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The Role of Stakeholders in Strengthening Communication Networks to Foster Farmers' Economic Institutions

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Abstract

The growing number of smallholder farmers in Indonesia necessitates the strengthening of economic institutions through the farmer corporation model. This study examines the role of stakeholders in strengthening communication networks to support farmer institutions in Jayakerta District, Karawang. Using a mixed-methods approach, data were collected from 281 farmers through surveys and 28 stakeholders through in-depth interviews. The results show that coordination among stakeholders remains limited. Communication network analysis reveals that farmers with high centrality are more actively involved in exchanging production-related information, while those with low centrality tend to seek marketing information but have limited interaction. Spearman's test indicates that internal farmer factors do not significantly influence communication networks ($\rho = 0.072$; $p > 0.05$), whereas stakeholder support shows a negative yet significant correlation ($\rho = -0.128$; $p < 0.05$), indicating a mismatch between the form of support provided and the farmers' actual needs. Although support is provided in various forms, its integration is not yet optimal. Strengthening communication networks and ensuring consistent stakeholder involvement are key to the success of farmer corporations. Local actors, such as voluntary agricultural extension agents, play a crucial role in reinforcing farmer information exchange. The low level of digital literacy among farmers also calls for policy interventions through training and capacity-building programs. These findings underscore the importance of integrated communication systems in supporting institution-based agricultural development in Indonesia.

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1. Introduction

The number of smallholders or gourem farmers in Indonesia continues to increase from year to year, by 18.5% from 2013 to 14.2 million farmers in 2023, increasing to 16.89 million farmers (Central Statistics Agency 2023). This condition causes farmers to have difficulties in accessing technology, information, capital, and markets, which ultimately has an impact on their low productivity and welfare (Debelo, 2024; De la Peña and Granados 2024). This limited access leaves smallholders vulnerable to price fluctuations and other risks. If this continues, it will result in farmers being trapped in a cycle of poverty. To overcome these problems, smallholders are expected to work together collectively in the forum of farmer organizations so that they have bargaining power and the ability to access inputs and technology well (Chauhan, Adhikary, and Pradhan 2021; Royer, Bijman, and Abebe 2017).

One of the strategies adopted by the government to overcome the challenges faced by smallholders is to form an organization that collects farmers in one container. Collective agriculture plays an important role in strengthening social capital, improving coordination, and managing cooperation among farmers. In addition, this approach encourages social learning through engagement in formal and informal networks, which strengthens the relationships between farmers, stakeholders, and supporting institutions, thereby improving the efficiency and sustainability of agricultural practices (Barghusen *et al.*, 2022). One of the collective organizational models formed in the form of Agricultural Economic Institutions (KEP), in this case called farmer corporations, aims to consolidate small farmers into a larger business entity. This model establishes primary cooperatives in each village and will later be united in a larger joint management forum in one area. This is expected so that small farmers can achieve a more optimal economic scale while strengthening their bargaining position. Farmer corporations are also designed to facilitate easier access to capital, technology, markets, and other resources that were previously difficult for individual farmers to reach (The Ministry of Agriculture of Indonesia, 2019).

In efforts to develop farmer corporations in Indonesia, they still face many challenges, especially in the aspect of communication that occurs between corporate members and with stakeholders. Effective communication plays an important role in deciding whether to adopt an innovation (Hasin and Smith, 2018). In addition, communication can drive social change through the dissemination of information and accelerate development in rural areas. Effective communication is an important prerequisite for creating solid governance and preventing conflict while supporting sustainable cooperation (Monticone et al. 2024). This lack of effective communication results in a decline in the organization's ability to provide services to farmers, including the provision of capital, means of production, marketing, and access to corporate territory (Pratiwi, Darma, and Mahyuddin 2022). Obstacles in communication are also caused by the limited capacity and performance of farmers, which results in weak coordination among corporate members and with stakeholders (Harjanto *et al.*, 2022). This situation can worsen the condition of farmers in rural areas; therefore, strategic steps are needed to strengthen communication networks to facilitate coordination and collaboration. To realize these rights, the support of external stakeholders is needed as a driver of collective action for smallholder farmers (Ahmad et al., 2024). Therefore, in building farmer corporations, it is necessary to strengthen communication networks among farmers and between farmers and external policymakers to increase the adoption of agricultural technology and innovation.

