and overcome challenges effectively (Sennuga *et al*., 2020a)

The data indicates that 93.8% of farmers recognize that CEAs facilitate collaboration among cocoa farmers to share effective farming methods. This high level of awareness suggests that CEAs play a crucial role in fostering a community of learning and mutual support among farmers, enabling them to benefit from each other's experiences and successful practices (Sennuga *et al*., 2020a; Maake & Antwi, 2022). Lastly, 93.5% of respondents are aware of CEAs offering personalised guidance, resources, and training programs tailored to the specific needs of cocoa farmers. This personalised approach ensures that farmers receive relevant and practical advice and support, which is critical for implementing effective farming practices and improving their productivity (Maoba, 2016). Given the high level of awareness among farmers about CEAs facilitating collaboration and the sharing of effective farming methods, it is crucial to strengthen community engagement and peer learning initiatives. CEAs can focus on organising regular community meetings, workshops, and farmer field schools that promote interaction and knowledge exchange among farmers. Additionally, leveraging experienced farmers as peer mentors can enhance the effectiveness of these initiatives, creating a sustainable model of continuous learning and improvement within the cocoa farming community.

Shifting the focus to the "quality of support" provided by CEAs, the data portrays a noteworthy awareness. Farmers are well aware that CEAs provide high-quality assistance, with 94.8% acknowledging this fact. Furthermore, a substantial percentage (93.3%) recognises that cocoa farmers receive expert guidance and market insights through CEAs. Additionally, 93.5% of respondents perceive CEAs as valuable in assisting cocoa farmers in navigating cocoa-related policies and funding opportunities. Importantly, 95.8% of farmers perceive seeking guidance from CEAs as beneficial for enhancing their

Table 3. Awareness of farmers on the activities of CEAs

Statements	Not aware (Freq./Percent)	Aware (Freq./Percent)
Good Agricultural Practices		
CEAs support cocoa farmers in adopting sustainable farming techniques.	31 (7.8%)	369 (92.3%)
CEAs provide cocoa farmers with the latest knowledge on cocoa cultivation for improved practices.	24 (6%)	376 (94%)
CEAs assist cocoa farmers in overcoming challenges and increasing cocoa productivity.	31 (7.8%)	369 (92.3%)
Cocoa farmers collaborate with CEAs to share effective farming methods and best practices.	25 (6.3%)	375 (93.8%)
CEAs offer personalised guidance, resources, and training programmes to cocoa farmers.	26 (6.5%)	374 (93.5%)
Quality of Support		
CEAs deliver high-quality assistance to ensure the success of cocoa farmers.	21 (5.3%)	379 (94.8%)
Cocoa farmers receive expert guidance and market insights through CEAs.	27 (6.8%)	373 (93.3%)
CEAs help cocoa farmers navigate cocoa-related policies and funding opportunities.	26 (6.5%)	374 (93.5%)
Seeking guidance from CEAs enhances cocoa farmers' decision-making and risk management.	17 (4.3%)	383 (95.8%)
CEAs provide accurate information to cocoa farmers about adopting best practices and maximising cocoa production.	24 (6%)	376 (94%)

Source: Field survey, 2023.

decision-making and risk management. Lastly, 94% of farmers are aware that CEAs provide accurate information for adopting best practices and maximising cocoa production. Consistent with the results of this study, Talib *et al*. (2018) found that farmers recognised the role of extension services in delivering agricultural information, offering feedback, advising on farming challenges, and introducing new agricultural techniques. Policies should focus on continuous professional development programs for CEAs to ensure they are equipped with the latest knowledge and skills in agricultural practices, market trends, and policy changes.

Farmers' Perception of the Effectiveness of Agricultural Extension Service

Table 4's results reveal how cocoa farmers in the study area perceive the effectiveness of CEAs' extension services. In the domain of accessibility and availability, the perception index stands at 3.98, indicating a generally positive perception among respondents. This suggests that farmers find the extension services provided by CEAs to be easily accessible in terms of physical proximity and readily available in their communities. The majority of respondents 'agree' or 'strongly agree' with statements about convenient access to these services, reflecting their overall satisfaction with the accessibility and availability of CEAs' support. Komba *et al*., (2018) contended that agricultural extension serves not only as an information source for new farming technologies but also guarantees access to improved technologies. According to Abate *et al*. (2023), a crucial element for enhancing agricultural production in developing nations is access to extension services. Danso-Abbeam *et al*. (2018) demonstrated that access to agricultural extension services contributed to increased technology adoption by farm households and subsequently led to higher household income.

