Fake News on the Farm: How Misinformation Shapes Cocoa Farmers' Decisions in Jukwa, Ghana

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ABSTRACT

Cocoa is vital to Ghana's economy, yet misinformation threatens productivity by distorting farmers' decision-making. This study examined how misinformation affects cocoa farmers in Jukwa District using a cross-sectional survey of 390 farmers. Farmers accessed information from multiple sources, but extension officers were the most frequently used. However, a considerable number of farmers had acted on false information in pruning, pricing, fertilizer application, and pest control. Misinformation spread mainly through peer interactions, cooperatives, and radio/television. Logistic regression showed radio/television, community information centers, and social media increased susceptibility. Strengthening extension services is essential to counter misinformation and promote informed decisions.

KEYWORDS

agricultural information; decision-making; fake news; farm; misinformation

Introduction

Cocoa is one of Ghana's most economically significant crops, serving as a primary source of income for millions of rural households and contributing substantially to the national economy. As the second-largest producer of cocoa globally, after Ivory Coast, Ghana produces an average of approximately 800,000 metric tons annually, making the crop a key driver of foreign exchange earnings and rural livelihoods (Benneh & Anaman, 2022). Cocoa contributed about GHS 3.1 billion (US$533 million) to the country's gross domestic product (GDP) in 2021, representing more than 10% of national GDP (Bunn et al., 2019). The export of cocoa beans and products accounts for 20 to 25% of total exports, behind exports of gold (Kolavalli & Vigneri, 2017). Over 800,000 smallholder farmers and their families

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form part of the 30% of beneficiaries who depend on the sector for their living (Anthonio & Aikins, 2009).

Although cocoa remains the dominant cash crop, farmers also cultivate food crops such as plantain, maize, cassava, and cocoyam to ensure household food security. The continued success of cocoa production therefore depends not only on favorable climate and soil conditions or effective pest management but also on farmers' access to credible and timely agricultural information to guide their decisions. In recent years, cocoa production practices have evolved in response to climate variability, declining soil fertility, and changing market dynamics. Farmers are increasingly adopting climate-smart methods such as improved shade tree management and integrated pest and disease control to enhance productivity and resilience. As these practices continue to change, access to accurate and consistent information becomes even more crucial, since misinformation or contradictory advice can affect farmers' uptake of recommended strategies. Understanding how farmers perceive and benefit from information delivery approaches, including group-based training programs, is therefore essential to strengthening sustainable cocoa production and ensuring long-term resilience within the sector (Ferrández García et al., 2025; Nasser, 2019; Salas-Macías et al., 2024).

Information is a critical resource across all sectors, including agriculture. It provides knowledge, innovation, and the basis for strategic planning and decision-making (Raviya et al., 2020). In agricultural value chains, information exchange fosters competitive and sustainable production within both local and global markets (Tham-Agyekum, Awuku, et al., 2024; Wainaina et al., 2021). Adequate and timely information is particularly essential for technology adoption. Jack (2013) argues that farmers are unlikely to embrace new technologies without a clear understanding of their benefits and use. Consequently, the availability of accurate information supports the adoption of improved agronomic practices, efficient resource use, and climate adaptation. Empirical studies confirm that well-informed farmers are better positioned to adopt yield-enhancing and resilience-building practices. For instance, Maguire-Rajpaul et al. (2020) found that improved access to climate-relevant information strengthens cocoa farmers' adaptive capacity, while Tham-Agyekum, Bakang, et al. (2024) report significant gains in yields, income, and household food security when farmers receive reliable climate information. In addition, agricultural information facilitates access to critical inputs such as credit, fertilizers, and improved seedlings, further enhancing livelihoods (Anang et al., 2016). These studies collectively demonstrate that agricultural information is indispensable for promoting farmer welfare, productivity, and resilience.

Advancements in information and communication technologies (ICTs) have expanded the range of communication channels available to farmers

(Tham-Agyekum, Awuku, et al., 2024). Mobile phones, digital platforms, and social media now complement traditional media such as radio and community information centers, improving interaction among farmers and between farmers and extension professionals (Kabir et al., 2023; Kaushik et al., 2018). However, this expanded information landscape has also amplified the circulation of misinformation, defined as false or misleading information (Van der Meer & Jin, 2020). Misinformation spreads rapidly through digital platforms and verbal networks, influencing perceptions on critical issues such as agrochemical use, improved seeds, and genetically modified organisms (Čechmánek, 2024; Kankanamge et al., 2025). Although concerns about misinformation in agriculture are increasing, little is known about its influence on cocoa farmers' decision-making in Ghana, suggesting a notable research gap.

