

COMMUNICATION NETWORK ANALYSIS AT THE MANDAILING JAYA COFFEE COOPERATIVE IN ULU PUNGKUT DISTRICT, MANDAILING NATAL REGENCY, NORTH SUMATRA PROVINCE

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Abstract. Communication problems often occur in organizational groups. This is the case with the Mandailing Jaya Coffee Cooperative, which has experienced communication issues within the organization. These problems have resulted in the accumulation of members' production and harvest yields in the cooperative's warehouse. The situation is due to the lack of interaction between cooperative members and the management during member meetings for disseminating information about proper coffee harvesting methods and good coffee harvest criteria. Therefore, this study aims to analyze the communication network of the Mandailing Jaya Coffee Cooperative in Ulu Pungkut District, Mandailing Natal Regency. The method used in this research is a descriptive quantitative method, employing snowball sampling with 118 respondents from four farmer groups affiliated with the cooperative. Data were collected through direct interviews and analyzed using communication network analysis with the Ucinet-Draw application. The results show that the communication network structure of the Mandailing Jaya Coffee Cooperative follows an all-channel structure characterized as a radial personal network. Network centrality identifies the roles of actors in the network, namely the gatekeeper (the cooperative chairman) actor SL, the opinion leader (a cooperative member) actor ISM, and the bridge (a cooperative manager) actor IK within the communication network of the Mandailing Jaya Coffee Cooperative.

Keywords: communication network; cooperative; network centrality

I. INTRODUCTION

The Mandailing Jaya Coffee Cooperative in Ulu Pungkut District, Mandailing Natal Regency, North Sumatra Province, faces significant communication problems that directly affect the smooth distribution of coffee harvests [1]. The failure to meet quality standards in line with market demands is caused by a lack of interaction and communication between members and the management, particularly in member meeting forums [2], [3]. This situation results in crucial information regarding harvest criteria not being evenly conveyed to all members, causing part of the harvest to fall short of quality standards and ultimately pile up in the warehouse. Such issues not only disrupt the supply chain but also lead to economic losses for the cooperative and the farmers involved, as well as reduce the competitiveness of the products in an increasingly competitive market [4], [5], [6].

The literature shows that communication effectiveness in agricultural cooperatives is a key factor influencing organizational success, including marketing performance and collective decision-making [7], [8], [9], [10]. Communication network analysis theory asserts that a well-structured network can facilitate the even and rapid flow of information among

members of an organization, as well as minimize communication barriers [11], [12]. However, in practice, many cooperatives encounter communication problems due to the absence of systematic mechanisms to ensure that strategic information is accessible to all members, resulting in persistent information gaps. This indicates that although theory has identified the crucial role of communication networks, their practical application in the field is often not optimal in addressing problems such as those faced by the Mandailing Jaya Coffee Cooperative.

This study aims to analyze the structure of the communication network formed within the Mandailing Jaya Coffee Cooperative, focusing on patterns of interaction between members and the management, as well as identifying actors who play central roles in disseminating information. In addition, the research seeks to understand the strategic roles of key actors such as gatekeepers, opinion leaders, and bridges in supporting the smooth flow of internal communication within the cooperative [13], [14]. Through accurate communication network mapping, it is expected that strategies can be formulated to improve the effectiveness of internal communication, which in turn can enhance the

distribution of information related to harvest criteria and improve the quality of the cooperative's production output.

This research is important because effective communication is the foundation of successful cooperative management, especially in the agricultural sector, which heavily depends on coordination and synchronization among actors in the production chain. Information gaps within cooperatives not only hinder the achievement of product quality standards but also reduce member trust and participation in decision-making processes [15], [16]. By understanding the structure of the communication network and the roles of actors within it, cooperatives can optimize information distribution, increase member engagement, and prevent the recurrence of problems such as the accumulation of unsold harvests. Therefore, this study is not only relevant for the Mandailing Jaya Coffee Cooperative but can also serve as a reference for other agricultural cooperatives facing similar challenges.