In the thematic area of knowledge and skills enhancement, the perception index is 4.03, indicating a positive perception among farmers. Respondents attribute their improved farming practices to the knowledge and skills acquired through CEAs' extension services. They also believe that CEAs effectively enhance their knowledge and skills regarding cocoa farming techniques. Bonye *et al*. (2012) stated that agricultural extension serves as a vital information source for farming communities about new technologies. Adopting these technologies can enhance production, increase incomes, and elevate living standards. Similarly, Bandiera *et al*. (2023) contended that agricultural extension extends beyond merely transferring technology. It also includes activities such as facilitating market access and promoting knowledge about best agricultural practices.

In terms of information dissemination and timeliness, the perception index is 4.08, indicating a favourable perception among respondents. Thus, respondents agree that CEAs disseminate relevant information on time and use familiar terminologies to explain recommended agricultural practices effectively. This positive perception suggests that CEAs play a valuable role in knowledge sharing, capacity building, and supporting farmers in adopting and implementing sustainable farming practices. Overall, the positive perception regarding information dissemination and timeliness associated with CEAs highlights the importance of effective communication, collaboration, and knowledge transfer in advancing agriculture and supporting farmers in their farming endeavours. Effective information dissemination is crucial in agriculture, as it ensures that farmers have access to timely, accurate, and relevant information to make informed decisions, adopt best practices, and address challenges effectively. In the realm of agricultural extension, delaying the delivery of necessary agricultural information to farmers may result in adverse effects on agricultural production (Oluwasusi & Akanni, 2014).

Table 4. Farmers' perception of the effectiveness of agricultural extension service delivery by CEAs

Statements	SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean of scores
Accessibility and Availability (PI = 3.98)						
The extension services of CEAs are easily accessible in terms of physical proximity.	62 (15.5%)	289 (72.3%)	28 (7.0%)	11 (2.8%)	10 (2.5%)	3.96
The services of CEAs are readily available in my community, reducing barriers to utilisation.	61 (15.3%)	291 (72.8%)	31 (7.8%)	12 (3.0%)	5 (1.3%)	3.98
I have convenient access to extension services, which helps me receive the support I need.	61 (15.3%)	301 (75.3%)	21 (5.3%)	11 (2.8%)	6 (1.5%)	4.00
Knowledge and Skills Enhancement (PI = 4.03)						
I attribute my improved farming practices to the knowledge and skills acquired through the extension services of CEAs.	73 (18.3%)	288 (72.0%)	23 (5.8%)	11 (2.8%)	5 (1.3%)	4.03
CEAs have effectively enhanced my knowledge and skills related to cocoa farming techniques.	77 (19.3%)	286 (71.5%)	22 (5.5%)	7 (1.8%)	8 (2.0%)	4.04
CEAs have helped me adequately address the specific knowledge and skill needs in cocoa farming.	65 (16.3%)	294 (73.5%)	28 (7.0%)	8 (2.0%)	5 (1.3%)	4.02
Information dissemination and timeliness (PI = 4.08) CEAs disseminate relevant information on time.	88 (22.0%)	277 (69.3%)	23 (5.8%)	7 (1.8%)	5 (1.3%)	4.09
CEAs use familiar terminologies to explain recommended agricultural practices.	83 (20.8%)	281 (70.3%)	20 (5.0%)	11 (2.8%)	5 (1.3%)	4.07
CEAs efficiently disseminate vital information on cocoa farming practices, market trends, and disease prevention.	78 (19.5%)	286 (71.5%)	24 (6.0%)	8 (2.0%)	4 (1.0%)	4.07
Impact on Yield, Income, and Relationships (PI = 4.00)						
The advisory services provided through extension by CEAs effectively address specific challenges in cocoa production, improving farmers' productivity and profitability.	63 (63%)	289 (72.3%)	29 (7.2%)	15 (3.8%)	4 (1.0%)	3.98
Extension services provided by CEAs have a positive impact on cocoa yield and income.	80 (20.0%)	282 (70.5%)	25 (6.3%)	12 (3.0%)	1 (0.3%)	4.07
CEAs play a role in fostering collaboration and networking among farmers.	45 (11.3%)	307 (76.8%)	33 (8.3%)	13 (3.3%)	2 (0.5%)	3.95
Overall Perception Index = 4.02						

