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## Proximity and information flows in farmer networks: a comparative analysis of certified and non-certified cooperative networks in Ghana's cocoa sector

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### ABSTRACT

**Purpose:** This paper reports a cross-cutting analysis of how information flows in certified and non-certified farmer cooperatives in Ghana's cocoa sector.

**Design/ Methodology/Approach:** We used a case study design and face-to-face interviews with a sample of 120 farmers. Data were analyzed using Social Network Analysis (SNA) to map and visualize information flows within certified and non-certified cooperative networks.

**Findings:** Our findings show that certification establishes two key information gatekeepers: a private extension officer and a cooperative manager. These gatekeepers centralise the flow of technical, market, and buyer-related information that farmers perceive as contributing to improving cocoa quality. Such a centralised network configuration may lead to effective channels of information exchange but also poses a risk to the overall efficiency of information flows due to potential biases and delays. However, these depend on the gatekeepers' capacities and on the proximity of the farmers.

**Practical implication:** This study provides insights that support the effective and efficient organisation of information flows within certified and non-certified cooperatives. The risk of potential delays and bias posed by the two information gatekeepers who share vital information related to improving cocoa quality could be reduced by promoting collaboration among the cooperative manager, private extension officer, and certified purchasing clerk. Also, friendship ties that exist in certified networks should be strengthened to serve as potential entry points for information flows.

### ARTICLE HISTORY

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### KEYWORDS

Proximity; information flow; cocoa; certification scheme; farmer cooperative; social network

**Theoretical implications:** Utilising the concept of proximity, we offer new perspectives and a deeper understanding of the flow of information within farmer cooperatives.

**Originality/Value:** Using the SNA method and network structure, connectivity, and interactions, we analyse how proximity can be used to disseminate information within farmer cooperatives.

## 1. Introduction

Despite the constant development and promotion of third-party certification to improve environmental and socio-economic benefits, key information flows and sustainability challenges still confront smallholder farmers (Owusu-Amankwah 2015; Vigneri and Serra 2016; Ansah et al. 2020). In addition to sustainability, improved quality, and market access, the flow of information remains a major goal of certification mechanisms (Mason 2011). However, in most agricultural commodity chains, asymmetric information creates transactional friction, preventing the achievement of perfect knowledge in markets. In these chains, in situations where the perfect competition paradigm is not met, information circulates thanks to proximity (Williamson 1981). Information incompleteness and asymmetries not only affect the market and quality of marketing activities but also influence inputs (e.g. seeds, fertilisers, machinery) and production-level practices. Incomplete information can lead to the adoption and use of inefficient or harmful practices. Cooperatives and certification can improve information flows through proximity. Proximity refers to the closeness of two actors and can be broadly considered as relational and spatial/geographical (Andre Torre and Rallet 2005; Ron Boschma 2005; Baland, Boschma, and Frenken 2015). Relational proximity refers to the various ways in which actors are close, independently of a geographical relationship, while geographical proximity refers to the physical distance between two entities (André Torre and Beuret 2012). Relational proximity also, includes organisational proximity (how actors organise their relationship, the degree of autonomy and control in organisational arrangements), and institutional proximity (closeness/approximation of actors' norms, rules, and values). Relational proximity also includes cognitive proximity (closeness of actors' knowledge bases), and social proximity (extent of trust, friendship, familiarity in relationships) and can integrate other dimensions such as costs and rents (André Torre and Talbot 2018). Frequent and direct contacts have been shown to strengthen geographically proximal relations (Dubois 2018) whilst geographical proximity is often needed (to build social and shared norms). Relational and spatial proximity play a key role in understanding how actors interact in a value chain and how this contributes to information flows (Huber 2012; Knobens and Oerlemans 2006).

Cooperatives play a crucial role in access to and in the dissemination of information to their members and between members and the market. Cooperatives give their members access to information and knowledge, which reduces information asymmetry and lowers transaction costs. This gives more negotiating power in markets, and improves members' understanding and perception of various circumstances (Prager 2015; Fischer and Qaim 2012; Ferguson 2012). Certification schemes that improve access to information from certified cooperatives to members can improve their livelihoods (Jena et al. 2012;

Astrid Fenger et al. 2017). However, the exchange of information is greatly influenced by proximity (Boschma and Frenken 2011; Kabirigi et al. 2022). This has benefits, but also risks, such as an entry barrier to information, making it difficult for geographically dispersed actors to engage in situations where face-to-face interaction predominates (Klerkx, Aarts, and Leeuwis 2010; Tambo and Abdoulaye 2013; Lyon 2000; Ajwang 2020; Edelmann, Quiñones-Ruiz, and Penker 2020). The literature highlights the crucial relationship between proximity and information flows in the context of farmer cooperatives, emphasising how proximity facilitates the exchange of information and knowledge and hence enhances the decision-making process among their members (Granovetter 1973; Conley and Udry 2010).

In Africa, certification mechanisms play a crucial role in enabling farmers to access niche markets and ensure traceability in the cocoa sector, where the main buyers of cocoa are imposing stricter regulations on ethical quality, agronomic and environmental aspects such as farming practices and deforestation for reasons of sustainability. In this context, information remains crucial for farmers and cooperatives to improve their economic outcomes. Information related to standards, regulated prices, markets, and premiums shared among certification actors such as certification bodies, standard owners, farmer cooperatives, and members is invaluable for decision-making. This information can improve sustainable farm practices, and help reduce child labour, deforestation, and poverty, the main challenges to sustainability faced by the cocoa sector. Therefore, compared to transactions in other competitive business environments, the competitive climate in the certified cocoa value chain requires different and specific exchanges of information to ensure overall efficiency. In recent times, there have been increasing calls for more research into the type of information that farmers share (Danielsen et al. 2020). Codjoe et al. (2023) stressed the importance of technical, market (price, premium, and buyer) information, which is shared within cooperatives in certification, reflecting on standards, sustainability, and compliance. However, the extent to which certification mechanisms provide useful information to farmers varies depending on the certification programme concerned and its design. This requires information flows on best practices to enhance crop quality and an understanding of both market requirements and standards, the latter being crucial to access high-premium markets. Existing literature focuses on the information shared within cooperatives already involved in certification schemes, whereas not much is known about the farmers' perception of information flows that influence improvement of cocoa quality in certification schemes.

Certification schemes here refer to third-party voluntary standards that use production or trade standards, monitoring, and labelling to identify and reward products sold by producers who comply with a set of environmental and social criteria. Rainforest Alliance (RA), Fairtrade (FT), and Organic (Org) are the certification schemes currently gaining traction in Ghana's cocoa sector. Organic-Fairtrade schemes (Organic combined with the Fairtrade scheme) have become increasingly common in agricultural commodity value chains (Raynolds 2009; Blackman and Rivera 2010). To improve information transparency in cooperatives, Organic-Fairtrade aims to provide information on technical standards, fairtrade minimum price, and to pay premium prices to all members of the cooperative. The provision of this information should enable cooperatives to promote environmental sustainability and/or socio-economic change in their areas of production, enhance integration in new export markets, and improve the livelihoods of members of

the cooperative (Weber 2007; Jena and Grote 2017). While the proximity paradigm is useful for buyers and sellers in information flows and in decision-making in the context of business and marketing activities, empirical evidence of its influence on the flow of information within certified cooperatives compared with in non-certified cooperatives is limited and merits further exploration.

Hence, the question we address in this paper is: To what extent does geographical and relational proximity drive information flows within farmer networks? We sought to understand how information flows differ in a certified farmer cooperative compared to flows in a non-certified cooperative network, and to identify what type of information is necessary to support the improvement of cocoa quality. Specifically, we used proximity to understand how it drives information flows within a certified cooperative. Further, we used Social Network Analysis (SNA) (Borgatti, Everett, and Johnson 2018), which focuses on human relationships, to examine the geographical proximity (inter-relation among communities) of actors, their face-to-face interactions or inter-personal relations (relational), and information flows within and between farmer cooperatives. SNA is an effective technique for evaluating the types of information networks and information flows (seeking and sharing) within certified compared with non-certified rural cooperatives (Nyantakyi-Frimpong, Matou, and Isaac 2019).