In Indonesia, the main obstacle to the development of communication networks is the lack of support from stakeholders, who are often only focused on technical aspects without considering strategic and long-term dimensions such as market access, information technology, and social capital. Network and stakeholder structures play a key role in development

communication networks and sustainable development, especially in sharing knowledge, facilitating negotiations, and creating mutual understanding and collaboration (Simpson then de Loë 2017; Zikargae, Woldearegay, and Skjerdal 2022). Collaboration between stakeholders has been proven to increase the effectiveness of program implementation, strengthen participation, and accelerate the achievement of development goals (Almeida Vittori Ferreira, Morgado, and Estellita Lins, 2024). Stakeholder support has tended to focus on technical aspects, while strategic aspects such as market access and financing have not been optimal. This gap highlights the need for increased coordination and collaboration across sectors (Jameel and Servaes 2021; Nguyen, Halibas, and Nguyen 2024). This is due to the lack of coordination between stakeholders, resulting in the weak transfer of innovation and knowledge, which ultimately hinders the success of the program (Monticone et al. 2024; Izadi, Saadi, and Kooshki 2024). Thus, improving communication networks and stakeholder involvement are important aspects that must be considered when building organizations, especially in the agricultural sector.

A good communication network is also an important foundation for ensuring more efficient collaboration, especially in terms of information management and access to resources. This consolidation uses professional management that supports the vision of advanced, independent, and modern agriculture (Gultom *et al.*, 2020). Previous research has highlighted that communication networks are one of the most effective sources of information for farmers and play an important role in their perceptions and decision-making processes (Crawford et al. 2015; Parks 2022). Studies on how stakeholder involvement can strengthen communication networks and contribute to the development of farmer corporations in Indonesia are limited. Communication networks are important for understanding the interaction and collaboration betweenss various stakeholders in the development of business-based agriculture (Balama *et al.*, 2023).

The role of stakeholders, namely the government, universities, the private sector, financial institutions, and change agents, in strengthening information exchange communication networks for the development of farmer corporations in Indonesia. This study aims to analyze the extent of the role of stakeholders in strengthening communication networks that support the effectiveness and sustainability of farmer corporation institutions in Indonesia. Through a better understanding of the role of external stakeholders, this research is expected to provide more effective strategic recommendations for stakeholders involved in supporting the growth of farmer corporations and improving the welfare of smallholders and supporting more sustainable and inclusive agricultural development in Indonesia.

In line with the problems that have been described, this research is based on a conceptual framework that places the strengthening of communication networks as a key element in the development of farmer organizations, in this case, farmer corporations (Opolot *et al.*, 2018; Chest *et al.*, 2023; Mutyebere *et al.*, 2023; Geleta, Natcher and Henry, 2023). This study employs the Social Systems Theory, which views farmer corporations as systems composed of interconnected and interacting components. Within this perspective, organizational effectiveness is largely determined by the degree of interrelation among the elements within the social system (Parsons, 2005). The communication network is influenced by two main variables: the internal factors of farmers and stakeholder support. Internal factors include individual characteristics of farmers (Islam and Tridakusumah, 2020); Siregar et al., 2020), while external support, including the role of governments, universities, the private sector, financial institutions, and agents of change, serves to strengthen access to resources and expand collaborative networks (Hermans et al., 2017; Tay et al., 2024). This framework is the basis for analyzing the relationship between variables and formulating communication strategies that encourage the effectiveness and sustainability of farmer cooperatives.

2. Research Methods

2.1. Research Location and Time

This research was carried out for seven months, from August to December 2024, in the Jayakerta District, Karawang Regency, West Java Province. This location was chosen purposively because it is the implementation area of the farmer corporation pilot program initiated by the Ministry of Agriculture in Indonesia.

2.2. Analytical Approach and Framework

This study uses a mixed-methods approach to gain a comprehensive understanding of the dynamics of communication networks and the role of stakeholders in the development of farmer corporations. Quantitative approaches are used to measure communication patterns and stakeholder engagement, whereas qualitative approaches are used to delve into social factors, challenges, and local dynamics that are not reached by statistical approaches. The analytical framework refers to the relationship between the internal factors of farmers (X1) and stakeholder support (X2) in the communication network (Y1). This frame of mind is visualized in Figure 1 and is used as a basis for testing the research hypotheses.