Definition of the Communication Network Concept

A communication network is a structure formed from the interaction relationships between individuals or groups within an organization, which enables the exchange of information both formally and informally. Theoretically, a communication network is viewed as a visual and analytical representation of communication patterns that illustrate who talks to whom, how often, as well as the direction and quality of the information flow [17], [18], [19]. In an organizational context, including cooperatives, the communication network serves as an important instrument for understanding knowledge distribution and coordination among members. This network can be measured through various indicators such as interaction intensity, relationship closeness, and the presence of key actors who influence information dissemination. Contemporary research emphasizes that communication networks not only facilitate message delivery but also function as a medium for shaping norms, work culture, and group solidarity [20], [21]. Thus, a deep understanding of the communication network concept provides a strong foundation for analyzing the effectiveness of information exchange within organizations, especially when facing complex coordination issues such as those in agricultural cooperatives.

Categorization of Communication Networks

The manifestation of communication networks in organizations can be categorized based on the form, nature, and degree of openness of their information flow. In general, communication network forms are divided into centralized networks, in which one or several actors hold dominant roles as information controllers, and decentralized networks, in which interactions occur more evenly among members [22]. In cooperative practice, centralized networks often take the form of the chairperson or management serving as the primary source of information, while decentralized networks are more common in small working groups that interact directly. Another manifestation can be seen from the dimension of formality, where formal communication occurs through meetings and written reports, while informal communication

takes place in daily conversations that can accelerate information dissemination [23]. Furthermore, the development of information technology has given rise to hybrid communication networks that combine face-to-face and virtual interactions, thereby expanding the reach of message distribution and speeding up the flow of information among members.

Definition of the Cooperative Concept

A cooperative is a form of economic organization owned and democratically managed by its members to meet their economic, social, and cultural needs and aspirations through collective effort. According to the principles of modern cooperatives, each member has equal voting rights in decision-making, regardless of the amount of capital invested [24]. In the agricultural sector, cooperatives play a vital role as a collective platform for farmers to improve bargaining positions, access markets, and share production resources. Cooperatives also serve as a strategic vehicle for managing market information, cultivation technology, and quality standards, so their operational success heavily depends on the quality of communication between members and management. Agricultural cooperatives in various countries have demonstrated the important role of internal communication networks in maintaining group cohesion and business sustainability, especially amid changing global market dynamics [25], [26].

Categorization of Cooperatives

Cooperatives can be categorized based on their business sector, such as consumer cooperatives, savings and loan cooperatives, service cooperatives, and producer cooperatives, each with distinct operational characteristics and communication patterns. In the context of agricultural cooperatives, manifestations of cooperative activities include the procurement of production inputs, marketing of harvests, and provision of technical services to members [27]. Cooperatives can also be distinguished based on the scale of membership, ranging from local cooperatives with small community-based membership to national cooperatives encompassing thousands of members. The manifestation of cooperative roles is not limited to economic aspects but also includes social functions such as human resource capacity building, strengthening social networks, and policy advocacy for the sector they represent [13].

Definition of the Network Centrality Concept

Network centrality is a measure used in social network analysis to determine the extent to which an actor's position is important within the network structure. In communication studies, centrality identifies individuals or groups who have significant influence over the flow of information, whether as primary senders, connectors, or frequently accessed receivers [28]. There are several types of centrality measures, including degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality, each providing a different perspective on the role of actors within the network. Understanding this concept is important as it helps identify strategic points in the network that can be leveraged to

improve communication effectiveness and information dissemination within the organization.

Categorization of Network Centrality

The manifestation of network centrality is reflected in the strategic roles played by actors within an organization. Actors with high degree centrality typically become the center of interaction because they have many direct connections, while those with high betweenness centrality act as connectors between separate groups, thus controlling the flow of information between them. Meanwhile, closeness centrality indicates an actor's ability to reach all network members efficiently, and eigenvector centrality highlights the influence of actors connected to other important actors. In the context of cooperatives, actors with certain levels of centrality can be identified as gatekeepers, opinion leaders, or bridges who play key roles in ensuring the smooth flow of information and strategic decision-making.