Misinformation undermines knowledge dissemination in agriculture by weakening trust in credible sources and distorting decision-making processes (Chowdhury et al., 2024; Stroud, 2019). The consequences can be immediate and far-reaching. In the cocoa sector, adoption of key management practices such as shade management, pest and disease control, fertilizer application, and weed management is essential for improving productivity and income (Asante et al., 2022). When decisions are based on inaccurate information, farmers risk adopting ineffective practices that lower yields and jeopardize livelihood security. Given cocoa's substantial contribution to Ghana's GDP and export earnings, such disruptions can also have adverse implications for the broader national economy (Woodside, 2024). These concerns reinforce the urgency of examining how misinformation shapes the behavior of cocoa farmers and the performance of the cocoa value chain.

Several studies have highlighted that misinformation constitutes a major barrier to effective extension service delivery. Misinformation can erode farmers' trust in scientific and evidence-based practices, diminish the credibility of extension agents, and reduce the adoption of improved agricultural technologies (Chowdhury et al., 2024; Magesa et al., 2024; Stroud, 2019). In addition, misinformation limits farmers' access to accurate knowledge, constraining their ability to make informed decisions (Stephen et al., 2024). Ultimately, these effects undermine agricultural development, reducing yields, profitability, and the broader socio-economic benefits of farming. Addressing misinformation is therefore critical to strengthening the effectiveness of extension services, ensuring farmers can access credible information, and facilitating the adoption of improved agricultural practices for a sustainable cocoa sector.

In this context, the present study seeks to assess the influence of misinformation on agricultural decision-making among cocoa farmers in the Jukwa Cocoa District of Ghana's Central Region. Specifically, the study aims to: (i) identify the sources and channels of agricultural information accessed by cocoa farmers; (ii) examine the types and sources of misinformation

prevalent in cocoa farming practices; (iii) analyze the factors influencing farmers' susceptibility to misinformation; (iv) assess the effect of misinformation on farmers' decision-making; and (v) identify the strategies to mitigate misinformation. By addressing these objectives, the study contributes to understanding the intersection of information quality, technology adoption, and agricultural productivity in cocoa farming communities. The findings are expected to provide practical insights for extension agencies, policymakers, and development partners seeking to strengthen agricultural information systems, improve decision-making, and foster a more resilient and productive cocoa sector in Ghana and similar agrarian economies.

Research methodology

Research design and study area

This study adopted a survey design, specifically employing the cross-sectional survey. The cross-sectional survey design was used to collect data from the population at a single point in time to capture respondents' experience regarding the study. The study was conducted in the Jukwa cocoa district, in the Central region of Ghana. The Jukwa cocoa district is the administrative district for the Cocoa Health and Extension Division (CHED) of the Ghana Cocoa Board. It is located in the Central Region of Ghana, along the southern coast of the country, bordering the Gulf of Guinea. The area is strategically positioned between the Western, Eastern, Ashanti, and Greater Accra regions, making it a key zone for agricultural and socio-economic activities. For the purpose of this study, three distinct zones were selected: Jukwa (covering Twifo/Hemang/Lower Denkyira districts), Abura-Dunkwa (covering Abura/Asebu/Kwamankese districts), and KEEA Municipality (covering Komenda/Edina/Eguafo/Abrim districts). The Jukwa zone, located in the northwestern part of the region, is characterized by a mix of forest and agricultural lands, supporting a range of crops including cocoa and coconut. Abura-Dunkwa, situated centrally, exhibits a combination of semi-urban and rural settlements with diversified agricultural activities. The KEEA Municipality, along the southern coastline, is a predominantly coastal zone with significant fishing and crop farming activities, and serves as a hub for trade and tourism. The selected zones offer a representative mix of agro-ecological, socio-economic, and infrastructural characteristics, making them suitable for studies on agricultural practices, value-chain development, and rural livelihoods (Figure 1).

Sampling procedure

The study population consisted of all the cocoa farmers (16,129) in the study area. The sample size for the study was statistically representative,