Source: Field survey, 2023

Finally, in terms of impact on yield, income, and relationships, the perception index stands at 4.00. This indicates a strong agreement among respondents regarding the positive influence of extension service on yield, income, and relationships. This positive perception is significant because it reflects the perceived effectiveness and benefits of extension services in improving agricultural outcomes, supporting farmers' livelihoods, and fostering collaborative relationships within the agricultural sector. The findings indicate a positive perception of agricultural extension and its potential to foster sustain-

able agricultural development, economic growth, and social cohesion within the farming community. The results align with the observations of Danso-Abbeam *et al*. (2018), who highlighted that agricultural extension initiatives positively impacted both household productivity and income.

Factors Influencing Farmers' Perception

Table 5 uses a probit model to determine the factors influencing the farmers' perceptions of the effectiveness of CEAs. The pseudo-R^2, which shows how the variables used in the regression model jointly explain the changes in the dependent variable, is 0.437. This indicates that the independent variables considered in the model jointly explain 43.7% of the variations in the dependent variable.

The findings in Table 5 reveal that, at a 1% significant level, farmers' age had a positive and statistically significant influence on farmers' perceptions of the effectiveness of CEAs. The positive coefficient suggests that as farmers' age increases, their perception of the effectiveness of CEAs also tends to increase. This could imply that older farmers, with more experience in agriculture, have a greater appreciation for the support and services provided by CEAs. They may recognize the value of extension services in improving agricultural practices, increasing yields, or addressing farm challenges. The statistical significance at the 1% level adds robustness to the findings, indicating that the observed relationship between age and farmers' perceptions is unlikely to be due to random chance. This lends credibility to the conclusion that there is a genuine and meaningful connection between age and the perceived effectiveness of CEAs. Consistent with the results, Oluwasusi & Akanni (2014) and Maake & Antwi (2022) similarly found a significant positive correlation between age and the perceived effectiveness of extension services.

The results presented in Table 5 indicate that off-farm activity has a positive and statistically significant relationship with farmers' perceptions of the effectiveness of CEAs at the 10% significance level. The positive coefficient suggests that there is a favorable relationship between engaging in off-farm activities and the perception of CEAs' effectiveness. In other words, farmers who participate in off-farm activities are more likely to view the services provided by CEAs as effective. One possible explanation is that farmers involved in off-farm activities may possess a diverse skill set or additional sources of income. This diversification could contribute to a more positive outlook on the impact of CEAs' services. Farmers engaged in off-farm activities might be more open to adopting new agricultural practices, technologies, or innovations introduced by CEAs, seeing them as beneficial to their overall livelihood. Contrary to the results, Komba *et al.* (2018) discovered that off-farm employment restricted farmers' engagement in extension activities and their adoption of new technologies.

At the 1% significance level, the results indicate that cocoa farms' age has a positive and statistically significant relationship with farmers' perceptions of the effectiveness of Community Extension Agents (CEAs). The positive coefficient suggests that there is a favourable relationship between the age of cocoa farms and the perception of CEAs' effectiveness. In other words, farmers with older cocoa farms are more likely to view the services provided by CEAs as effective. One plausible explanation is that farmers with older cocoa farms may have accumulated more experience and knowledge in cocoa cultivation. This accumulated expertise could lead to a greater appreciation for the guidance and support offered by CEAs. Older cocoa farms may also signify a longer engagement with agricultural practices, making farmers more receptive to innovative techniques and interventions proposed by CEAs.

Table 5. Probit regression for factors influencing farmers' perception of effectiveness