Our findings provide useful insights into how information flows driven by proximity could be used by policymakers and certification stakeholders to develop effective and efficient information-dissemination strategies in certification mechanisms.

Information flows in a farmer network involve the sharing of advice and knowledge provided by various support actors among farmer members of the network. Providing farmers with access to relevant information, helps them make better decisions at farm level. This can influence their adoption of agricultural practices. It is therefore, essential to understand this flow to be able to identify gaps and to focus on ways to improve information exchange that can increase productivity and contribute to overall quality improvement.

Proximity and information flows play a crucial role in understanding how various types of information circulate within farmer networks, especially in improving the quality of cocoa. This is because using both concepts can contribute to the creation of an informed farmer network which, in turn, will help improve cocoa quality. The demand for high-quality and ethically produced cocoa is a key requirement not only for buyers (chocolate manufacturers and processors) but also for producers in order to access the European Union (EU)certified market. High-quality and ethically produced cocoa refers not only to the quality of the bean *per se* (flavour, bean size, and fermentation level) but also to environmental and social quality. One way of improving cocoa quality to meet buyers' changing demands in addition to the availability of funding and adherence to standards (prevention of child labour and cultivation on deforested and degraded land) is the improved flow of information (Renier et al. 2023). Thus, timely access to information on technical aspects, and on the market (buyers, prices, and premiums), helps farmers adjust their production practices to meet the quality demands of the market. Farmers 'in proximity' can therefore interact more often, which can facilitate access to relevant information and foster group learning that can improve cocoa quality.

Again, the African context, particularly that represented by the cocoa value chain, offers a unique context for exploring the 'proximity' paradigm. Applying this concept can contribute new insights by examining how both spatial and relational proximity

influences information flows in the unique context of farmer cooperatives and certification schemes, providing a fresh perspective compared to studies in other industries or regions. With different configurations of farmer networks and levels of proximity, Ghana's cocoa industry is among the most advanced in terms of certification and cooperative practices. Comparing case studies is highly relevant, hence our study focuses on certified and non-certified cooperatives. Comparing cases contributes to a nuanced understanding of how information flows can be optimised and which specific information supports quality improvement in cocoa production in both contexts. Further, it offers scalable lessons for improving information dissemination mechanisms and provides a framework for designing interventions that suit both network structures.

Our findings provide useful insights into how information flows driven by proximity could be used by policymakers and certification stakeholders to develop effective and efficient information-dissemination strategies in farmer cooperatives (non-certified and certified).

The rest of this paper are structured as follows: in Section 2 we explain the methods we used, in Section 3 we, present our results, in Section 4 we discuss the results and in Section 5, we conclude with policy implications.

## 2. Methodology

### 2.1. Study setting

The study was conducted in the Suhum Municipality in the Eastern Region of Ghana. The Region accounts for a substantial portion of Ghana's national cocoa output. In the 2019/2020 production season, it contributed 89,131 tonnes of cocoa beans out of the 770,699.44 tonnes, or 12% of national output. This makes it the fourth largest cocoa-producer region in Ghana. The Eastern Region is the origin of Organic cocoa and Fairtrade sustainability initiatives, and has been exporting to global markets since 2005 (Glin, Oosterveer, and Mol 2015). Suhum Municipality, in particular, is noted for its production of certified cocoa, where most of the experimental plots and communities of the Cocoa Research Institute of Ghana (CRIG) are located.

### 2.2. Case study

For this study, we adopted the case study method of individuals, firms, and networks developed by McCormick and Schmitz (2001, 140) to gain an in-depth understanding of proximity and information flows within farmer cooperatives. Our case study involves two cooperatives: first, a registered certified cocoa farmer cooperative hereafter referred to as a 'certified network': which is certified under the joint Organic-Fairtrade certification programme. We compared this cooperative with the second cooperative: a non-certified cooperative hereafter referred to as a 'non-certified network' which only grows conventional cocoa and is not involved in any certification programme. Organic-Fairtrade certifications have both social and environmental objectives. In recent years, the combination of Organic-Fairtrade certification has gained popularity due to its increased market potential. Thus, in the Global South, the deployment of multi-certification, for instance, the combination of Organic with Fairtrade has become more common, and Ghana's cocoa value chain is no exception (Raynolds,

Murray, and Heller 2007; Blackman and Rivera 2010). Among its objectives are advancing information transparency in cooperatives, encouraging openness and honest transactions, and improving the capacity to manage price premiums effectively. Starting with Kuapa Kokoo Farmers' Union, which obtained its Fairtrade certificate in 1995, Ghana's production of Fairtrade cocoa has increased substantially to reach 54,600 tonnes in 2013/2014 (Fairtrade International. 2015), equivalent to 6.1% of the national production. As of 2012, about 1,000 farmers in the Suhum municipality had switched to the cultivation of organic cocoa (Djokoto, Owusu, and Awunyo-Vitor 2016). Out of the 200,755 tonnes of national certified cocoa produced in the 2021/22 cropping season, the certified cooperative produced 830.31 tonnes of organic certified cocoa.

### 2.3. Data Collection

Our fieldwork was conducted July/August 2022. The mapping of farmer networks was achieved in three stages: data collection, data cleaning, and data analysis. The data collection process involved several steps: selection of farmer cooperatives among certified and non-certified cooperatives; selection of farmers, and a farmer survey which comprised interviews with 120 selected farmers.

First, to collect data for SNA and to characterise farmer networks, since we employed a case study approach, we purposively selected a certified farmer cooperative, named ABOCFA, located at Aponoapono, and Akote, a non-certified farmer cooperative located in the Akote community (Table 1). ABOCFA was purposively selected because it is certified by Organic and Fairtrade bodies while Akote has not undergone any certification. Again, both cases involve a wide range of quality improvement practices to help understand the information that drives quality in addition to different channels and actors for information dissemination. This is to facilitate the understanding of proximity and information flows. Again, Akote was chosen because it is located in a non-organic or certified cocoa zone meaning the area is not free from the intensive use of inputs and chemicals for cocoa production and the government's mass spraying activities. This makes it a good case for comparison with ABOCFA, which is a declared Organic zone free from chemical cocoa production by the Ghana Cocoa Board (regulator of the cocoa sector). ABOCFA is one of the double certification cooperatives (Organic-Fairtrade) and the largest out of the ten (10) identified Organic cooperatives in the region. With the help of AGRO-Eco, ABOCFA cooperative obtained Organic certification in 2007 and Fairtrade certification in 2011 to become the only Organic-Fairtrade cooperative in West Africa. ABOCFA has 1,063 members (274 women), 1,519 farms, total farm size of 1,514.55 hectares, and 13

**Table 1.** Distribution of villages and farmer population.

Type	Name of Cooperative	Villages/hamlets	No. of Cocoa farmers	Sample size
Certified	ABOCFA	Kokotesua	155	23
		Safrosa/Okanta	149	23
		Tei Mensah	86	14
		<b>TOTAL</b>	<b>390</b>	<b>60</b>
Non-Certified	Akote	Traio	72	29
		Kwahyia	21	8
		Kumikrom	57	23
		<b>TOTAL</b>	<b>150</b>	<b>60</b>

Source: Cocoa Health and Extension Division and Cooperative Data, 2022.



locations (villages). The production capacity of the cooperative ranges from 800 to 1,000 tonnes of certified cocoa beans per season. The cooperative holds three organic certifications: EU organic certification, USDA organic certification, and JAS certification (Japanese organic). ABOCFA area is comprised of 13 locations (villages).