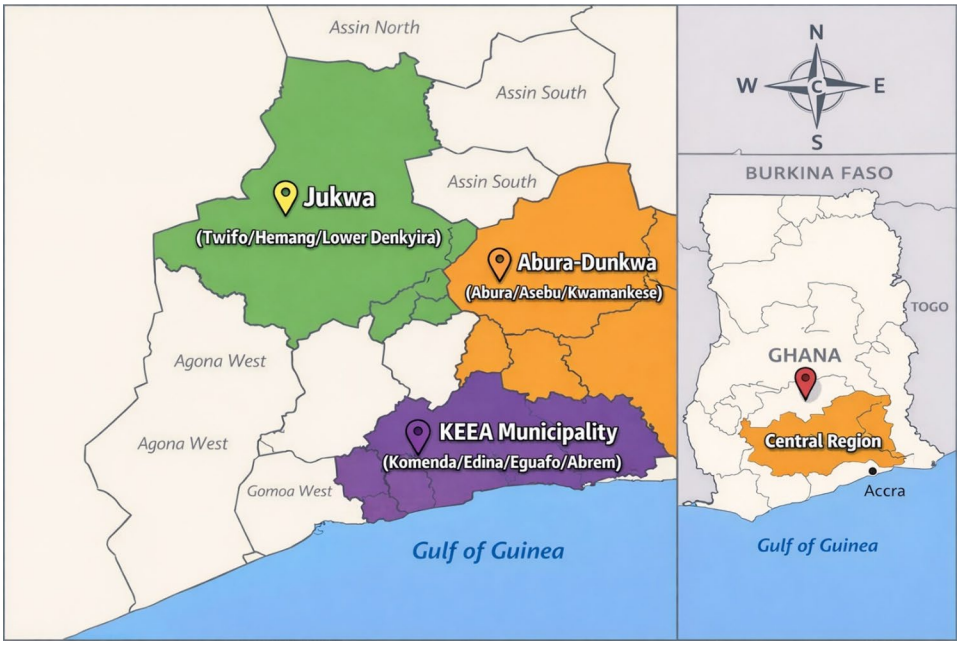

Figure 1. Ghana's central region and the three study zones in the Jukwa cocoa district.

based on 95% confidence level and 5% error margin. It was determined following Yamane's formula for sample size calculation (Yamane, 1967), thus, 390 farmers. The study employed a multi-stage approach in selecting the district, communities, and farmers for the survey. In the first stage, the Jukwa cocoa district was purposively selected due to its predominant cocoa cultivation and the rich and relevant context it provides for the survey. In the second stage, the district was divided into three clusters or zones; Jukwa (Twifo/Hemang/Lower Denkyira), Abura-Dunkwa (Abura/Asebu/Kwamankese), and KEEA (Komenda/Edina/Eguafo/Abrim) and a proportionate number of farmers were selected from each zone based on their respective populations. Communities were randomly selected from each zone for the data collection exercise. This was to ensure that the diverse backgrounds and experiences of farmers across the district were well represented. At the next stage, data on farmers from these communities were obtained from the district office, from which farmers were randomly selected for the study. Table 1 shows the distribution of the sampled farmers across the three zones.

Data collection procedure

Quantitative data was collected using a structured questionnaire containing both open and close-ended questions, focusing on measurable variables such as socio-demographic characteristics of farmers, access to information,

Table 1. Proportional allocation of sampled farmers in Jukwa cocoa district by zone.

Zone	Farmer population	Proportion of total (%)	Sample size
Jukwa	3,518	21.8	85
Abura-Dunkwa	8,138	50.5	197
KEEA	4,473	27.7	108
Total	16,129	100	390

access to extension services and training, source of information, farmer-based organizations, farm practices used by farmers, among others. The questionnaire was designed in line with the objectives of the study, ensuring that it adequately addressed the objectives of the study. The finalized data collection tools were administered to farmers through in-person interactions. Before administering the questionnaire, the purpose and objectives of the study were explained to the respondents, and their informed consent obtained, highlighting confidentiality and voluntary participation. This step is not only ethical but also encourages open and honest responses from respondents. To ensure accessibility and uniform understanding across sampled farmers, the questionnaire was translated into the local language spoken by the respondents. This was crucial in overcoming language barriers since most respondents are unable to read the English language in which the questionnaire was prepared and minimize potential misinterpretations of questions.

To ensure the reliability and validity of results produced by this, a combination of strategies was employed. First, the data collection tools were pre-tested with a small group of farmers with similar characteristics of the sampled farmers. This was to ensure the appropriateness of the questions, wording, verbal translation of key concepts of the study in the language, and readiness of the data collection instruments. The instrument was revised and finalized based on the feedback from this exercise. The final instrument was reviewed and validated by the project supervisor to ensure that it captures all the variables required to respond to the objectives of the study. The study employed a Computer-Assisted Personal Interviewing (CAPI) tool, KoboCollect, for the data collection. This provided real-time access to the data collected. Daily reviews of work done was conducted, and follow-up made as needed to ensure that accurate data had been captured, and all questionnaires are fully completed.

Data analysis

The data was analyzed using descriptive and inferential analysis to respond to the research objectives. For instance, descriptive statistics such as frequencies, percentages, and mean scores were used to summarize data related to the sources and types of misinformation encountered by cocoa

farmers, including categorizing sources of misinformation and identifying the most common misinformation among farmers. In cases where farmers had the option to choose from multiple response options, multiple response analysis was used to summarize and present the data. On the other hand, inferential statistics such as binary logistic regression analysis were used to determine the relationship between variables. The analysis was conducted using Statistical Package for Social Scientists (SPSS) version 28.

Empirical framework

For objective one, descriptive statistics methods were used to summarize responses from farmers, using frequencies and percentages to identify the source and channels of agricultural information among cocoa farmers. This was to identify the most common information sources farmers accessed agricultural related information from. Objective two was analyzed using frequencies and percentages to summarize the data and identify the most common misinformation types and sources. Multiple response analysis was employed to summarize responses where farmers cited more than one type or source of misinformation.