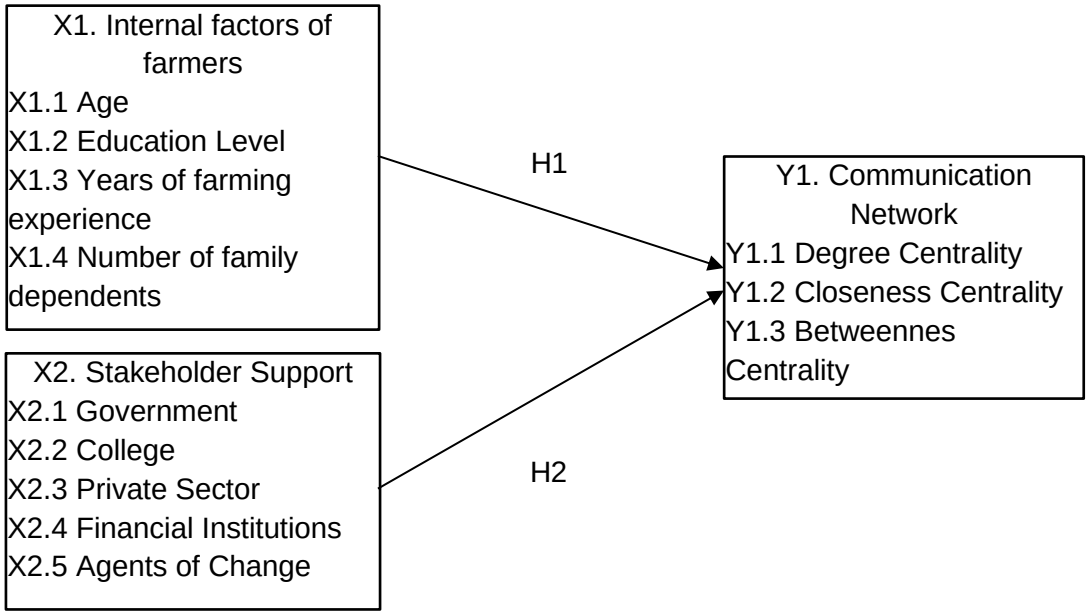

Figure 1. Research analysis framework for strengthening communication networks In farmer corporations

2.3. Types and Techniques of Data Collection

The data collected consisted of primary and secondary data. Primary data were obtained through a survey of 281 farmers who were members of the corporation and in-depth interviews with 28 stakeholders. The stakeholders consist of two farmer members who are active in farmer corporate activities, five chairmen of the cooperative, the head of The Jayakerta Regional Technical Implementation Unit (UPTD) one person, and five experts at Indonesian Agency for Agricultural Engineering and Modernization (IAAEM), formerly the Agricultural Research and Development Agency of the Ministry of Agriculture of Indonesia, who have assisted the development of the corporation since 2018. Furthermore, the universities Bogor Agriculture Development Polytecnic one person, the University of Singaperbangsa one person, financial institutions (Mandiri Bank and other financial institutions) two people, the Taiwan Technical Mission (TTM) one person, Aksi Cepat Tanggap (ACT) one person, the change agent consists of two civil servant extension workers, one private extension worker, and five voluntary

agricultural extension worker The quantitative questionnaire uses a Likert scale and was compiled to measure farmers' perceptions of stakeholder support and the effectiveness of communication networks. Qualitative data was collected through in-depth interviews using semi-structured guidelines on topics such as policy, corporate development challenges, and collaboration strategies.

2.4. Population, Samples, and Sample Extraction Techniques

The population in this study is 800 farmer corporations mamber from five villages in Jayakerta. A sample of 281 people was determined using the Slovin formula, with a margin of error of 5% and a confidence level of 95%. The sampling technique was carried out purposively based on the following criteria: having participated in corporate training, having a communication tool, and receiving support from the Ministry of Agriculture of Indonesia or other stakeholders. The sample consisted of 264 rice farmers, eight horticultural farmers, and six duck farmers.

2.5. Research Instruments and Indicators

Indicators and operational definitions of variables are Farmer Internal Factors (X1): age, education, length of farming, number of family dependents, Stakeholder Support (X2): intervention from the government, universities, private sector, financial institutions, and agents of change and Communication Network (Y1): degree centrality, closeness centrality and betweenness centrality in the exchange of information.