II. RESEARCH METHOD

The object of this research is the Mandailing Jaya Coffee Cooperative, located in Ulu Pungkut District, Mandailing Natal Regency, North Sumatra, focusing on the analysis of the communication network formed between members and management. The main phenomenon addressed is the communication problem that has resulted in the accumulation of coffee harvests in the warehouse due to uneven dissemination of information regarding harvest criteria to members. This issue indicates the presence of barriers in information distribution, which has implications for product quality and marketing. The analysis of the communication network within this cooperative is expected to reveal the structure of relationships, the roles of actors, and the level of connectedness that affect the effectiveness of information exchange. This approach is relevant because communication networks in organizations play a crucial role in facilitating coordination, shaping group norms, and ensuring operational continuity [29].

This study uses a quantitative descriptive method with a Social Network Analysis (SNA) approach to quantitatively map the communication patterns among cooperative members. The data used consist of both primary and secondary data. Primary data were obtained through direct interviews with cooperative members, while secondary data were sourced from internal cooperative documents, meeting reports, and relevant communication records. The quantitative approach was chosen because it allows for the objective measurement of various communication network indicators such as degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality, thereby facilitating the identification of key actors in information distribution [30].

The data sources for this study include 118 respondents who are members of four farmer groups affiliated with the cooperative. The respondents were selected using the Snowball Sampling technique, a sampling method in which participants are recruited through referrals from initial respondents until the entire network under study can be

identified. This technique is effective in social network studies because it enables researchers to identify actors who play important roles but are not always visible in the organization's formal structure [31]. The collected data cover the frequency of interactions, the direction of information flow, special communication roles, and the relationships among members within the cooperative's network.

Data collection was conducted through structured interviews using a questionnaire designed to identify communication relationships among cooperative members. Respondents were asked to name the individuals with whom they communicated regarding cooperative activities, the frequency of interaction, and special roles such as gatekeeper, opinion leader, or bridge. The data obtained were then organized into an adjacency matrix for analysis using UCINET software and visualized with NetDraw, which is the standard procedure in social network analysis to identify interaction patterns and actor positions within the network.

Data analysis was carried out by calculating various measures of network centrality, including degree centrality to measure the number of direct connections an actor has, closeness centrality to measure an actor's efficiency in accessing all network members, betweenness centrality to identify actors serving as bridges between groups, and eigenvector centrality to measure the influence of actors connected to other important actors. This process follows the Social Network Analysis (SNA) procedures recommended by Borgatti and colleagues in empirical studies of organizational networks [32]. The results of this analysis were then used to map the structure of the cooperative's communication network and to determine strategies for optimizing the flow of information.

III. RESULTS AND DISCUSSION

General Overview of the Research Area

Ulu Pungkut District is one of the districts in Mandailing Natal Regency, North Sumatra Province. The distance between Ulu Pungkut District and the Regency's capital is approximately 57 km. Ulu Pungkut District covers an area of 29,519.06 hectares (BPS, 2023). The daily air temperature ranges from 21°C to 34°C, with annual rainfall between 2,000 mm and 3,000 mm. The village's topography is undulating to hilly, with moderate soil productivity.

In terms of administrative boundaries, Ulu Pungkut District is bordered to the south by Pasaman, West Sumatra; to the north by Kotanopan; to the east by Muara Sipongi and Pakantan; and to the west by Pasaman and West Pasaman, West Sumatra. The demographic profile of Ulu Pungkut District, based on the village profile data for the surveyed villages Alahankae, Simpang Pining, and Huta Padang in 2023 shows a total of 299 households with a population of 1,110 people.