For objective three, the binary logistic regression model was used to identify factors influencing cocoa farmers' susceptibility to misinformation. A set of socio-demographic characteristics and information sources were included in the model to assess how they influence farmers' susceptibility to misinformation. In order to assess the effect of misinformation on cocoa farmers' decision-making, frequencies and percentages were used to summarize the data and identify how misinformation has affected cocoa farmers' farming decisions and practices. Thematic analysis was used to identify and summarize dominant themes from the qualitative responses provided by farmers on strategies to mitigate misinformation.

This model was used to determine the factors influencing cocoa farmers' susceptibility to misinformation. The dependent variable in the model was a binary outcome (Yes-1, No-0), susceptibility to misinformation; representing whether a farmer has fallen for misinformation related to cocoa farming practices or not. The independent variables included socio-economic characteristics such as age, education (Bilodeau & Khalid, 2024; Fidelugwuowo, 2022; Modirwa, 2019; Nyarko & Kozári, 2020), sex (Modirwa, 2019; Nyarko & Kozári, 2020), farming experience (Fidelugwuowo, 2022; Modirwa, 2019), farm size (Fidelugwuowo, 2022), and various information sources (Nyarko & Kozári, 2020). Some of the variables employed in the cited studies differ from the one developed in this study; however, their inclusion is intended to provide conceptual and empirical support for the selection of explanatory variables and the general modeling approach

Table 2. Description of variables in the binary logistic regression model.

Independent variables	Description	Measurement	A-prior expectations
Sex (SX)	Sex of cocoa farmer	Dummy (1 = Male; 0 = female)	+/−
Age (AG)	Farmer's age in years	Continuous (Years)	+
Education (EDU)	Number of years in school	Continuous (Years)	+
Farm size (FSIZE)	Cocoa farm size measured in hectares	Continuous (Hectares)	+
Farming experience (FEXP)	Number of years in cocoa farming	Continuous (Years)	+
Access to mobile phone (ACMOB)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Farmer organization (MFBO)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Extension officers (EXTOFF)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Radio/Television (RADTEL)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Community information center (CIC)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Social media (SM)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Other farmers (OF)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Internet/website (INTWEB)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−
Family members (FAM)	Use of information source	Dummy (1 = yes; 0 = otherwise)	+/−

rather than to replicate their specifications. The model was specified as: Logit (P (Susceptibility to Misinformation) = β_0 + β1SX + β2AG + β3EDU + β_4FSIZE + β_5FEXP + β_6ACMOB + β_7MFBO + β_8EXTOFF + β_9RADTEL + β_{10}CIC + β_{11}SM + β_{12}OF + β_{13}INTWEB + β_{14}FAM + ϵ. Detailed explanation is in Table 2.

Results and discussion

Socio-demographic characteristics of farmers

The majority of respondents were male (75.1%), reflecting the gender distribution typical of Ghana's cocoa sector. Majority of the respondents were married (79.2%). Most farmers owned their farms (67.7%), while others were sharecroppers, caretakers, or rented land. Membership in farmer-based organizations was high (85.1%), suggesting strong engagement in collective activities and access to shared resources or information. While the majority focused solely on cocoa farming, about 40% engaged in off-farm income-generating activities such as trading, artisanry, teaching, or driving. Educational attainment was relatively low, averaging eight (8.34) years of formal schooling, reflecting that most farmers had completed primary or junior high education. The average farm size used by cocoa farmers was 5.16 ha. The cocoa farmers in the district were predominantly middle-aged to older, with a mean age of 52.17 years. Households averaged 5.0 members, suggesting moderately sized family units that could support farm labor and household needs. Farmers had considerable experience, averaging 21 years in farming, demonstrating a high level of practical knowledge that could support adaptation and innovation in cocoa production (Table 3).

Table 3. Socio-demographic characteristics of farmers.

Variables	Category	Frequency	Percent
Sex	Male	293	75.1
	Female	97	24.9
Marital status	Married	309	79.2
	Divorced	17	4.4
	Widowed	29	7.4
	Single	35	9.0
Farm ownership	Owner	264	67.7
	Caretaker	43	11.0
	Sharecropper	77	19.7
	Rented	6	1.5
Membership of farmer-based organizations	Yes	332	85.1
	No	58	14.9
Engagement in off-farm activities	Yes	158	40.5
	No	232	59.5
Education	Mean = 8.34	SD = 4.69	
Farm size	Mean = 5.16	SD = 1.03	
Age	Mean = 52.17	SD = 8.41	
Household size	Mean = 5.00	SD = 2.01	
Cocoa farming experience	Mean = 21.11	SD = 10.19	

Sources and types of information for cocoa farmers

Regarding sources of information, cocoa extension officers were the most cited (96.4%). Farmers relied heavily on extension officers, with 65.7% always consulting them and 29.3% frequently, confirming their pivotal role in shaping production practices. Farmer cooperatives (67.2%) and other farmers (57.4%) were also important sources, while traditional media such as radio and television reached 52.8% of farmers, and community information centers 40.8%. Digital platforms, including social media (19.5%) and websites (9%), were less frequently used, reflecting limited digital adoption. Cocoa extension officers play a crucial role in shaping production practices among cocoa farmers. Farmers frequently consult these officers. According to a study by Salam (2024), a significant majority of farmers rely on extension officers for guidance, indicating their trust and the perceived value of their expertise. While extension officers are pivotal, some studies suggest that reliance on peer sources and cooperatives can also foster innovation and adaptation among farmers, indicating a multifaceted approach to agricultural information dissemination is beneficial (Krishnan, 2023; Opara, 2008).