Variables	Coef.	Standard error	t-value	p-value	Conf	[95% interval]
Sex	-0.189	-1.190	0.24	-0.502	0.123	
Age	0.020***	0.007	2.83	0.005	0.006	0.033
Marital status	0.108	0.099	1.09	0.274	-0.085	0.301
Education	0.020	0.014	1.43	0.151	-0.007	0.048
Household size	0.017	0.021	0.83	0.407	-0.023	0.057
Cooperative membership	0.244	0.177	1.38	0.169	-0.104	0.591
Access to credit	-0.080	0.167	-0.48	0.633	-0.407	0.247
Off-farm activity	0.305*	0.179	1.70	0.089	-0.046	0.656
Farming experience	-0.005	0.012	-0.39	0.696	-0.027	0.018
Age of the cocoa farm	0.025***	0.008	3.10	0.002	0.009	0.040
Land ownership	-0.042	0.270	-0.16	0.876	-0.572	0.488
Labor type	0.223	0.269	0.83	0.409	-0.305	0.751
Distance to extension office	0.243	0.287	0.85	0.396	-0.319	0.806
Constant	-1.771***	0.506	-3.50	0	-2.762	-0.780
Mean dependent var	0.802	SD dependent var	0.399			
Pseudo r-squared	0.437	Number of obs	400			
Chi-square	54.653	Prob > chi2	0.000			
Log-likelihood	-171.440					

Notes: Author's computation, 2023. *** p<.01, ** p<.05, * p<.1.

Challenges Faced by Farmers in Using Extension Services of CEAs

Table 6 presents the results of the challenges farmers face in using the services of CEAs. These challenges are ranked based on their mean scores, providing a clear indication of their perceived severity. Kendall's W value of 0.699 implies that there is a 69.9% level of agreement among cocoa farmers regarding the ranking of the challenges they face with CEAs. Thus, the surveyed farmers generally share similar perceptions about which challenges are most significant and which are less critical in their interactions with CEAs. At the forefront of these challenges, "Inadequate visits by CEAs," with a mean score of 1.27 was ranked as the most significant challenge. This challenge highlights the critical importance of consistent and timely interactions with CEAs. Adequate support and guidance depend on regular visits, making this issue a central concern for farmers looking to improve their cocoa farming practices. With a low number of extension workers (Sennuga *et al*., 2020b), CEAs are unable to regularly visit the farms and/or homes of farmers. Hence a challenge for these farmers.

Second in rank is the "lack of trust in CEAs due to experience" with a mean of 2.79. The success of farmers' collaboration with extension services hinges on their confidence in the skills of extension workers and their satisfaction with the perceived benefits of the services offered (Sennuga *et al*., 2020a). Transparent communication, reliable service delivery, and involving farmers in the planning and evaluation of extension activities can achieve this. Promoting community engagement and participatory approaches in extension services can help build stronger relationships and trust. Policies should encourage CEAs to work closely with farmer groups and local leaders to foster a sense of collaboration and mutual respect (Ehsan *et al*., 2022; Chilemba & Ragasa, 2020).

Ranked third is the challenge of "poor communication channels", with a mean score of 3.12. Effective communication is paramount for conveying knowledge and information. The perception of inadequate communication channels suggests that clear and accessible communication between CEAs and farmers needs improvement to enhance the transfer of knowledge and best practices Antwi-Agyei

Table 6. Challenges faced by cocoa farmers in using the services of CEAs

Challenges	Mean Rank	Rank
Inadequate visits by CEAs	1.27	1st
Lack of trust in CEAs due to experience	2.79	2nd
Poor communication channels	3.12	3rd
High input costs	3.80	4th
Lack of resources to implement recommended practices proposed by CEAs	5.07	5th
Limited access to credit	5.35	6th
Outmoded practices of CEAs	6.61	7th
N	400	
Kendall's W	0.699	
Chi-square	1676.638	
Df	6	
Asymp. Sig.	0.00	

Source: Field survey, 2023

& Stringer (2021) determined that communication issues significantly impede the delivery of extension services. They also highlighted additional challenges, such as elevated input expenses, insufficient resources for implementing recommendations from CEAs, restricted access to credit, and outdated methods employed by CEAs. Policies should focus on improving communication infrastructure in rural areas, including mobile networks and internet access, to facilitate better communication between CEAs and farmers. Integrating information and communication technology (ICT) tools in extension services can enhance knowledge dissemination and accessibility. Policies should support the development and use of mobile applications, SMS services, and online platforms to provide farmers with timely information and advice.

CONCLUSIONS

This study sheds light on the pivotal role of CEAs in facilitating knowledge transfer, enhancing agricultural practices, and promoting sustainable cocoa farming. The findings highlight the farmers' strong awareness and positive perceptions regarding the activities and support provided by CEAs, particularly in terms of knowledge dissemination, skill enhancement, and accessibility. The study finds that farmers' age, age of cocoa farms and engagement in off-farm activities significantly influence their perceptions of CEAs' effectiveness. The study indicates that inadequate visits by CEAs, lack of trust in CEAs due to experience and poor communication channels are the major challenges.