General Overview of the Cooperative

A cooperative is a business entity comprised of individuals or legal cooperative entities, operating based on cooperative

principles and functioning as a people's economic movement grounded in the principle of kinship. The cooperative in Ulu Pungkut District was established in 2016 and continues to operate to this day. It is known as the Mandailing Jaya Multipurpose Coffee Cooperative (Koperasi Serba Usaha Kopi Mandailing Jaya). This cooperative runs more than one type of economic activity or serves multiple economic interests of its members. The aim of establishing this multipurpose cooperative is to encourage members and the community to participate more actively in efforts to improve economic welfare. Such cooperatives include Village Unit Cooperatives (KUD), Multipurpose Cooperatives (KSU), and cooperatives within employee communities. According to Widiyanti (2003), the diversity of cooperative business activities that are developing is expected to help improve member welfare and provide greater benefits to the wider community.

This cooperative was created to assist its members in managing their harvests from upstream to downstream. The coffee sold is not limited to powdered coffee; the Mandailing Jaya Coffee Cooperative also sells coffee in the form of green beans, roasted beans, and processed coffee beverages. The cooperative has its own trademark, "BANAMON." Mandailing Jaya Coffee Cooperative has marketed its products to several coffee shops in various regions of North Sumatra Province, as well as to several areas outside the province. It is the only cooperative of its kind in Mandailing Natal Regency. The members of this multipurpose cooperative are coffee farmers in Ulu Pungkut District, with a total of 189 members. The cooperative's management structure is as follows:

Table 1. Management Structure of the Mandailing Jaya Coffee Cooperative

Name	Role
Syafruddin Lubis	Cooperative Chair
Zulham Riadi	Secretary
Saiful Anwar	Treasurer
Ilhamul Karim	Person in Charge

From the table above, it can be seen that Syafruddin Lubis serves as the cooperative's chairperson, assisting members in accessing the coffee market and seeking cooperative partners for collaboration in marketing the cooperative's coffee products. The secretary, Zulham Riadi, is responsible for assisting the chairperson in carrying out tasks, managing the cooperative's correspondence, archiving important cooperative documents, monitoring household and office supply needs, and preparing cooperative meetings. The treasurer, Saiful Anwar, is responsible for planning the cooperative's income and expenditure budget, maintaining all cooperative assets, recording transactions with suppliers above IDR 1 million, handling account balance top-ups, and performing cashier cash counts. The person in charge, Ilhamul Karim, is responsible for overseeing the cooperative's harvest storage warehouse and post-harvest equipment.

Characteristics of Members of the Mandailing Jaya Coffee Cooperative

The characteristics of the members of this cooperative can illustrate their ability to manage their farms. These characteristics also reflect the social and economic conditions of the members. In this study, the characteristics examined include age, education, occupation, and cooperative experience of the members.

Table 2. Characteristics of Cooperative Members

No	Characteristics	Number	Persentase%
1	Gender:		
	- Female	11 orang	8%
	- Male	107 orang	92%
	Total	118 orang	100%
2	Age:		
	- Productive 15-65 years	92 orang	80%
	- Non-productive >65 years	26 orang	20%
	Total	118 orang	100%
3	Education		
	- ELEMENTARY	10 orang	14%
	- JUNIOR HIGH SCHOOL	10 orang	14%
	- SMA	54 orang	45%
	- S1	34 orang	27%
	Total	118 orang	100%
4	Occupation		
	- Self-employed	33 orang	28%
	- Farmer	36 orang	30%
	- Laborer	9 orang	4%
	- ASN	10 orang	6%
	- Honorary Employee	17 orang	20%
	- Private Employee	13 orang	12%
	Total	118 orang	100%
5	Experience		
	- 1-5 years	69 orang	58%
	- > 5 years	49 orang	42%
	Total	118 orang	100%

From the table above, it can be seen that the total number of cooperative members who were respondents in this study is 118 people, consisting of both members and management of the Mandailing Jaya Coffee Cooperative. Of these, 11 respondents are female, and 107 respondents are male. The respondents are members of farmer groups within the cooperative, namely Poktan Huta Godang Agro, Sejati Hutagodang, Harapan Baru, and Subur Tani.

Productive age is defined as the adult or working-age range, between 15 and 64 years. In this age range, many individuals complete their education, build careers, and start families. Population grouping by age is important for planning basic needs such as food, housing, clothing, education, health, and employment. As individuals age, decision-making behavior tends to become more prudent due to greater caution in later years. From the characteristics table, it is evident that the number of cooperative members in the productive age group is greater than those in the non-productive age group, with 92 productive members and 26 non-productive members.