Farmers predominantly accessed production-focused information, including pruning (81.8%), pest and disease control (77.7%), and fertilizer application (74.4%). Information on recommended chemicals (51%) and weed control (48.7%) was also sought, whereas market pricing (38.7%), climate change adaptation (34.6%), and post-harvest practices such as harvesting (20.8%) and fermentation (19%) were less frequently accessed. The prioritization of yield-enhancing practices reflects farmers' immediate economic

Table 4. Sources and types of information for cocoa farmers.

Sources of Information (Multiple responses)	Frequency	Percent
Cocoa Extension Officers	376	96.4
Farmer cooperatives / groups	262	67.2
Radio / Television	206	52.8
Community information center	159	40.8
Social media (Facebook, WhatsApp, TikTok)	76	19.5
Other farmers	224	57.4
Family members	47	12.1
Websites / Internet	35	9.0
Types of Information Accessed (Multiple responses)	**Frequency**	**Percent**
Pruning	319	81.8
Pest and disease control	303	77.7
Fertilizer application	290	74.4
Weed control	190	48.7
Recommended chemicals	199	51.0
Selecting planting materials	155	39.7
Pricing / market information	151	38.7
Climate change adaptation	135	34.6
Hand pollination	106	27.2
Harvesting	81	20.8
Fermentation	74	19.0
Drying	54	13.8
Financial assistance / loans	35	9.0

interests and corroborates findings in other cocoa-producing regions (Ogunjobi et al., 2025) (Table 4).

Farmers' experience of misinformation in cocoa farming

The study revealed that misinformation is a prevalent concern in cocoa farming communities. Nearly half of the surveyed farmers (45.4%) reported having acted on cocoa farming information that later proved false, highlighting the vulnerability of the sector to misinformation (Table 5). This aligns with prior studies that indicate the agri-food sector is particularly susceptible to misinformation due to reliance on informal sources, complexity of agricultural practices, and limited access to extension services (Čechmánek, 2024; Edet, 2024; Kankanamge et al., 2025).

Pruning (37.6%), cocoa pricing (33.1%), fertilizer application (22.5%), and pest management (19.7%) were the most common types of misinformation encountered, reflecting the areas of high demand for information. These instances of misinformation illustrate how farmers' decisions can be influenced by inaccurate information. These findings resonate with Mukhopadhyay & Shah (2022) who noted that information overload increases exposure to falsehoods, particularly in contexts where farmers actively seek knowledge to improve productivity. Asafo-Agyei (2024) also noted that entrenched misconceptions can significantly deter the uptake of proven yield-enhancing techniques. The focus on pruning mirrors the observation that farmers frequently seek this type of information, making

Table 5. Farmers' experience of misinformation in cocoa farming.

Experience of misinformation	Frequency	Percent
Yes	177	45.4
No	213	54.6
Types of misinformation experienced	**Frequency**	**Percent**
Pruning	67	37.6
Cocoa pricing	59	33.1
Fertilization	40	22.5
Pest management	35	19.7
Planting materials	25	14.0
Shade management	18	10.1
Cocoa diseases	12	6.7
Fermentation	4	2.2
Planting distances	11	6.2
Weed management	8	4.5
Hand pollination	7	3.9
Harvesting	1	0.6
Others (e.g., climate change)	4	2.2
Sources of misinformation	**Frequency**	**Percent**
Other farmers	154	87.0
Farmer cooperatives/groups	38	21.5
Radio/Television	27	15.3
Social media	13	7.3
Extension officers	12	6.8
Community information center	5	2.8
Websites/internet	2	1.1
Information verification practices	**Frequency**	**Percent**
Consult cocoa extension officer	92	52.0
Check with other farmers	34	19.2
Rely on personal experience	19	10.7
Search online	3	1.7
Don't verify	29	16.4

it a high-risk area for misinformation. Misinformation on cocoa pricing is especially concerning because it can directly affect economic decision-making, potentially reducing farmers' profitability.