REFERENCES

Abate, G.T.; B. Tanguy; M. Simrin & D.J. Spiegelman (2023). Accelerating technical change through ICT: Evidence from a video-mediated extension experiment in Ethiopia. *World Development,* 161 (January), 1–14.

Amponsah-Doku, B.; A. Daymond; S. Robinson; L. Atuah & T. Sizmur (2022). Improving soil health and closing the yield gap of cocoa production in Ghana–a review. *Scientific African*, 15, e01075.

Ankuyi, F.; E.K. Tham-Agyekum; D. Ankrah; A.Y. Oduro-Owusu; J.E.A. Bakang; D. Boansi & S. Asirifi (2023). Beyond certification: Investigating the nexus between compliance with sustainable agriculture standard and livelihood assets of certified smallholder cocoa farmers in Ghana. *Cogent Food & Agriculture*, 9(1), 2256556.

Ankuyi, F.; E.K. Tham-Agyekum; D.C. Aidoo; J.A. Bakang; K. Amankwah; K.A. Akowuah & W.T. Makafui (2022). Drivers of knowledge, attitude, practice, aspiration and perceptions of sustainable agriculture

standard: Evidence from certified cocoa farmers in Ghana. *Russian Journal of Agricultural and Socio Economic Sciences*, 11(131), 125–140.

Antwi-Agyei, P. & L.C. Stringer (2021). Improving the effectiveness of agricultural extension services in supporting farmers to adapt to climate change: Insights from north eastern Ghana. *Climate Risk Management*, e 32, 2021, 100304.

Aparajita, G. (2010). Information, direct access to farmers, and rural market performance in Central India. *American Economic Journal: Applied Economics,* 2(3), 22–45.

Bandiera, O.; R. Burgess; E. Deserranno; R. Morel; M. Sulaiman & I. Rasul (2023). Social incentives, delivery agents, and the effectiveness of development interventions. *Journal of Political Economy: Microeconomics,* 1(1), 162–224.

Bonye, S.Z.; K.B. Alfred & G.S. Jasaw (2012). Promoting community-based extension agents as an alternative approach to formal agricultural extension service delivery in Northern Ghana. *Asian Journal of Agriculture and Rural Development,* 2(393-2016-23897), 76–95.

Chilemba, J. & C. Ragasa (2020). The impact on farmer incomes of a nationwide scaling up of the farmer business school program: lessons and insights from Central Malawi. *The European Journal of Development Researc*h, 32, 906–938.

Cole, S.A. & A.N. Fernando (2020). Mobilizing agricultural advice: Technology adoption, diffusion and sustainability. *The Economic Journal,* 131(633), 192–219.

Danso-Abbeam, G.; D.S. Ehiakpor & R. Aidoo (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. *Agric & Food Secur,* 7, 74 (2018).

Denkyirah, E.; E.D. Okoffo; D.G. Adu & O.A. Bosompem (2017). What are the drivers of cocoa farmers' choice of climate change adaptation strategies in Ghana? *Cogent Food & Agriculture,* 3(1), 1334296.

Donkor, E.; E. Owusu-Sekyere; V. Owusu & H. Jordaan (2016). Impact of agricultural extension service on adoption of chemical fertilizer: Implications for rice productivity and development in Ghana. *NJAS: Wageningen journal of life sciences*, 79(1), 41–49.

Ehsan, N.; G. Hoogenboom; M.K. Qamar; C.J. Wilkerson; S.A. Wajid & F. Aziz (2022). Climate change risk perception and adaptation to climate smart agriculture are required to increase wheat production for food security. *Italian Journal of Agronomy,* 17(4).

Fernando, A. (2021). Seeking the treated: The impact of mobile extension on farmer information exchange in India. *Journal of Development Economics,* 153, 1–17.

Gebrehiwot, K.G. (2015). The impact of agricultural extension on households' welfare in Ethiopia. *International Journal Soc Econ*, 42(8), 733–48.

GSS (2021). *Population and Housing Census Provisional Results.* Ghana Statistical Service.