Education is a process for developing one's potential, improving life, and preparing for participation in society. Education is one of the factors influencing agricultural production, alongside human capital, capital assets, and technology or knowledge to increase productivity [33]. From

the characteristics table, it can be seen that 10 members have an elementary school education, 10 have a junior high school education, 54 have a senior high school education, and 34 have completed a bachelor's degree.

Occupation is a social activity where individuals or groups devote their efforts over time and space. Cooperative members' occupations outside of coffee farming can also affect the marketing of coffee products through the cooperative's communication network. As shown in the characteristics table, 36 members work as farmers, 33 as entrepreneurs, 9 as laborers, 10 as civil servants, 17 as contract employees, and 13 as private employees. Members with jobs outside coffee farming can help bring external information into the Mandailing Jaya Coffee Cooperative's communication network. An individual's occupation influences the type of information they need for example, the information needs between the cooperative chairperson and members, or between the chairperson and cooperative partners, as well as between members and partners.

Experience refers to something a person has gone through, undertaken, or felt, which is then stored in memory. Experience can be gained directly or indirectly. Experience in cooperative activities reflects members' involvement in the cooperative's operations. Cooperative experience can be seen from how long members have been part of the cooperative, to assess whether they only serve as members or also take on management roles within the Mandailing Jaya Coffee Cooperative.

Communication Network Analysis of the Mandailing Jaya Coffee Cooperative in Ulu Pungkut District, Mandailing Natal Regency

The results of this study depict the structure of the communication network within the Mandailing Jaya Coffee Cooperative and illustrate the roles of actors in the cooperative's communication network. Rogers and Kincaid state that communication network analysis uses sociograms, density, and centrality as network indicators. A sociogram is an illustration of the relationships between individuals within a social network, while density describes the degree of interconnectedness among individuals. Centrality is a measurement within the communication network found in sociometric concepts as the "star."

The communication network in the Mandailing Jaya Coffee Cooperative is formed through interactions between cooperative members and individuals outside the cooperative, with the aim of helping coffee farmers gain information on the marketing of their coffee products. The number of actors involved in the communication network of the Mandailing Jaya Coffee Cooperative is 118, consisting of 113 actors who are cooperative members and 5 external actors, including one from the Sidikalang Coffee Cooperative, one from the Plantation Division, one director of SCHI, one coffee MSME entrepreneur, and one community empowerment officer in Ulu Pungkut District.

As stated in the study by Sarwiti Sarwoprasodjo et al. (2016), socialization and communication between farmers and external parties in Pamelorange cultivation can form a

communication network structure. Based on Rogers and Kincaid's (1981) theory, the network structure formed in the dissemination of information on Pamelorange cultivation is a radial personal network, as the communication network is large in size, has low integration, high diversity, and is open to external information such as from agricultural extension workers, agricultural field officers, or the Agriculture Department.

Table 3. Density Value of the Communication Network in the Mandailing Jaya Coffee Cooperative

Density value	Number of actors
0.082	9

From the table above, based on the processed data on the communication network in the Mandailing Jaya Coffee Cooperative, there are communication ties formed among cooperative members with a low network density value of 0.082. This means that within the cooperative's communication network, only 8.2% of the potential communication ties are actually established among members. In other words, out of 118 actors in the network, only 9 are connected to each other through the flow of information. This indicates low engagement between members and management, mainly due to the low participation of members in cooperative meetings. A lack of interaction among members or interactions limited to a few members results in low network density. According to Zhang (2013), low communication density is caused by group size and the number of ties present: the larger the group and the fewer the ties, the lower the communication density. Ultimately, members have insufficient knowledge of proper harvesting criteria.