Second, we chose an equal number of villages in each case. Thus three out of the five villages of Akote and three out of the 13 villages in the ABOCFA case. The villages of Akote were chosen based on the distance to Akote township, where meetings are held by the cooperative and the public extension officer. The meeting place serves as a centre of information flow. Similarly, the ABOCFA villages were chosen based on walking distance to the nearest cooperative office. Villages closer to the office and villages farther from the office were distinguished by distances of up to 10 km and more than 10 km, respectively. We systematically included villages located at varying distances (nearby and distant) to avoid selecting only villages that are close to – or farther from – the cooperative office. For the comparison, a set of farmers in the non-certified villages located 10 km from the certified villages were chosen to avoid spillover of information flows. Farmers located in the villages of the non-certified cooperative do not belong to any cooperative (hereafter referred to as non-members) plus farmers who are members. The non-members are farmers who cultivate cocoa as individual farmers, while the members are farmers who belong to the cooperative but are not engaged in any certification scheme (s) either Fairtrade, Organic, or Rainforest Alliance.

Thirdly, all 120 farmers from the six villages were selected for the farmer interviews. An equal number of 60 were randomly selected across each case: 60 farmers across the three selected villages of ABOCFA and 60 farmers across the other three villages of the Akote cooperative using the cooperative's membership list (Table 1). During the interviews with the farmers, questions were asked concerning the following general aspects: (1) farmer connections and proximity, meaning the individuals they go to when they need information on prices, technical aspects, buyers, and premiums (the latter only apply to certified farmers); (2) frequency of meeting and degree of trust in the information provided by these individuals; and (2) the quality of the information, including the type of information (price, technical aspects, buyers, and premiums) that influences cocoa quality.

## 2.4. SNA Data Analysis

Social Network Analysis (SNA) is an effective tool for examining information flows and network structures from the perspective of nodes (individual actors) and the ties, edges, or links (relationships or interactions) that connect them (Borgatti and Halgin 2011; Scott 1988). We used SNA to understand potential differences in information flows within the certified cooperative and within the non-certified cooperative, the latter is registered by the Department of Cooperatives but is not involved in any certification activities. A node is an actor in a network; in this study, it refers to each survey respondent (source) and to any person named (target) by the survey respondent (source) as having a specific connection. Nodes refer to actors such as individuals, organisations, and entities in the network. The nodes (actors) with attributes (nodal attributes) include the role of the actors e.g. member or non-member, purchasing clerk, private extension officer, chief farmer, chairman, cooperative manager, group secretary, vice chairman, and geographical location (e.g. name of town/ community/ village). A link,



also called ‘tie’ or ‘edge’ is a connection between two nodes. It refers to the relationship or interactions that connect two nodes.

We analysed four types of ties (connections) related to information flow: prices, technical information, buyers, and premiums. In this study, price refers to the farm gate price of cocoa while technical information includes information on good agronomic practices, certification standards, and certification requirements. Information related to buyers and their requirements (quality and quantity) is referred to as buyer information. Premium information is related to the payment of extra income for compliance with standards, buyer criteria, and information on markets that give farmers this extra income. Prices, technical information, buyers, and premiums were all taken into account in the certified network, however premiums were not included in the four categories of ties in the non-certified network. This is because farmers in this network do not earn a premium for the cocoa they produce. A connection is identified if there is an exchange of information. The number of information ties the actors exchange is indicated by thickness, and the type of ties is indicated by colour. Therefore, our data are binarized and undirected. We asked respondents to identify the five providers of information they considered to be the most important. As we were unable to interview most of the people mentioned by the farmers to obtain information, our network is not complete. As a result, network parameters such as degree centrality, betweenness, density, or distance could not be computed for all the data, a similar approach to that used by Ekboir, Blundo Canto, and Sette (2017). Collecting information from all these contacts would require a huge number of resources. The complete network is thus likely to be more connected than the one that is about to be mapped because the other actors are likely to work together both with farmers and among themselves. We used the data set to explore the structure, connectivity, and interactions within the network. We created a node catalogue with unique names for all the actors, IDs, and their node attributes. We also created an ‘edge list’ that defines all the relationships between nodes and links, including their tie attributes (Aguilar-Gallegos et al. 2015). Tie attributes are defined by the type of relationship (friendship, family, church member, ethnicity, and ‘unrelated’). In our study, friendship ties are defined as interpersonal relationship-based social connections that are frequently characterised by trust and support between the parties involved. Usually, they are voluntary and informal. Kinship relationships, such as those between parents, siblings, cousins, or extended family, are referred to as family ties. Ties between church members refer to the relationships formed within a religious group through involvement in religious activities. Ethnic ties are relationships between people who have a shared cultural heritage or background. Relationships that are not based on any of the established categories, such as friendship, family, ethnicity, or religion, are referred to as ‘unrelated’ ties. Finally we examined the farmers’ perception of the influence of access to information on cocoa quality improvement. Organic-Fairtrade certifications can also help improve product quality and the different types of information can affect this process. In such schemes, the technical information provided to cooperatives and members by standard owners, private and public extension officers, and other certification actors is intended to improve farmers’ knowledge of standards and agronomic practices and their ability to comply. This could improve the ability of the cooperative to provide high-quality, traceable, sustainable cocoa. Additionally, information shared about buyers on who buy their certified cocoa, how much they offer as premium, and the buyer’s requirements

of the cooperative and of its members can influence ethical quality (production that respects sustainability conditions, particularly in terms of cocoa farmers' livelihoods and decent production conditions). Limited information on the farm gate price provided by COCOBOD, the state regulator who sets the market or farmgate price for all cocoa farmers at the beginning of each cropping season makes it difficult for farmers to comply with the quality and other requirements and additionally puts them in a weak bargaining position. Information about premium prices is a key attraction for farmers to join certification schemes. Information on how much the cooperative and the members receive from their buyers for complying with a standard is invaluable for members' decision-making. This is because premiums paid to cooperatives support individual and collective services including supplying inputs, agricultural extension services, or other activities. These services help the cooperative manage and coordinate production activities while organising group sales of produce to buyers.

We conducted a comparative analysis of each network (certified and non-certified) based on all the information links. We analysed node and tie characteristics for each of the cited individuals (Aguilar Gallegos et al. 2017; Borgatti, Everett, and Johnson 2018). Node and tie attributes were used as indicators to highlight relational and geographical proximity within the certified and the non-certified network. Further we analysed egos and explored the ties among all the actors to whom these egos have a direct connection. Networks focused on individual nodes can be used to study significant aspects of the structure of a research network; these networks are hereafter referred to as 'ego networks' (Ekboir, Blundo Canto, and Sette 2017). The ego network for node *i* contains *i* and the other nodes that *i* is connected to (*i*'s neighbours). It is possible to define as many ego networks as there are nodes in the network. The 'egos' in the network studied here are the key resource people to approach for information (identified as those who are most connected) in the networks. In this study, ego networks were analysed using the first step neighbourhood from the central actors. This is because we were interested in identifying the actors in the neighbourhood of our central actors who can provide other network participants with information. The choice of neighbourhood by the researcher depends on the focus of his /her study. The study of the ego network is important as one of the indicators under the relational component of proximity. Thus, as a further analysis to understanding the relational component of proximity, its use is necessary not only to identify key individuals who serve as primary sources or gatekeepers of information but also to highlight how personal relationships (relational proximity) influence information dissemination. This can inform strategies to improve communication and adoption of practices within farmer networks. We used Gephi® 0.9, an open-source software to map the information networks.

### 3. Results

We have structured our results based on the components of the geographical and relational proximity the study addressed as well as on the types of information needed to improve cocoa quality. We begin by comparing the structure of the certified and non-certified networks, and then present our findings based on geographical inter-community relations, relational proximity, and finally, the farmer's perception of the types of information that influence quality.

### 3.1. Structure of the certified and non-certified networks

Network structure analysis revealed no difference in the number of nodes in the two networks but more links in the non-certified network (Table 2).