Jamil, K.M.; N. Khan; F. Khan & M. Zakria (2015). Effectiveness of Agricultural extension services in dissemination of information to the farming community of Bhimber district, Pakistan. *Journal Agriculture Research.* Vol. 28 No.2,

Kehinde, A.D. & A.A. Ogundeji (2022). The simultaneous impact of access to credit and cooperative services on cocoa productivity in South-western Nigeria. *Agriculture & Food Security,* 11(1), 11.

Kenton, W. (2020). *Population samples*. Investopedia.

Komba, N.C.; M.R. Mlozi & Z.S. Mvena (2018). Socio-economic factors influencing farmers' perception on effectiveness of decentralized agricultural extension information and services delivery in Arumeru District, Tanzania. *International Journal Agriculture Extension Rural Development,* 6(2), 594–602.

Levai, L.D.; H.D. Meriki; A. Adiobo; S. Awa-Mengi; J.F.T.K. Akoachere & V.P. Titanji (2015). Postharvest practices and farmers' perception of cocoa bean quality in Cameroon. *Agriculture & Food Security*, 4(1), 1–8.

Maake, M.M.S. & M.A. Antwi (2022). Farmer's perceptions of effectiveness of public agricultural extension services in South Africa: an exploratory analysis of associated factors. *Agriculture & Food Security,* 11, 34.

Maguire-Rajpaul, V.A.; K. Khatun & M.A. Hirons (2020). Agricultural information's impact on the adaptive capacity of Ghana's smallholder cocoa farmers. *Frontiers in Sustainable Food Systems*, 4, 28.

Maoba S. (2016). Farmers' perception of agricultural extension service delivery in Germiston Region, Gauteng Province. *South African Journal Agriculture Extension,* 44(2), 167–73.

Maria, J. & F. Kondylis (2018). Does feedback matter? Evidence from agricultural services. *Journal of Development Economics,* 131 (March), 28–41.

Norton, G.W. & J. Alwang (2020). Changes in agricultural extension and implications for farmer adoption of new practices. *Applied Economic Perspectives and Policy*, 42(1), 8–20.

Okoffo, E.D.l M. Mensah & B.Y. Fosu-Mensah (2016). Pesticides exposure and the use of personal protective equipment by cocoa farmers in Ghana. *Environmental Systems Research*, 5, 1–15.

Oluwasusi, J.O. & Y.O. Akanni (2014). Effectiveness of extension services among food crop farmers in Ekiti State, Nigeria. *Journal of Agricultural & Food Information,* 15(4), 324–341.

Ramesh, P.; S. Govind & D. Vengatesan (2019). Factors influencing effectiveness of private extension service in sugarcane cultivation. *Journal Phrmacogn Phytochem.* SP2:344–6.

Rickards, L.; J. Alexandra; C. Jolley & T. Frewer (2018). *Final Report: Review of Agricultural Extension*. Australian Centre for International Agricultural Research (ACIAR)

Sennuga, S.O.; R.N. Baines; J.S. Conway and & C.W. Angba (2020a). Awareness and adoption of good agricultural practices among smallholder farmers in relation to the adopted villages programme: The case study of Northern Nigeria, *Journal of Biology, Agriculture and Healthcare,* 10(6), 34-49.

Sennuga, S.O.; S.O. Oyewole & E.M. Emeana (2020b). Farmers' perceptions of agricultural extension agents' performance in Sub-Saharan African communities. *International Journal of Environmental and Agriculture Research*, 6(5), 1-12.

Somanje, A.N.; G. Mohan & O. Saito (2021). Evaluating farmers' perception toward the effectiveness of agricultural extension services in Ghana and Zambia. *Agriculture & Food Security,* 10, 53.

Talib, U.; I. Ashraf; R. Agunga & K.M. Chaudhary (2018). Public and private agricultural extension services as sources of information for capacity building of smallholder farmers in Pakistan. *Journal Animal Plant Science*, 28(6), 1846–53.

Williams, R. (2006). Generalized ordered logit/ partial proportional odds models for ordinal dependent variables. *The Stata Journal,* 6(1), 58-82.

Wongnaa, C.A.; J.E.A. Bakang; M. Asiamah; P. Appiah & J.K. Asibey (2021). Adoption and compliance with council for scientific and industrial research recommended maize production practices in Ashanti region, Ghana. *World Journal of Science, Technology and Sustainable Development*, 18(4), 438-456.

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