Communication network analysis serves to identify specific communication roles played by actors within the network, such as opinion leaders, bridges, liaisons, gatekeepers, cosmopolites, and isolates. This analysis illustrates members' positions within the network, identifying who provides information to others and who connects different members. In management, a whole network analysis is used, with the unit of analysis being the actors in each group, to examine all actors within the network. A key question often asked is which actor (node) stands out or plays the most decisive role in the network. The most prominent actor in the group is referred to as having centrality. Centrality refers to individuals who hold power and are the most influential in the network, describing their position within the overall network and the extent of their central role [34].

The communication network analysis conducted on the Mandailing Jaya Coffee Cooperative is a whole network (complete network) analysis. A complete network refers to an analysis level using a single unit of analysis the actor measuring the relationships between actors in the network. The measurement used in this network analysis is centrality, which refers to the position of an actor (node) within the overall network. In network analysis studies, a crucial question is which actor (node) stands out and plays the most

decisive role in the network. Those with high centrality hold prominent positions or power within the network.

The structure of the communication network in the Mandailing Jaya Coffee Cooperative and the roles of actors within it are as follows:

1) Communication Network Structure in the Mandailing Jaya Coffee Cooperative

The sociogram illustrating the results of the communication network analysis in the Mandailing Jaya Coffee Cooperative shows an “all-channel” structure. The all-channel or star pattern is similar to a circular structure in which all members are equal and possess the same influence to affect others. In this structure, every member can communicate with every other member, allowing for optimal member participation. The communication network structure in the Mandailing Jaya Coffee Cooperative is a radial personal network. In this context, the radial personal network indicates that the cooperative does not form a cohesive, unified group. This finding is consistent with the research by Hertanto, Sugiyanto, and Safitri (2016), which showed that network structures often display dispersed patterns, where farmer group members tend to contact as many other actors in the network as possible to obtain the best and most profitable information on seedlings. Interactions that are spread out, with a low degree of integration but openness to the environment, are referred to by Rogers and Kincaid (1981) as a radial personal network. The low interaction among cooperative members and management is partly due to members’ other commitments outside the cooperative. As a result, members have limited knowledge about proper harvesting practices and criteria. Insufficient communication leads to poor adoption of innovations, causing substandard coffee to pile up in the warehouse.

Member meetings are essential for disseminating information between members and management to ensure that necessary information reaches all members. However, the study’s observations revealed that many members could not attend these meetings, preventing full information dissemination. This lack of participation hinders members from adopting innovations in harvesting methods and criteria, resulting in imperfectly ripe coffee accumulating in the warehouse.

A radial personal network is less integrated but more open than interlocking personal networks, making it more effective for exchanging new information [35]. While it has low integration, it maintains openness to its surroundings. Found that social networks within communities are often based on promoting knowledge flow, where meetings with extension workers enhance this flow. Conversely, communication networks do not form without such meetings, highlighting the importance of face-to-face interaction in knowledge diffusion and network formation. In the Mandailing Jaya Coffee Cooperative, the network should be more tightly connected to strengthen communication between management and members. Management should also involve members in discussions on important cooperative matters. This can be achieved by holding member meetings to ensure information is distributed to all members, not just a select few. During these meetings, management can communicate issues related to harvesting, good harvest criteria, and the potential losses if members continue careless harvesting practices, thus preventing further accumulation of unsold coffee in the warehouse.

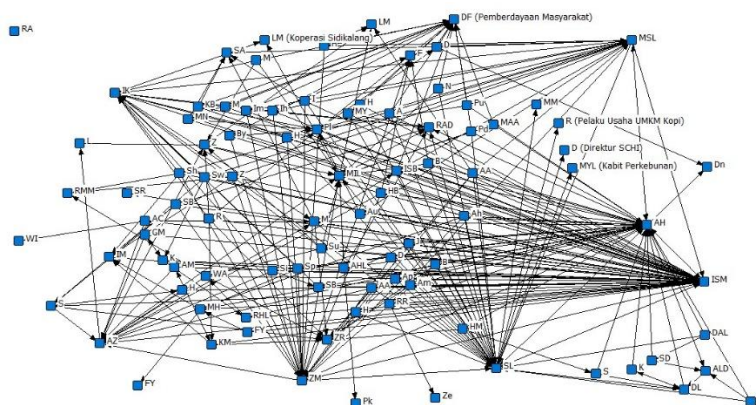


Fig 1. Sociogram of the Communication Network at the Mandailing Jaya Coffee Cooperative