Again, farmers, some of whom are members and some are not members of the cooperatives, represent the majority of actors in the two networks (86% of the certified cooperative, and 91% of the non-certified cooperative). But our results indicate somewhat more diversity concerning extension service providers, i.e. a slightly higher percentage of private extension officers in the certified network (2%) and public extension officers (0.7%) compared to public extension officers (2.5%) and no private extension officers in the non-certified network. Similarly, our results show more links in the non-certified network than in the certified network.

#### 3.1.1. Main actors in the structure of the certified and non-certified network

Our results show that the cooperative manager, the private extension officer, and the certified purchasing clerk are the main information actors in the certified network, while the public extension officer plays this role in the non-certified network. The structure further demonstrates the actors' role in the type of information shared and incentives for the dissemination of information (Table 3). According to the COCOBOD regulation, cooperatives can aggregate certified beans for their external buyers by entering into trading agreements with Licenced Buying Companies (LBCs), who are represented at the community level by purchasing clerks. In contrast to non-certified networks, the regulations enable members of the cooperative to sell exclusively to purchasing clerks employed by contracted LBC, guaranteeing that the appropriate volumes are recorded for the appropriate premium payment (Figure 1).

### 3.2. Geographical proximity and inter-community relations

In both networks, the main actors disseminate price, technical, buyer, and premium information among communities (geographical proximity). Results based on the structure of the geographical network revealed eight geographical (communities) locations of the actors in the non-certified network: Nankese, Traio, Kwahyia, Kumikrom Akote, Amanhyia, Gyato, Akrabo, compared to four geographical locations: Tei Mensah, Safrosa, Kokotesua, and Suhum in the certified network (Figures 2(a) and 3(a)). The structure further illustrates the fact that communities in certified networks are further apart in terms of distance in kilometres (km) than communities in non-certified networks. Compared to non-certified communities, the roads leading to these certified communities are not motorable. When walking, the average distance is 5 km, while the average distance covered commuting between non-certified communities 2.5 km. Again, the network structure reveals two new information gatekeepers in the

**Table 2.** Nodes and links in the networks.

Network	Nodes	Links
Certified	153	274
Non-certified	158	307

Source: Field data, 2022.

**Table 3.** Main actors and information shared in certified and non-certified networks.

Main Actors of Information Flow	Actor-network	The type of Information the Actor provides	To whom the Actor provides the Information	Role of the Actor	Incentive to provide a giventype of information	Mode of Information dissemination
Cooperative Manager	Certified	Premium, Buyer, Technical	Cooperative farmers and External buyers	Manages the operations and serves as the main link between farmers and external entities	To Streamline information and ensure commitment to certification standards and the welfare of farmers	Annual General Meetings, Training Workshop,
Private extension Officer	Certified	Technical information, Prices	Cooperative farmers	Provides specialised technical advice and support to certified farmers	Commitment to compliance with certification and to improve sustainable agricultural practices, productivity, and sustainable cocoa production	Farm visits, Training Workshops, by phone
Public Extension Officer	Non-certified	Technical information, Prices	Certified and non-certified farmers	Provides general technical advice and support to all farmers (certified and non-certified)	Commitment to good agricultural practices, productivity, and sustainability of the cocoa sector	Farmer rallies, Training Workshop, Farmer Business Schools, by phone
Purchasing clerk	Certified	Prices, premiums and buyers, Technical information	Certified farmers	First point of contact for farmers at the community level on quality of cocoa, price, markets, and certification benefits	Commitment to quality of cocoa produced, farmers' knowledge of the farmgate price of cocoa, and benefits of certification	Via phone, one-on-one contact
Purchasing clerk	Non-Certified	Prices and technical information	Certified farmers	First point of call on farm gate prices	Commitment to getting more volumes of cocoa purchased	One-on-one contact

Source: Authors, constructed from field visits and survey in 2023.

certified network: the cooperative manager and private extension officer who form the information link between geographically separate communities (Figure 2(a) and (b)). Furthermore, the network structure illustrates the absence of any interaction in these types of information ties between spatially separate individuals in the certified network. Results of the ego network show that in the neighbourhood (in network terms) of the cooperative manager (Ego 1) and the private extension officer (Ego 2),

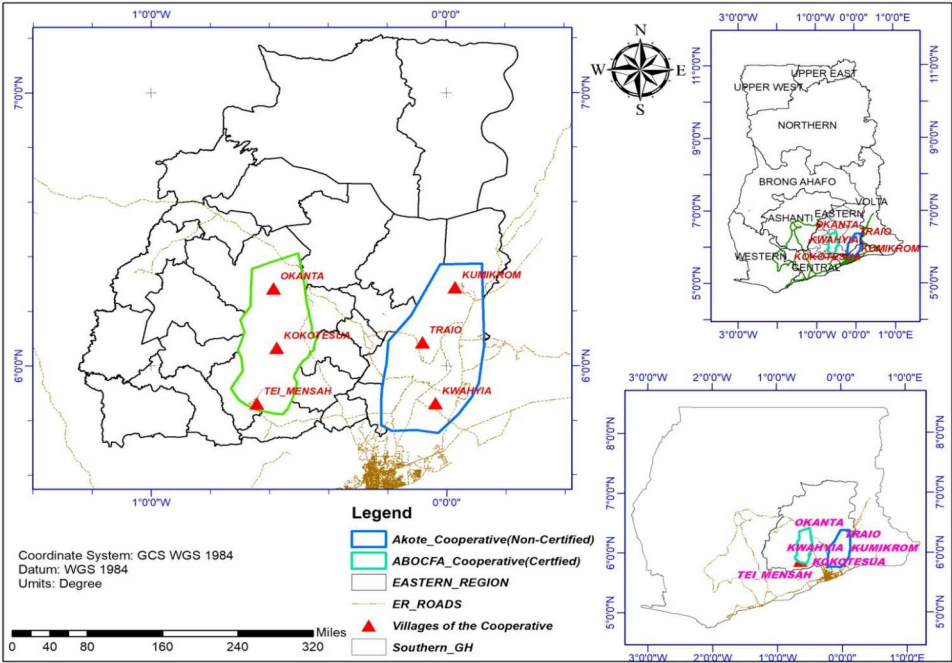


Figure 1. Map of the study area.

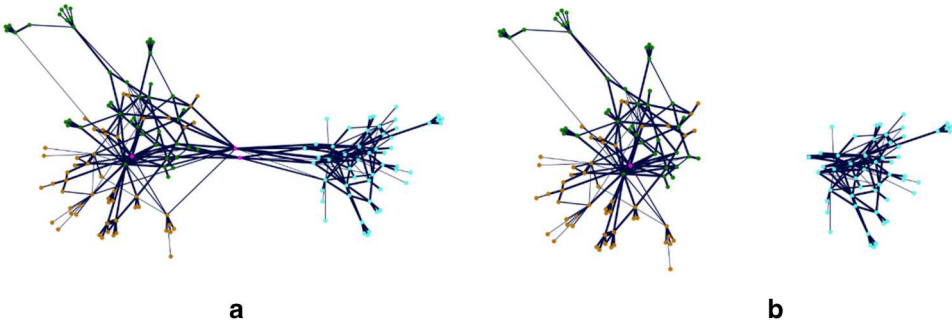
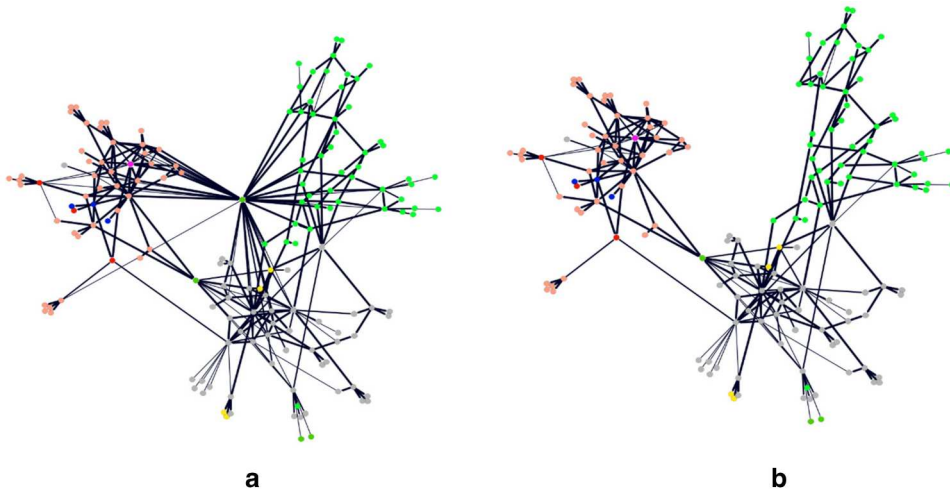