Table 1. Indicators and operational definitions of variables

Variable	Sub Variables	Indicators	Reference
Internal factors of farmers	Age	FI1-FI4	Islam and Tridakusumah (2020); Siregar et al. (2020)
	Education Level		
	Years of farming experience		
	Number of family dependents		
Stakeholder support	Government	DPK1-DPK4	Sumardjo, Firmansyah, and Dharmawan (2023);Sakai et al. (2020); Bahtiar et al. (2021); Tao et al. (2024)
	College		
	Private Sector		
	Financial Institutions		
	Agents of Change		
Communication networks	Degree Centrality	JS1-JS3	Almeida et al. (2019); Kusumadewi et al. (2020)
	Closeness Centrality		
	Betweenness Centrality		

2.6. Data Analysis Techniques

Quantitative data analysis was conducted descriptively and inferentially using SPSS. UCINET software version 6 was used to analyze the communication network. The Spearman correlation test was used to examine the relationships between variables. Qualitative data were analyzed using a thematic approach and tested for validity through the triangulation of methods.

3. Result and Discussion

3.1. Farmer Corporation Profile and Farmer Characteristics

To support the collective management of farming and networking in agricultural areas, five farmer cooperatives were formed in Karawang Regency. In addition, there are 12 external stakeholders classified into five main categories: governments, universities, financial institutions, the private sector, and change agents. From the government side, involvement came from the Ministry of Agriculture of Indonesia, the Karawang Regency Agriculture and Food Security Office, and the Cooperatives and MSMEs Office. The supporting universities include and University of Singaperbangsa in Karawang. Financial institutions include conventional banks and savings and loan cooperatives. TTM and ACT also contributed to the private sector. Meanwhile, change agents include civil servant extension workers, private extension workers, and voluntary agricultural extension workers who play an important role in information transfer and assistance to farmers.

The program was initiated in 2017 with a visit by the Ministry of Agriculture of Indonesia and TTM to Jayakerta District to identify the potential of rice farming businesses. The results show that the main problem in irrigation is the construction of long storage and repair of water channels. In 2018, planning for the location of Demonstration Farm was carried out in five villages out of eight existing villages, followed by PRA (Participatory Rural Appraisal) activities, FGD, and the introduction of healthy rice cultivation technology such as legowo row planting systems, transplanters, balanced fertilization, and OPT and HPT control.

The year 2019 was an important milestone with the establishment of Gapoktan-based farmer corporations and groups, as well as cooperatives at the sub-district level. In 2020, five primary cooperatives were formed, consisting of four new cooperatives and one old cooperative (Sri Asih Mandiri), with a total of ten business units, including labeled seeds, Alsintan services, feed production, livestock product management, and premium rice production units. However, only three business units are still active today: horticulture, savings and loans, and Alsintan services.

During 2019–2020, farmer capacity building was carried out through technical training, comparative studies to Taiwan, Yogyakarta, and Bandung, IT-based cooperative management training, and the recruitment of young farmers. In 2021, corporate assets were transferred to the local government. The evaluation showed two active cooperatives, namely Medang Asih Mandiri (horticulture), which is still being fostered by TTM, and Sri Asih Mandiri (savings and loan unit and warehouse business/RMU).

Since the program's inception, the involvement of stakeholders such as the Agriculture Service, private sector, and financial institutions has been fairly consistent, although not entirely integrated into the corporate program. TTM specifically assisted horticultural development during 2018–2021, including the construction of seedling houses behind The Jayakerta Regional Technical Implementation Unit. Civil servant extension workers have been active in accompanying farmers since the beginning. On the other hand, private extension workers are not directly involved in corporations and carry out activities according to the interests of the company, while voluntary agricultural extension worker play an important role as information disseminators and the main companions of farmer groups. In the mentoring process, various challenges are faced, especially the limitations of the development of the cooperatives formed. However, the activity will continue until it enters the transition phase in 2022–2023, before the management is fully handed over to the Karawang Regency Government.

The characteristics of farmers in the research location have the characteristics of urban fairies, namely, community groups living in transitional areas between urban and rural areas. This area is often referred to as a peri-urban area, which experiences the dual influence of urban

development and agrarian village life (Sumardjo, Firmansyah and Dharmawan, 2021). There are several characteristics of farmers in this study that are inherent characteristics of a person that are characteristic of everyone. The characteristics of farmers in this study are based on age, formal education, length of farming, and number of family members. The characteristics of the farmers and farmer corporation members are presented in Table 2.