Sources of misinformation were predominantly other farmers (87%), followed by farmer cooperatives/groups (21.5%), and to a lesser extent radio/television (15.3%), social media (7.3%), and extension officers (6.8%). This underscores the dual nature of peer-to-peer interactions: while critical for knowledge sharing, they can also facilitate the spread of false information if farmers are not well-informed themselves (Berg & Spicka, 2023; Sandy et al., 2024). Even though farmers overwhelmingly rely on extension officers (65% frequently or always) and consider them the most trusted source (93%), misinformation still circulates, suggesting that peer networks may be filling communication gaps left by formal channels. Enhancing direct engagement between farmers and extension workers is therefore essential to limit misinformation and promote sustainable practices (Somanje et al., 2021).

Farmers employ diverse strategies to verify information, with the majority (52%) consulting extension officers. Others cross-check with peers (19.2%) or rely on personal experience (10.7%), while 16.4% do not verify

information at all. Reliance on personal experience and peers, though facilitating practical learning, can limit the adoption of improved practices if the knowledge base is inaccurate (Balasha et al., 2024; Owusu et al., 2018).

Factors influencing cocoa farmers' susceptibility to misinformation

The results of the logistic regression analysis in Table 6 showed that farmers susceptibility to misinformation is significantly influenced by their source of information on cocoa farming practices rather than demographic characteristics. For instance, the results showed a significant positive relationship ($p < 0.001$) between accessing information from other farmers and susceptibility to misinformation. This implies that farmers who rely on other farmers for information are more likely to be susceptible to misinformation. The odds ratio value Exp(B) of other farmers as an information source indicates that accessing information from this source increases farmers susceptibility to misinformation by 3.9 times, assuming all other independent variables remain constant. Consistent with this finding, Zhang & Cheng (2024) identified peer-to-peer interactions among participants as an easy means to spread misinformation. Among rural farmers, advice from fellow farmers is often not validated, particularly when such advice come from trusted peers or prominent community members. However, such information is most often not scientifically validated and may be based on individual's personal experience which may lack accuracy.

The results of the regression analysis also revealed a significant positive relationship ($p < 0.001$) between radio/television and farmers susceptibility to misinformation. As shown by the odds ratio in Table 6, cocoa farmers' susceptibility to misinformation is influenced by reliance on information from radio/television (Exp(B) = 2.700, $p = 0.001$). The implication is that

Table 6. Factors influencing cocoa farmers' susceptibility to misinformation.

Variables	B	S.E.	Wald	P-value	Exp(B)
Sex	−0.069	0.281	0.061	0.805	0.933
Age	0.011	0.014	0.644	0.422	1.011
Years of education	0.037	0.027	1.912	0.167	1.038
Farm size	0.032	0.044	0.541	0.462	1.033
Farming experience	0.021	0.016	1.621	0.203	1.021
Access to mobile phone	−0.268	0.492	0.297	0.586	0.765
Membership of FBO	0.012	0.363	0.001	0.974	1.012
Extension officers	−0.036	0.642	0.003	0.955	0.965
Cooperative/group	−0.194	0.306	0.401	0.526	0.824
Radio/Television	0.993	0.289	11.833	0.001***	2.700
Community information center	−1.007	0.285	12.452	0.000***	0.365
Social media	−1.047	0.435	5.802	0.016**	0.351
Other farmers	1.355	0.261	26.932	0.000***	3.876
Internet/website	0.942	0.516	3.339	0.068	2.566
Family members	−0.482	0.362	1.773	0.183	0.618
Constant	−1.928	1.223	2.487	0.115	0.145

Note: *** and **, Significant at $p < 0.001$ and $p < 0.05$, respectively. B, Parameter estimate; SE, Standard error.

farmers who rely on radio or television are about 2.7 times more likely to be susceptible to misinformation, compared to farmers who do not. While radio and television are widely accessible to farmers, content quality and verification mechanisms may be of concern, particularly when such programs do not include expert review. Under such instances, misinformation can easily be spread. This is more concerning, especially in the context of the current study where a significant proportion of farmers admitted that they are unable to distinguish between reliable and unreliable information. Gadjanova et al., (2022) in their study on misinformation in Northern Ghana identified that traditional media such as radio and television is a more common channel for misinformation, especially in rural areas. Kankanamge et al. (2025) also asserts that commercialization and desire for viewership/listenership have often influenced media outlets engagement in sensational content which may contain inaccurate information rather than scientifically based information. Although some studies have shown that in areas like Zambia, radio campaigns positively influenced farmers awareness and adoption of best practices, this success however hinged on quality content and complementary field support (Rware et al., 2021).