Figure 2. (a) Certified Network including the Cooperative Manager and Private Extension Officer (two information gatekeepers). (b) Certified Network without the Cooperative Manager and Private Extension Officer (two information gatekeepers). Notes: The colour of the node represents the geographical location of the actors: light blue = Tei Mensah, brown = Safrosa, green = Kokotesua, and pink = Suhum. The two pink nodes in the central position of the network represent the geographical location of the cooperative manager and the private extension officer as depicted in Figure 4(a). The thicker and darker the edges, the more the types of information received come from a single node.

there are no alternative routes to enable the spread of information to the entire network (Figure 6(a) and (b), see appendix).

On the other hand, the network structure shows that the public extension officer is a key information broker connecting three communities, whose removal would represent a risk to information dissemination in the geographically dispersed communities (Figure



**Figure 3.** (a) Certified Network including an information broker (Public Extension Officer). (b) Certified network with no information broker (Public Extension Officer). Notes: The colour of the node represents the geographical location of the actors in the non-certified network: Green = Nankese, Grey = Traio, Rose = Kwahyia, light green = Kumikrom, Yellow = Akote, Red = Amanhyia, Blue = Gyato, Pink = Akrabo. The single node in the central position of the network represents the geographical location of the public extension officer as depicted in Figure 4(b). The thicker and darker the edges, the more the types of information received come from a single node.

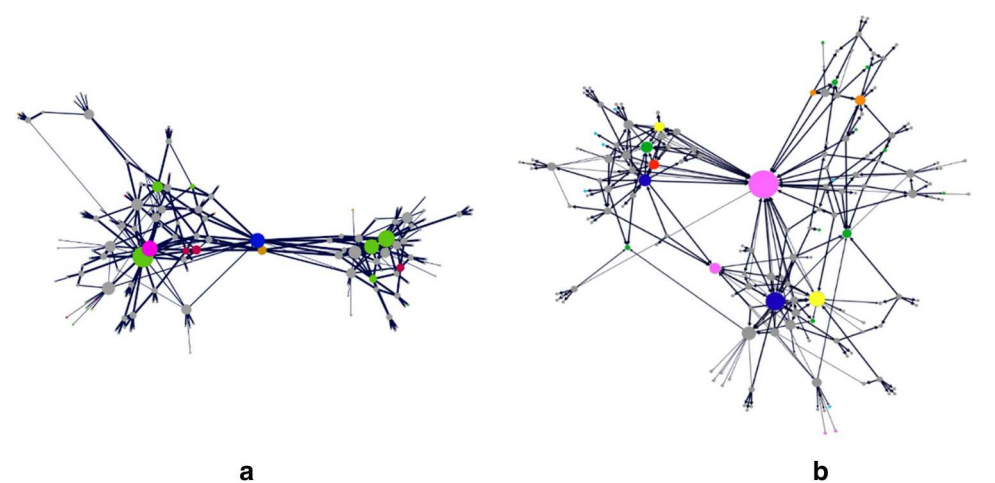
3(b)). The geographical structure of the network further illustrates the fact that there are more inter-spatial connections and exchanges in the non-certified than in the certified network Figure 3(a). Again, the results of the ego network show that in the neighbourhood of the public extension officer (Ego 3), more alternative routes exist for the spread of information to the entire network (Figure 6(b), see appendix).

### 3.3. Relational Proximity

#### 3.3.1. Network Relational Connections

The size of the nodes in Figure 4(a) and (b) identifies the most connected actors, which, in the certified network, also indicates the extent of interactions and relationships with other farmers and stakeholders within the network, i.e. the purchasing clerk, the cooperative manager, and the public extension officer. In the non-certified network, the public extension officer, the chairman of the farmer group, and the vice-chairman are the most connected actors. While the purchasing clerk is the most connected actor (20 connections) in the certified network, the public extension officer has even more connections (37 connections) in the non-certified network. In both networks, more particularly in the certified network, the network structure illustrates the role played by purchasing clerks (PCs) in disseminating information to members within the cooperative set-up (Figure 4(a)). In the certified network, the purchasing clerk shares technical information, and information concerning buyers, prices, and premiums with farmers, whereas in the non-certified network, the purchasing clerk shares only technical information and information on prices. Additionally, farmers organised in groups are more closely connected to the purchasing clerks, alongside extensionists and cooperative staff (managers), in both networks (Figure 4(a)).





**Figure 4.** (a) Connections and role of actors (certified network). Notes: The size of the node indicates the number of connections. The most connected nodes are bigger. The nodes are colour-coded to represent the role of actors, as follows: pink = public extension officer, light brown = private coop ext officer, wine = hamlet field coach, green = purchasing clerk, grey = member farmers, blue = cooperative manager. (b) Connections and role of actors (non-certified network). Notes: The size of the node indicates the number of connections. The most connected nodes are bigger. The nodes are colour-coded to represent the role of actors, as follows: pink = Public extension officer, light blue = non-member, red = group secretary, green = purchasing clerk, grey = member, blue = group chairman, orange = chief farmer, yellow = group vice chairman.

Again, we found no major difference between the certified and non-certified networks in terms of the information that is shared (Table 4). Apart from information concerning premiums which is only shared within the certified network, price, technical and buyer information is shared in both networks., The majority (67%) of farmers go to the same individual/actor for all 4 types of information (prices, technical information, buyers, and premiums) in the certified network. Others source 1, 2 or 3 type(s) of information from the same actor (Table 4). Similarly in the non-certified network, 70% go to the same individual for all 3 types of information (prices, technical information, buyers) while others source 1 or 2 type(s) of information from the same actor (Table 5). In both networks, trust appears to play a significant role in explaining why most farmers rely on one person as their sole source of all types of information. Most farmers (95% in the certified and 92% in the non-certified network) say they have a high level of trust in the information shared by their contacts.

**Table 4.** Percentage distribution showing whether all information is sourced from one person or not.

No° of types of information sourced	Percentage of farmers who source the information from a single person (Certified)	Percentage of farmers who source the information from a single person (non-certified)
4	(184) 67%	
3	(31) 11%	(216) 70%
2	(27) 10%	(48) 16%
1	(32) 12%	(43) 14%
<b>Total</b>	<b>(274) 100%</b>	<b>(307) 100%</b>

Source: Field data, 2022.