Table 2. Characteristics of farmers in farmer corporations in Karawang, West Java

Description	Category	Frequency (n)	Percentage (%)
Age	22–41 years old	56	19,92
	42–60 years old	171	60,85
	61–79 years old	54	19,21
Education Level	No School	17	6,04
	Primary school	188	66,90
	Junior High School	34	12,09
	High School	31	11,03
	University	11	3,91
Years of farming experience	Rice Paddies		
	1-17 years	121	45,31
	18-34 years	110	41,19
	35-51 years	51	19,10
	Horticulture		
	1-2 years	2	25
	2,1-4 years	4	50
	>4 years	2	25
	Duck		
	<1 year	2	33
	1.1-2 years	3	50
	>2 years	1	17
Number of family dependents	0-3 people	177	62,9
	4-7 people	98	34,8
	8-11 people	6	2,13

The majority of farmers involved in farmer corporation activities are in the productive age group, with the largest distribution in the age range of 42–60 years (61 %). Nevertheless, the existence of elderly farmers remains a major concern, considering the importance of labor availability in the agricultural sector in the long term. Therefore, farmers' regeneration efforts are crucial for realizing a sustainable agricultural system. This regeneration process can start from the family environment through the inheritance of farming skills to children and can be strengthened through the active role of the government, extension agencies, communities, and farmer corporations (Anwarudin et al., 2020).

The results of the study show that the education level of most farmers is still relatively low, with around 67 % completing only elementary school and only 4 % going to college. This finding is in line with the results of research that show that the majority of farmers have a low level of education, even though they have good farming experience and adequate mastery of technical aspects. However, the limitation in the level of education has an impact on the weak managerial ability of farmers, especially in terms of planning, farm management, and information-based decision making (Haryanto et al. 2022).

Farmers' experience in farming varies based on the type of commodity they are cultivating for paddy rice, most farmers have been working for 1 to 17 years; for horticulture, it ranges from 3 to 4 years, while for duck farming, the average experience is only 1 year. Most horticultural businesses have only been carried out since the implementation of farmer corporate activities and duck farming. Most farmers and breeders have never ventured into horticultural and livestock farming. In terms of the number of family dependents, most farmers are in the low category (62.9%), which means they have between 0 and 3 family members who are economically dependent.

3.2. Stakeholder Support

Government Support

Government support for farmers in Jayakerta District, Karawang Regency, consists of three main institutions: The Ministry of Agriculture of Indonesia, the Karawang Regency Agriculture and Food Security Office, and the Karawang Regency Cooperatives and MSMEs Office. Farmers' perceptions of the interaction carried out by the three government agencies are presented in the following Table 3.

Table 3. Perception of farmers' interaction with the government

Interaction	Frequency (n)	Percentage (%)
The Ministry of Agriculture of Indonesia		
Media Interpersonal	269	95,73
Hybrid Media	12	4,27
None	0	0
Karawang Regency Agriculture and Food Security Office		
Media Interpersonal	109	38,79
Hybrid Media	14	4,98
None	158	56,23
Karawang Regency Cooperatives and MSMEs Office		
Media Interpersonal	24	8,54
Hybrid Media	0	0,00
None	257	91,46

Based on the results of the study, the majority of farmers (95.73 %) stated using interpersonal media with the Ministry of Agriculture of Indonesia, especially through participation in training and receiving assistance for production facilities. This interaction is carried out regularly through various technical implementation units, with training topics tailored to the location, type of business, and commodities managed by farmers. This reflects the active involvement of farmers in the activities organized by the Ministry of Agriculture of Indonesia. Nevertheless, only 4.27 % of farmers reported interacting intensively through face-to-face meetings or communication via phone and WhatsApp groups. This intensive interaction is generally carried out by farmers in the use of information technology is important for strengthening the synergy between stakeholders and empowering agricultural communities (Sumardjo, Firmansyah and Dharmawan, 2023).