On the other hand, the results show a significantly negative relationship between reliance on Community Information Centers and farmers' susceptibility to misinformation (Exp(B) = 0.365, $p = 0.000$), implying that farmers who rely on this source for cocoa farming information are less likely to be susceptible to misinformation. Community information Centers are increasingly becoming popular in Ghana as a critical mass communication tool for information dissemination (Akueteh et al., 2024), especially in rural areas. Some studies have affirmed that unlike traditional media, community information center programs are often tailored to the interests and needs individuals in a certain geographical area offering them access to information which hitherto may not have been accessible to them (Krishnamurthy et al., 2012). In the study area, community information centers are mostly common and provide an important platform for agricultural education. Indeed, the influence of community information centers on misinformation as revealed by the regression analysis could be explained by the fact that community information centers are widely accessible in most cocoa farming communities and are widely used by used by extension officers from the Cocoa Health and Extension Division (CHED) to disseminate accurate and timely information to a wider audience. These platforms are mostly in the reach of farmers and information provided are more relevant and reliable. In their study to understand cocoa farmers experience on community radio in Ghana, Tham-Agyekum et al. (2023) found that most farmers agreed that the content and presentation of community radio programs were suitable for them. Akueteh et al. (2024)

in their study confirmed that community members were generally satisfied with information they received from community information centers and regard such information as timely, reliable, clear, relevant, and responsive to their needs. Therefore, with easy access and use of community information centers by extension officers, farmers are more likely to receive verified and scientific based content which reduces their exposure to misinformation.

The results also show a significant relationship between social media and farmers' susceptibility to misinformation. As shown by the odds ratio of social media in Table 6, farmers who access cocoa farming information from social media (Exp(B) = 0.351, $p = 0.016$) are less likely to be susceptible to misinformation than those who do not. This finding may seem unreasonable since the proliferation of misinformation on social media has become a major concern in recent years (Gadjanova et al., 2022; Thompson et al., 2022). However, recent evidence suggests that digital platforms, especially social media platforms such as WhatsApp are being leveraged by extension officers to fill the information gap created by traditional extension systems (Kabir et al., 2023). According to Thakur et al. (2018) and Sarku et al., (2025), WhatsApp groups and individual messages, including voice recordings, shared by extension officers effectively facilitated real-time accurate update on diseases, weather, and best farming practices with farmers. In this context, social media serves as a channel for experts such as cocoa extension officers to share verified and accurate information, thereby reducing the risk of misinformation. While the above reasoning supports the finding of this study, it is worth mentioning that some contrary evidence has been highlighted in literature. For instance, Ramjattan et al. (2024) acknowledged that social media can amplify misinformation among farmers since most community members have limited ability to evaluate the credibility of the information. However, these dynamics may be different when social media content are accurate, and farmers are able to verify the information. The implication of the findings of this study is that social media, when used effectively, could be a channel to combat misinformation.

Effect of misinformation on cocoa farmers' decision-making

The consequences of misinformation were far-reaching. About 80.3% of the farmers reported negative experiences, with reduced yield. This outcome is expected given that core yield-determining practices such as pruning and pest management were strongly affected. Previous studies have emphasized that poor agronomic practices directly translate into productivity losses (Chowdhury et al., 2024; Edet, 2024). Beyond yield, farmers also reported increased input costs (32.4%), financial loss (29.6%),

Table 7. Effect of misinformation on cocoa farmers' decision-making (multiple responses).

Consequences of misinformation-driven practices	Frequency	Percent
Reduced yield	57	80.3
Increased input cost	23	32.4
Financial loss	21	29.6
Crop loss	17	23.9
Environmental damage	9	12.7
Health issues (e.g., pesticide illness/injury)	8	11.3
Increased labor cost	5	7.0

and crop loss (23.9%), confirming Čechmánek's (2024) assertion that misinformation has measurable economic repercussions. Additionally, health-related issues (11.3%) and environmental damage (12.7%) were noted, especially among those who engaged in improper pesticide use. Struelens et al. (2022) similarly found that misleading pesticide advice often results in long-term ecological harm and latent health risks, even when effects are not immediately perceived (Table 7).

Strategies to mitigate the spread of misinformation

The analysis revealed that assessing information from trusted personnel was a major theme highlighted by respondents. An overwhelming majority of farmers expressed their trust in extension officers as central to mitigating misinformation. Indeed, responses from the farmers indicated that many of them suggested the exclusive reliance on extension officers for cocoa information related to cocoa farming. This calls for increased engagement and presence of extension officers. However, while this strategy may be laudable, it may be practically difficult due to several factors such as the high ratio of farmers to extension officers which hinder timely one-on-one visits with farmers. Ultimate this calls for the need to explore other complementary strategies that can enhance the work of extension officers, such as leveraging community information centers, group meetings, and strengthening farmers capacity for peer learning. As shown by Stroud (2019), blending learning technologies facilitated accurate information exchange among farmers which helped them to debunk misinformation on soil health and management practices.

Respondents also placed emphasis on verification and fact-checking of information, especially before acting on it. Responses from the questionnaire often included statements such as "*always verify information from reliable sources*" and "*fact check from professional sources*", reflecting farmers' awareness of the importance of sourcing accurate information. Information fact-checking ensures that information received are vigorously assessed to ascertain its accuracy and reliability. In this regard, many farmers stressed the need to consult extension officers to fact-check verify information. Available evidence suggests that information fact-checking reduced belief

in misinformation (Porter & Wood, 2021). It is worth mentioning that strategy could be as relevant to extension officers as it is to farmers, knowing that not only farmers are at risk but also extension workers could be exposed to misinformation when information, particularly from online sources, are not fact-checked.