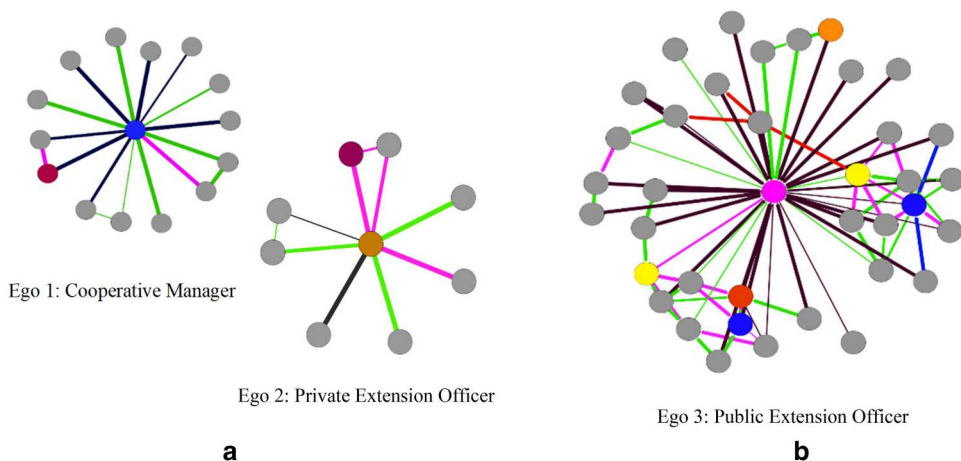
**Table 5.** Distribution of the diversity of inter-personal relations (relational proximity).

Name of tie	Certified	Non-certified
Friendship	(136) 50%	(121) 39%
Family	(93) 34%	(104) 34%
Ethnic	(5) 2%	(8) 3%
Unrelated	(13) 13%	(64) 21%
Church member	(4) 1%	(10) 3%
<b>Total</b>	<b>(274) 100%</b>	<b>(307) 100%</b>

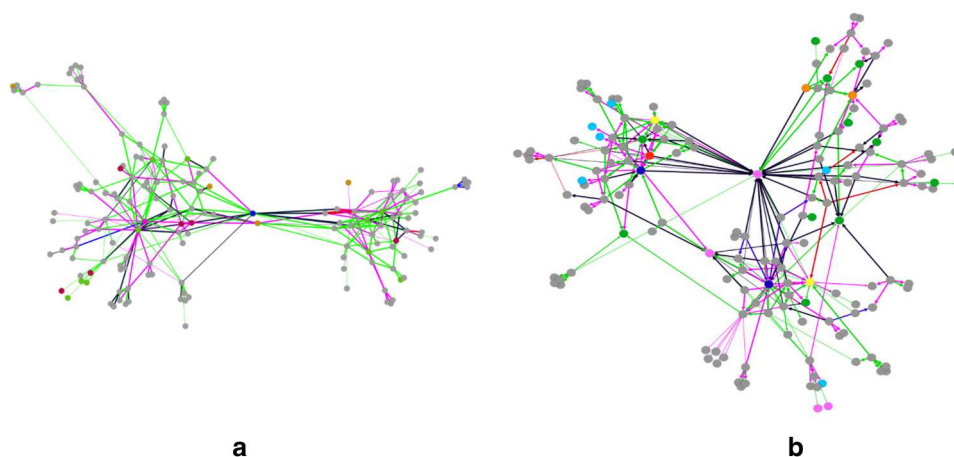
Source: Field data, 2022.

### 3.3.2. Diversity of inter-personal relations

Our results show that in both networks, information is shared through a wide range of interpersonal relations: friendship, ethnicity, family, and church. In most cases, the farmers rarely move outside their geographical space to look for information, and thus rely on these forms of relational proximity. Our results further indicate that while information flows through relational proximity in both networks, friendship seems to be more important in the certified network (50% certified, 39% non-certified) (Table 5). Friendship and family ties are network interactions that are more diffuse in both networks (Figure 5(a) and (b)). However, friendship is more intense in the certified network than in the non-certified network. What is more, the network shows that the farmers are arranged in smaller groups (Figure 5(a), see appendix). Our field findings indicate that members of the certified cooperative, initially connected through family and friendship ties established during its formation and sensitisation stage, benefit from stronger



**Figure 5.** (a) Ties in the certified network. Notes: The nodes are colour-coded to represent the role of actors, as follows: pink = Public extension officer, light brown = Private Coop Ext Officer, wine = hamlet field coach, green = purchasing clerk, grey = member farmers, blue = Coop Manager and the edges are coloured to indicate kinship as follows: red = church member, blue = ethnic, green = friendship, pink = family ties, black = unrelated. (b) Ties in the non-certified networks. Notes: The nodes are colour-coded to represent the role of actors, as follows: pink = Public extension officer, light blue = non-member, red = group secretary, green = purchasing clerk, grey = member, blue = group chairman, orange = chief farmer, yellow = group vice chairman and the edges are colour to indicate kinship as follows: red = church member, blue = ethnic, green = friendship, pink = family ties, black = unrelated.



**Figure 6.** (a) Ego Networks of information gatekeepers (certified network). Notes: Node colour represents the role of the actor as follows pink = public extension officer, light brown = Private Coop Ext Officer, wine = hamlet field coach, green = purchasing clerk, grey = member farmers, blue = Coop Manager. Ego 1 (cooperative Manager, blue node colour) and Ego 2 (private extension officer, light brown node colour). Edges are coloured to indicate diversity of relation as follows: red = church member, blue = ethnic, green = friendship, pink = family ties, black = unrelated. (b) Ego network of information broker (non-certified network). Notes: Node colour represent role of actor as follows pink = public extension officer, light blue = non – member, red = group secretary, green = purchasing clerk, grey = member, blue = group chairman, orange = chief farmer, yellow = group vice chairman. Ego 3 (public extension officer, pink node colour: central actor of interest). Edges are coloured to indicate kinship as follows: red = church member, blue = ethnic, green = friendship, pink = family ties, black = unrelated.

networks. Through training, capacity-building initiatives, and collective action, established family and friendship ties have been reinforced, fostering greater support, resource-sharing, and knowledge exchange among farmers. In contrast, non-certified cooperatives provide minimal and unstructured capacity-building, resulting in weaker social ties and limited opportunities to strengthen networks.

Again, the ego network reveals that the public extension officer has more unrelated ties with neighbours (38 nodes, 93 ties) than the private cooperative extension officer (9 nodes, 10 ties) Figure 6(a) and (b) (see appendix).

### 3.4. Farmers' perception of the influence of the type of information on cocoa quality

Certified farmers perceive that cocoa quality is driven by technical, buyer, and premium information while non-certified farmers only perceive the role of technical information as a support for improvement of their cocoa quality (Table 6). Farmers' perceptions show that they use the information they obtain concerning buyers to understand the buyers' requirements (quality and quantity) in order to modify their operations and improve cocoa quality (Table 7). Information gathered from the cooperative manager suggests that the direct relationship with buyers including chocolate manufacturers and processors, helps provide members with detailed feedback on the quality of their cocoa

**Table 6.** Perceived influence of the type of information on cocoa quality.

Type of Information	Extremely Influential		Very Influential		Somewhat Influential		Slightly Influential		Not Influential at all	
	Certified (%)	Non-Certified (%)	Certified (%)	Non-Certified (%)	Certified (%)	Non-Certified (%)	Certified (%)	Non-Certified (%)	Certified (%)	Non-Certified (%)
Price	53.3	40	20	26.7	13.3	20	13.3	0	0	13.3
Technical	66.7	46.7	26.7	26.7	6.7	20	0	6.7	0	0
Buyer	66.7	40	33.3	13.3	6.7	33.3	6.7	13.3	0	0
Premium	66.7		13.3		20		0		0	

**Table 7.** Comparison of information flows and decision-making processes in certified and non-certified cooperatives.

Type of information	Content	Source	Dissemination mechanisms	Channel	Upfront investment	Expected results	Certified	Non-Certified
Technical	GAPs (weeding, pruning, spraying, harvesting, fermentation)	Private and public extension officers, certified and non-certified purchasing clerks and cooperative managers	Training, capacity building workshops, regular meetings, farmer business schools	Oral, flyers, by phone	Yes	Improved production practices and cocoa quality	x	x
	Certification standard (buffer creation, child labour issues) and requirements (cost of certification renewal, auditing, etc)	Private extension officer, Cooperative manager	Capacity building workshops, farmer business schools	Oral	Yes	Improved production practices and cocoa quality	x	
Buyer	Buyer at the market	Cooperative manager, certified purchasing clerk	General Meeting	Oral	Yes	Improved cocoa quality and access to better buyers	x	
Price	Requirement of buyers (quality and quantity)	Cooperative manager, certified purchasing clerk	General Meetings	Oral	Yes		x	
	Farm gate of cocoa	Certified and non-certified purchasing clerks, farmers, private and public extension officers	Farm visits, Training,	One-on-one contacts radio, TV, via phone	No	Get a fixed price for cocoa beans	x	x
Premium	Premium markets	Cooperative manager and certified purchasing clerk	General meetings	Oral, phone, and visits	No	Get higher premium prices for quality cocoa	x	

Source: the Authors (constructed from field visits and survey in 2023).