The role of the Karawang Regency Agriculture and Food Security Office is still limited, it can be seen that as many as 56.23 % of farmers stated that they had never interacted directly, especially in the early stages of implementing the corporate program. The Karawang Regency Agriculture and Food Security Office is not fully involved in the program’s implementation,

although it continues to coordinate and be present in activities carried out by the Ministry of Agriculture of Indonesia. However, 38.79 % of farmers reported using interpersonal media to interact with the service. A small percentage of farmers (4.98 %) communicate using hybrid media that combine face-to-face meetings, phone calls, and social media such as Facebook.

The Karawang Regency Cooperatives and MSMEs Office plays a role in fostering and assisting the formation of cooperatives through technical training programs. However, the participation of farmers was relatively low because only 24 (8.54%) interacted using interpersonal media. The majority of participants came from leadership groups, such as the chairman of farmer groups, farmer group associations, and the Agricultural Equipment and Machinery Service Provider Unit (UPJA) in the village. Meanwhile, 257 farmers (91.46%) were not involved.

The government provides various forms of assistance in the form of production inputs. One of them is through the Ministry of Agriculture of Indonesia, which provides assistance in the form of Inpari 32 rice seeds, agricultural tools and machinery, fertilizers, pesticides, and technical and managerial training, including leadership training. Meanwhile, the Karawang Regency Agriculture and Food Security Office focuses on cultivation and farming training, although its involvement is limited. The Cooperatives and MSMEs Office also provided initial training on the formation of cooperatives to the four planned cooperatives, including assistance for the cost of making notary deeds and facilitating cooperative registrations.

Overall, the government plays a crucial role in the development of farmer corporations through the provision of a legal framework, facilitation of the formation of cooperative legal entities, and the provision of training and business consulting services (Tan and Mailena 2021; Suharyono et al. 2021). In addition, infrastructure development such as storage and transportation facilities is essential in expanding market access and reducing post-harvest losses (Boris *et al.*, 2021). This cross-sectoral role strengthens the institutional foundation of farming towards sustainability and independence of farmers.

College Support

Some of the universities involved in the implementation of farmer corporations include Bogor Agriculture Development Polytecnic and The University of Singaperbangsa. The perception of farmers' interaction with universities can be seen in Table 4.

Table 4. Perception of farmers' interaction with universities

Interaction	Frequency (n)	Percentage (%)
Bogor Agriculture Development Polytecnic		
Media Interpersonal	9	3,20
None	272	96,80
University of Singaperbangsa		
Media Interpersonal	4	1,42
None	277	98,58

Based on the data obtained, the majority of farmers (96.80%) do not interact with Bogor Agriculture Development Polytecnic students. This is because the assistance carried out in only a few places does not cover all activity locations. Meanwhile, only 3.20% reported interacting using interpersonal media with the institution. Nevertheless, Bogor Agriculture Development Polytecnic actively contributes to the development of farmer corporations, especially through mentoring by students which is carried out in the early stages of program implementation. The assistance is focused on several strategic activities, such as the development of duck businesses and the introduction of agricultural tools and machinery. Bogor Agriculture Development Polytecnic students also provide training related to feed management and financial management

of duck egg harvests. In addition, technical guidance resource persons were invited several times from the Bogor Agriculture Development Polytecnic to provide relevant material for farmer capacity development.

University of Singaperbangsa also supports the development of farmer corporations through the placement of intern students. In the early stages, one student was placed at TTM to help nurture horticultural farmers. Then, six other students were involved in crop management at the Rice Milling Unit (RMU). However, only a small percentage of farmers (1.42%) interacted using interpersonal media, while the majority of farmers (98.58%) never interacted with these students. This shows that the contribution of University of Singaperbangsa in the farmer corporation development program is still limited in certain areas.

The involvement of the University of Singaperbangsa is evidenced by the assistance of intern students from the University of Singaperbangsa in horticultural farmer activities in collaboration with TTM and RMU management. Nevertheless, the existence of universities is important in improving the competence of farmers through training, knowledge transfer, research, innovation, education, collaboration, fostering partnerships and strategic planning that can ultimately advance agricultural science and ensure sustainable practices that meet global food demand (Opolot et al. 2018; Beachy 2014). Thus, if universities continue to be involved in mentoring and research, the institution can contribute to increasing agricultural productivity and expanding market access for farmers.

Financial Institution Support

Financial support in farmer corporate activities involves conventional banks and savings and loan cooperatives. The support provided is in the form of capital loans to farmers to develop their farming businesses. Farmers' perception of farmers' interaction with financial institutions is shown in Table 5.