The analysis revealed farmers call for continuous education and training, particularly on how to identify misinformation as an effective strategy to mitigate misinformation. It is not surprising that most farmers were concerned about enhancing their capacity to identify misinformation. Prior research has confirmed that educational strategies such as media literacy education through Farmer Field Schools and training on good agronomic practices are crucial to enhancing farmers' capacity to identify and counter false information (Chowdhury et al., 2024). Such training provides alternative beliefs that are scientifically based which correct farmers' misconceptions, enhance their ability to discern misinformation, and influence their adoption of best practices (Calabrese & Albarracín, 2023). Particularly in the digital age, the era of misinformation, information literacy is vital for farmers to effectively navigate and utilize information available to them, emphasizing the need for continuous education and training to build the farmers' capacity. Other studies have recommended approaches such as the implementation of a local agricultural information hub as a complement to traditional extension methods to combat misinformation (Chowdhury et al., 2024).

In addition, some respondents opined that restricting misinformation sources could be an effective approach to mitigate the spread of misinformation. This assertion is backed by statements such as "*avoid giving platforms to people with no technical knowledge*", "control the use of social media for farming information", and "*information should only come from officers*" which were frequently made by respondents in their response to the questionnaire to highlight their view of limiting unverified voices. This perspective aligns with Doshi and Schmidt (2022) who assert that this approach can prevent initial entry of misinformation, addressing the issue at its source. For instance, when agricultural related radio programs are presented by experts or their content is verified by professionals, farmers are more likely to receive accurate and reliable information. Also, commercial advertisements intended to convey information to farmers on some products or services, may contain some misinformation if their content is not well vetted and verified. Limiting platforms for the spread of misinformation and holding authors accountable can significantly reduce the dissemination of false information, and thereby discouraging the creation and sharing of such content. The author further emphasized that the approach not only reduces the spread of misinformation but focuses on prevention and control which enhances information integrity and source tracking.

Conclusion

The study establishes that misinformation is not a peripheral issue but a central threat to sustainable cocoa production, with nearly half (45.5%) of farmers acting on false information. Its impact is profound, spanning yield reductions, economic losses, health risks, and compromised agronomic integrity. While informal peer networks remain a dominant knowledge source, they are also the largest transmitters of misinformation, reinforcing harmful practices such as the avoidance of pruning or misuse of pesticides. In contrast, extension officers emerge as the most trusted gatekeepers of accurate information, yet their limited reach constrains their corrective influence. Moreover, radio and television, often assumed to be reliable communication channels, unintentionally amplify misinformation when unregulated. Conversely, Community Information Centers and expert-led social media platforms demonstrate potential as effective counterweight mechanisms when tied to verified content. The findings affirm that misinformation thrives not only due to information scarcity but also due to weak verification systems, social reinforcement, and structural gaps in advisory services.

Combating misinformation requires a multi-channel, system-wide response centered on strengthening official advisory structures while transforming informal networks into assets rather than liabilities. Extension systems should be enhanced, digitally scaled, and repositioned as active misinformation watchdogs, leveraging community information centers, WhatsApp platforms, and trained "Lead Farmers" to rapidly disseminate verified information. Targeted counter-campaigns must be launched to debunk persistent misconceptions, particularly on pruning, pesticide usage, and fertilization, using simple, consistent messaging across trusted touchpoints. Parallel to this, farmer resilience must be strengthened through media and information literacy training, promoting a culture of "verify before you apply" across cooperatives and farmer meetings. Finally, radio and television programing should be formally aligned with certified agricultural expertise, ensuring mass media transitions from being a misinformation conduit to a quality-controlled knowledge amplifier. Together, these strategies create a layered defense system, transforming misinformation from an invisible threat into an actively managed risk within the cocoa farming landscape.

Limitations of the study

The data relied heavily on self-reported perceptions of misinformation. Such perceptions may be influenced by recall bias, misclassification of accurate information as misinformation, or the reluctance of respondents to admit

adopting practices later considered harmful. Consequently, the findings may not fully reflect the actual prevalence or severity of misinformation exposure. The study does not capture misinformation circulating outside the farmers' awareness. Some farmers may unknowingly rely on inaccurate information, making it difficult to evaluate the real behavioral impact solely through self-report measures. Relatedly, the cross-sectional design limits the ability to establish causal relationships between misinformation exposure and behavioral outcomes such as technology adoption, productivity, and income changes. Additionally, the study focuses on farmers within a specific geographical context, which may influence the channels of information access and institutional support available to respondents. This limits the generalizability of findings to other agro-ecological zones or information environments with different communication infrastructures.

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Data availability statement

Data will be made available upon reasonable request.

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