Note: GAPs: good agricultural practices.

they require to be able to improve it. This feedback includes information on bean attributes such as size, flavour, fermentation, contamination levels, and ethical issues such as cocoa produced from deforested lands and child labour..

### *3.4.1. Mechanisms of information flows and decision-making in certified and non-certified cooperatives that support cocoa quality improvement*

Based on the structure of certified and non-certified networks, the key sources of technical information, and information concerning buyers, premiums, and prices in our study area are cooperative managers, private and public extension officers, and purchasing clerks (Table 3). In the certified network, farmers obtain this information through a variety of dissemination mechanisms and channels compared to the non-certified network, which has limited mechanisms and channels. Farmers access information directly through cooperative activities such as training, capacity-building workshops, and regular and general meetings (Table 4). The information obtained from these major actors encourages individual farmers to invest in inputs and labour, and to adjust their production practices to enhance cocoa quality and be able to access a high-premium market. In the non-certified cooperative, technical information and information on prices helps farmers make decisions to achieve the desired cocoa quality and to secure fixed farm gate prices.

## **4. Discussion**

This paper deepens existing insights into the extent to which geographical and relational proximity drive information flows within farmer cooperatives. To understand the flow of information through a comparison of certified and non-certified cooperative networks, we used two key proximity concepts: geographical and relational proximity. Our starting hypothesis was that farmers' cooperative networks can effectively address information asymmetry and foster improvements and innovations by using the two dimensions of proximity to transfer knowledge and practices to members of the cooperatives and to other actors. Thus, geographically close farms can encourage the creation of farming communities that can support one another within the cooperative, while strong relational proximity can enhance cooperative governance and member commitment by fostering a sense of community, mutual support, and collective decision-making. This in turn, can increase the sharing of information on, for example, market prices (prices and premiums), quality standards (technical information), and buyer requirements (buyer information) from farmers to the cooperative management, from the cooperative to buyers, and the other way around. Using varied distances (both close to and farther from the cooperative office) as a selection criterion enhances generalizability of findings and reveals the effectiveness of information flow within the farmer network. This is because varied distances extends beyond members who live close to the cooperative, which advances the objective of analysing information flow and proximity. Our main research question was: To what extent does geographical and relational proximity drive information flow in farmer networks? How different are information flows within a certified farmer cooperative network and in a non-certified production network, plus what information is needed to improve cocoa quality? The findings

provide three key points of discussion for the effective and efficient organisation of information within certified networks.

First, findings based on the components of proximity we examined show that concerning geographical proximity, certification involves two information gatekeepers: private extension officers and cooperative managers. These actors are not present in non-certified networks except in certification schemes in which the presence of a cooperative manager for better administration of the cooperative is a legal requirement. Again, for specific information needs such as better information flows on best practices and compliance with standards, the private extension officer's role becomes critical compared to that of the public extension officer, who provides general information on agronomy to all farmers. These results underline the specific importance of geographical proximity, where inter-community relations with members and the existence of these two information gatekeepers can increase the number of communities that can be reached with information. Additionally, it implies a centralised network which involves both advantages and risks. A network set-up of this kind can help create streamlined and efficient channels of information exchange for faster decision-making within the cooperative. On the other hand, over-reliance on this kind of network configuration poses a risk to the overall effectiveness of information flows due to potential bias and delays in information dissemination. The risky nature of these information gatekeepers is linked to the frequency and variety of information they provide to farmers and how critical the information is for farmers in making decisions that help improve cocoa quality (Table 7). Again, the information we gathered suggests that, in line with Fairtrade standards for improving transparency and increasing the participation of producers, the aim of the certified cooperative strategy is to provide members with access to all necessary information. To this end, the cooperative organises workshops and training sessions for all of its members, as well as between one and three sessions per year for their group of farmers at the different geographical locations within the area covered by the cooperative. However, the approach to information dissemination applied by the certified cooperative is not effective since most farmers have only limited access to the information they need at the appropriate time to make the best production decisions. Similarly, in the non-certified network, the role of the public extension officer in information dissemination to farmers is recognised, despite logistical challenges, such as limited access to motorbikes, which also hinder their effectiveness. The capacity of individual farmers to make use of information is extremely heterogeneous even among extension service professionals. For the efficient organisation of information flows within certified networks, the collaboration of private and public extension support systems is the key to provision of quality information to improve farmers' decision-making. According to Baah (2009), Ghanaian cocoa farmers already pay for extension services through the taxes deducted by the government on the cocoa beans purchased. This gives credence to the supporting role of COCOBOD in the provision of extension support services to all cocoa farmers in Ghana. Public sector extension such as COCOBOD's have contributed to the growth of rural cocoa-growing communities and the agricultural sector despite the challenge posed by resource constraints, increasing expenses, and shifting views on the role of government in extension services. They improve farmers' abilities, help spread information and technology, and encourage changes in farmers' perspectives (Khan et al. 2012).

Based on the network structure, information flows through relational proximity in both networks. Friendship ties play a critical role in the dissemination of information within farmer networks, acting as key channels for sharing information related to good agricultural practices, child labour, premium payments and markets. Farmers rely on friendship ties in informal and accessible ways that formal extension services may not provide (Conley and Udry 2010). Through friendship ties, farmers mentor their peers, thereby promoting the flow of information and knowledge transfer. Friendship plays a mediating role in maximising the benefits of information flows by enhancing trust, relevance, and accessibility within farmer networks (Konda and Konda 2021). Trust is crucial for knowledge sharing, as farmers are more inclined to use knowledge from reputable sources (Fisher 2013). In the certified network, the issue of trust is particularly crucial as it encourages farmers to participate in cooperative arrangements (Takacs et al. 2013). This strengthens friendship ties in the certified network and is a potential entry point for information flows.

Second, the purchasing clerk in the certified network disseminates more diverse types of information than the cooperative manager and the extension officer in both networks. Results based on the main actors and the information shared indicate that, despite operating in a non-certified network, purchasing clerks do share their knowledge of certification requirements and benefits with certified farmers. Through their interactions with both certified and non-certified actors, they share information on farm gate prices, post-harvest handling, fermentation, and drying practices that enhance cocoa quality.

These results are in agreement with those of Baah et al. (2012) who found that the purchasing clerk is responsible for a range of tasks, from buying cocoa to providing technical information and financial support to cocoa growers. Other authors have found that farmers are more likely to trade and exchange information with purchasing clerks when they are motivated by incentives such as loans or supplies of agro-inputs (Poku and Lamptey 2015). The highly competitive local domestic market (Vigneri et al. 2009) and the distance between the purchasing clerk and the cocoa farmer account for the information exchange and trading interactions with the purchasing clerk (John-Eudes et al. 2021). Again, between the purchasing clerk and the two information gatekeepers in the certified network, the incentives for sharing information with farmers are similar, i.e. geared towards farmers' commitment to the production of quality cocoa, knowledge of the farm gate price, and the benefits of certification. By design, the purchasing clerks work more closely with farmers in the community than the two information gatekeepers. This calls for improved collaboration between the purchasing clerk, the cooperative manager, and the private extension officer.