A sociogram illustrates a graphic that depicts the relationships and interactions among individuals within a group. It is also used to evaluate and reveal the internal workings of relationships in a group. The sociogram generated through Ucinet-Draw shows that the actor most frequently encountered by others or acting as the opinion leader is not the cooperative’s chairperson, but rather ISM, who is a cooperative member. As observed by John Gardner (1986–1988), leadership is more than merely holding a

position of authority. While a formal position of authority may strongly facilitate the leadership process, merely occupying that position does not automatically make someone a leader. The concept of leadership is closely related to the concept of power. Through power, leaders gain the means to influence the behavior of their followers. There are several sources and forms of power, including coercive power, legitimate power, expert power, reward power, referent power, informational power, and relational power.

Actor 17 became the central actor (opinion leader) in disseminating information because information regarding the farmer's card was initially delivered by the chairperson to the members. However, in the findings of this study, the person who became the opinion leader in the cooperative was not the one serving as the chairperson.

In this cooperative, the chairperson is identified as actor SL. As seen in the sociogram, actor SL acts as a gatekeeper, namely, a person or group tasked with monitoring and filtering information before it is disseminated. Besides filtering information, ideally, actor SL could serve as an opinion leader who informally influences the actions and attitudes of others. However, the results of this study indicate that the chairperson merely filters and receives information without being able to influence the attitudes and actions of the members. The bridge in the cooperative, based on the data analysis, is the cooperative's management, namely actor IK. The bridge functions as a link between individuals or groups and can also filter the information that will be received by other actors.

2) Roles of Actors in the Communication Network of the Mandailing Jaya Coffee Cooperative

The measurement of centrality includes Degree Centrality, Closeness Centrality, Eigenvector Centrality, and Betweenness Centrality. In describing the position of actors in the whole network, the main task is to identify which actors hold positions within these centrality measures. Centrality values may change if the population size changes. In this study, the actors whose centrality is analyzed include both cooperative members and individuals outside the Mandailing Jaya Coffee Cooperative. The results of the data processing for each centrality measure are as follows:

Table 4. Centrality Levels in the Network Analysis of Mandailing Jaya Coffee Cooperative Members

Communication Network	Value	Role in Network and Cooperative
Degree Centrality	0.114	Opinion Leader (Member)
Closeness Centrality	0.141	Bridge (Cooperative Management)
Betweenness Centrality	7.21	Gatekeeper (Cooperative Chair)
Eigenvector Centrality	0.464	Star (Member)

The table above explains that the roles of actors in the Mandailing Jaya Coffee Cooperative's communication network can be seen from the centrality results. The following is a description of each centrality measure in Table 4:

a) Degree Centrality

The results of this study show that the actor serving as the opinion leader is identified from the highest Degree Centrality value calculated using UCINET-Draw. The actor with the highest degree centrality score of 0.114 acts as the

opinion leader in the communication network of the Mandailing Jaya Coffee Cooperative. This opinion leader is not the cooperative chairperson but rather a member actor ISM.

Actor ISM is a cooperative member in the productive age range, with approximately seven years of coffee farming experience, a bachelor's degree in agriculture, and a profession as a teacher. ISM also has many connections in coffee farming and in coffee shop and café businesses both locally and outside the area. These characteristics give ISM access to valuable external information about proper harvesting methods and criteria. ISM also has several partners in marketing coffee products and possesses broad coffee-related knowledge.

However, in practice, ISM is not the cooperative chairperson, even though the opinion leader role is ideally held by the chair. As noted in Sintje A. Rondonuwu's (2018) study, opinion leaders whether consciously or unconsciously often provide development-related information due to their community standing and ability to influence others. The lack of member attendance at cooperative meetings further impacts the dissemination of information, which hinders cooperative development.