Third, based on farmers' perceptions, certified farmers use technical, buyer, and premium information to improve the quality of their cocoa, suggesting that access to this information enables them to make production decisions that can help improve cocoa quality. This can help achieve the objectives of certification, which include enhanced quality, market access, and sustainability.

The application of the specialised technical information which certified farmers obtain from the private extension officer can enable members of the cooperative to improve on good agricultural practices (GAPs) that can both increase their yield and improve cocoa quality. Again, with technical information on certification requirements such as



avoidance of child labour, etc., technical information can contribute to ethical quality, i.e. sustainable production, particularly in terms of cocoa farmers' livelihoods and decent production conditions.

Certification programmes often offer premium prices for higher quality or sustainably produced cocoa. Again based on farmers' perceptions, they use the information they obtain concerning premiums to invest in inputs, in better farming and ethical practices, such as organic fertilisers, no use of child labour, manual weeding, creation of buffer zones, and shade trees to enhance cocoa quality. In particular, this result aligns with that of Abate et al. (2021), who found that, when quality price premiums are applied, producers respond by enhancing quality.

In the non-certified network, farmers perceive that applying the technical information concerning good agricultural practices, such as pest and disease management, pruning, regular harvesting, drying, and fermentation, provided by the public extension officer allows decisions to be taken that can influence cocoa quality (Table 7). This result aligns with that of Aniagyei et al. (2024) who found that agricultural extension support services contribute positively to cocoa quality and also corroborates the results obtained by Suh et al. (2020), who found a positive and significant effect of the provision of technical information such as good agricultural practices and good post-harvest handling on cocoa quality. This gives further credence to the quality-enhancing role of technical information in non-certified networks.

Farmers' perceptions further suggest that the availability and quality of information provided by public extension officers is lower than that of the information provided by private extension officers. Within the cooperative information network set-up, more trust is placed in the private extension officers, which, in turn, accounts for farmers' perception that technical, buyer, and premium information concerning cocoa quality has less influence than in the non-certified network. This is not surprising, particularly given that public extension agents' ability to disseminate information may be hampered by the number of operational areas targeted, their proximity to many cocoa farmers who live in deprived communities with poor road networks coupled with lack of proper means of transportation. However, this is not typical of the technical officers employed by cooperatives. This result supports those of earlier studies which underscored the contribution of private extension initiatives to increasing Ghana's sustainable cocoa production and income (Attipoe et al. 2021). It further underscores the fact that improving the quality of cocoa in certification programmes requires strong policies in the private extension support sector.

To the best of our knowledge, this is the first study to examine how proximity drives information flows within farmer cooperatives. The findings are those of a case study of a cocoa farmer cooperative engaged in Organic-Fairtrade bi-certification. For this reason, our results cannot be extrapolated to certification in general. However, in the African context, it will be useful to question what is happening to other cash crops, such as coffee, shea, oil palm, cashew, tea, which rely more on certification and oncooperatives for product marketing and improved value chain sustainability. More research is needed to understand different information flows in certified and non-certified cooperatives, with a focus on the factors that influence access to flows of information concerning certification. To this end, research that combines an econometric approach with quantitative social network analysis based on a complete network will be insightful.

## 5. Conclusion and policy implications

This study used comparative analysis of a certified cocoa farmer cooperative and a non-certified farmer cooperative in the Suhum municipality in Ghana to understand whether proximity influences information flows within certified networks. Our results lead us to conclude that proximity facilitates information flows within farmer networks in certification networks. Apart from proximity, which appears to be the second-best solution in a situation where the perfect competition paradigm is not met, certification does not appear to aid in the flow of information. Our findings could prove useful to support the effective and efficient organisation of information in certified cooperatives.

This study has important policy implications. The roles of the cooperative officer and the private extension officer remain crucial in transforming Ghana's cocoa sector, in addressing key policy issues, reducing information asymmetry, and enhancing the quality and sustainability of cocoa production. In Ghana's cocoa sector, power asymmetries exist due to the lack of access to relevant agricultural information. Although cocoa quality is important for stakeholders in the cocoa industry, information asymmetry issues hinder communication between them and may even lead farmers to avoid using recommended practices and standards. Asymmetry in information issues in the cocoa sector include farmers' lack of accurate information on cocoa prices (at the farm gate and on the world market), and a gap in their understanding of quality standards compared to buyers' expectations. Farmers are also not fully aware of critical standards such as those related to child labour and the need to use recommended inputs to enable certification auditors to check compliance. Additional asymmetry issues involve limited knowledge of optimal farming practices and access to credit, as well as buyers' and purchasing clerks' exploitation of farmers' lack of information to get them to accept lower purchase prices.

First, the cooperative manager's and the private extension officer's role in information dissemination, which is performed annually and orally, should be strengthened to enable more frequent and regular dissemination, as they are the gatekeepers of buyer, premium, and technical information which drives cocoa quality. This is because absenteeism at the annual general meetings and training sessions means information may not be reaching all members. The cooperative manager can play a key role in addressing information asymmetry by negotiating collective contracts, informing members of the cooperative about premium markets, and facilitating access to reliable financing and quality inputs. Similarly, a private extension officer can collaborate with the cooperative to organise knowledge-sharing sessions on market requirements and educate farmers on best agronomic practices, sustainability certification processes, and the use of inputs like fertilisers, thereby reducing these information gaps and member farmers' information asymmetry. Furthermore, to the extent that increasing participation is an important goal for policymakers and certification actors, reducing imperfect knowledge through regular meetings, workshops, and information campaigns may prove an effective strategy that should also be encouraged at the level of the cooperatives.

Again, as gatekeepers, the cooperative manager and the private extension officer are responsible for providing technical, buyer, and market information. This includes details on buyers' quality and quantity requirements as well as certification standards

such as ensuring no child labour has been used. By strengthening their role through capacity building on this aspect of information, member cooperatives and the cocoa industry as a whole can address important policy issues related to child labour and poor (ethical) quality cocoa. However, improving cocoa quality should be supported by upfront investment in inputs and practices. This underlines the need to support and strengthen certified farmer cooperatives in Ghana's cocoa sector to enable them to adequately meet their obligation to disseminate information to their members.

Second, the collaboration between cooperative managers, private extension agents, and purchasing clerks is crucial for effective and efficient information dissemination in cocoa certification schemes in Ghana. This is because each actor plays a distinct yet inter-dependent role in ensuring that information about certification standards, practices, and benefits reaches farmers. The role of the purchasing clerk in the certified network could be supported through training and workshops to disseminate relevant information on certification, thereby reducing the risks associated with both gatekeepers in a centralised certified network. Similarly, collaboration between private and public extension should be promoted and strengthened to address information asymmetry in Ghana's cocoa sector. This approach can bridge the gap between farmers' understanding of quality standards and buyer expectations, while also improving the farmers' knowledge of optimal farming practices and access to credit.

Third, relationships based on friendship within cooperatives can be used by cooperative managers and private extension officers to promote and enforce certification standards. In practice, this means that farmers should be encouraged to communicate with their farmer friends about the standards. However, cooperatives should not be used to 'oblige farmers to become friends' as trust issues could arise. However, farmer cooperatives can leverage existing friendship networks or ties within the cooperative and engage key influencers to act as information champions. These influencers can leverage their friendships to spread information more effectively and encourage wider adoption of new practices. By establishing peer learning groups and mentorship programmes, the cooperative becomes a learning environment where experienced farmers, who are either friends or can become friends, mentor less experienced farmers. This could be an entry point for information dissemination as a result of established trust. Also, the owners of cooperative and certification schemes can enhance interaction between farmers by designing interactive and participatory training sessions during capacity-building activities. The use of group activities, discussions, and role-plays that require farmers to work together could improve and deepen existing friendship networks that can facilitate information dissemination within a farmer cooperative network.

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