Study on potato farming technology adoption, where opinion leaders were experienced farmers with strong social capital that allowed them to control communication flows in their groups. Degree centrality represents the number of direct links an actor has (in-degree and out-degree), with higher scores indicating greater influence. Nash et al. (2013) and Prell (2012) emphasize that high degree centrality identifies actors most connected to others, who often become primary information sources and influence others' attitudes and behaviors.

b) Closeness Centrality

Closeness Centrality measures how close an actor is to all others in the network and can reveal actors who act as bridges. In this study, the bridge role is held by actor IK, a cooperative manager. UCINET-Draw data indicates that actors with lower closeness scores are more central in terms of distance, meaning they can reach others more quickly. Actor IK's score of 0.141 is the lowest, identifying him as the bridge.

IK is in the productive age range, has three years of coffee farming experience, a senior high school education, and works as an entrepreneur. His relatively flexible schedule allows him to receive and disseminate cooperative information efficiently. As a bridge, IK connects members who otherwise would not directly receive information from the cooperative's chair, ensuring that harvesting criteria information is spread effectively.

This aligns with Rosadi, Sayamar, and Andriani's (2020) research on independent palm oil farmers, where bridges played crucial roles as communication links between farmers and buyers (tauke). Eriyanto (2014) notes that high closeness centrality indicates the actor is capable of reaching all others in the network most quickly, either directly or indirectly.

c) Betweenness Centrality

Betweenness Centrality identifies actors who act as gatekeepers those who control information flow by filtering what enters the network before sharing it. In this study, the cooperative chairperson (actor SL) plays this role, with a betweenness score of 7.21.

As a gatekeeper, SL controls which information is passed to others, and members often need to go through SL to reach other actors, especially new members. While SL has ten years of coffee farming experience and was one of the cooperative's founders, the study found that his role is limited to filtering information rather than actively disseminating it. This lack of active communication has contributed to improper harvesting practices and unsold coffee stockpiles.

Similar roles were observed in study of women's farming groups, where the group leader acted as a gatekeeper, simplifying and relaying information from external agricultural extension officers to members [36], [37]. Also stress that high betweenness centrality indicates an actor's ability to bridge otherwise unconnected parts of the network.

d) Eigenvector Centrality

Eigenvector Centrality measures the importance of an actor based not only on their direct connections but also on the influence of those they are connected to. In this study, the star role is held by actor ISM, with a score of 0.464.

ISM's position as both a star and an opinion leader makes him highly sought after by cooperative members for information. His educational background, professional network, and experience give him valuable insights into coffee farming and marketing that help guide cooperative development.

Which found that respected community leaders often hold star positions due to their extensive networks and influence [38], [39]. Explains that high eigenvector centrality means an actor is well connected to other influential individuals, enhancing their visibility and power in the network [40].

IV. CONCLUSIONS

The results of this study show that the communication network structure in the Mandailing Jaya Coffee Cooperative has an all-channel network structure, meaning that the nature of the network structure is a radial personal network. This is due to the fact that cooperative members have other activities outside the cooperative, resulting in limited interaction between members and the cooperative management. The research findings reveal three actor roles in the communication network of the Mandailing Jaya Coffee Cooperative: opinion leader, gatekeeper, and bridge. The actor who serves as the opinion leader is a cooperative member, namely actor ISM. The actor serving as the gatekeeper, who plays the role of a star in the network, is the cooperative chairman, actor SL. Lastly, the actor who serves as the bridge is the cooperative's person in charge, actor IK. The study shows a dispersed network structure; to strengthen the group, an interlocking personal network structure is needed. Member meetings should be held for information

dissemination so that the necessary information can be received and conveyed effectively to cooperative members. In this study, the opinion leader role is held by a cooperative member. Ideally, the opinion leader should be the cooperative chairman so that information conveyed by the chairman can be directly received by members. This is because members are more likely to accept information disseminated by an opinion leader than by someone who is not an opinion leader in the Mandailing Jaya Coffee Cooperative.

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