Table 5. Perception of farmers' interaction with financial institutions

Interaction	Frequency (n)	Percentage (%)
Conventional Banks		
Media Interpersonal	37	13,17
Hybrid Media	5	1,78
None	239	85,05
Cooperation		
Media Interpersonal	5	1,78
Hybrid Media	5	1,78
None	271	96,44

Based on the results of the study, as many as 13.17% of farmers reported interpersonal media with conventional banks, while another 1.78% accessed banking services through hybrid media, mainly for the purpose of applying for People's Business Credit (KUR). The most frequently accessed banks are BRI Bank, Mandiri Bank, and West Java Bank, with the use of loan funds generally allocated for the purchase of rice fields and financing agricultural cultivation. However, most farmers (85.05%) stated that they did not interact with conventional banks during the implementation of the Farmer Corporation program. The savings and loan cooperatives that play a role in financing are only limited to certain areas such as Ciptamarga Village and have been established before the start of farmer corporate activities. Data shows that 96.44% of farmers did not make loan transactions with cooperatives during the program. Only 1.78% of farmers reported interacting using interpersonal media and 1.78% using hybrid media. These

findings indicate that the role of cooperatives in providing capital during the program is still very minimal, limited to certain areas.

In the context of cooperatives, research Royer, Bijman, and Abebe (2017) and Ahmad, Shadbolt, and Reid (2024) emphasized that well-managed cooperatives can increase the supply capacity of goods, strengthen internal governance, improve managerial capabilities and the use of financial and non-financial resources, and there is an alignment of values between cooperatives and their members. Although the role of cooperatives is not very visible, the existence of cooperatives provides an alternative as financial assistance for farmers to obtain a business model. Therefore, it is necessary to provide continuous guidance from the government and support institutions from the beginning of its formation in order to establish cooperation with various parties and run business sustainably. This step is important to create cooperatives that are able to carry out business functions and empower farmers in a sustainable manner (June *et al.*, 2023).

In general, both conventional banks and cooperatives only contribute in the form of individual capital, not collective. Farmers apply for loans to finance their personal needs. Actually, the role of financial institutions is very important to support agricultural financing. This fact shows that farmers' access to sources of financing from financial institutions is still limited, and they are not able to support farming collectively, many farmers are forced to rely on loans from middlemen. Although informal, middlemen are considered a reliable alternative source of funding, especially when farmers have difficulty accessing financing from formal financial institutions (Hidayat, Nur and Nurdiyana, 2024). The role of middlemen is significant in providing short-term funds, both for daily needs and financing farming businesses.

Private Support

Private support in this study includes contributions from TTM and ACT, which focus on interactions to support the development of farmer corporations. TTM is part of The International Cooperation and Development Fund (TaiwanICDF) with a cooperation program between Taiwan and Indonesia to improve the welfare of local farmers through various initiatives in the agricultural sector. Its focus is on fostering farmers in agricultural planning and management, market development, and regular training to increase farmers' productivity and income. Meanwhile, ACT is an Indonesian institution that focuses on raising funds to be distributed to Muslim communities affected by disasters, conflicts, or poverty. As one of the largest donation collection institutions in Indonesia, ACT plays an important role in mobilizing humanitarian aid from the community. The perception of farmers' interaction with private institutions can be seen in Table 6.

Table 6. Perception of farmers' interaction with private institutions

Interaction	Frequency (n)	Percentage (%)
Taiwan Technical Mission		
Media Interpersonal	15	5,34
Hybrid Media	4	1,07
None	262	93,24
Aksi Cepat Tanggap		
Media Interpersonal	6	2,14
Hybrid Media	4	0,36
None	272	96,80

The results showed that only 5.34 % of farmers were involved through interpersonal media with TTM, while 1.07 % used hybrid media. Meanwhile, a small percentage of farmers 0.36 %, reported interaction with TTM through hybrid media. In contrast, the majority of respondents

92.24 % did not interact at all, which is due to TTM's greater focus on horticultural farmers, which are much less than rice farmers in the total sample. TTM provides more comprehensive assistance, including capital, fertilizers, seeds, pesticides, agricultural tools and machinery, technical training and guidance, marketing, and farming skills, where all horticultural farmers receive all types of assistance. However, all horticultural farmers involved, interact intensively with TTM.

ACT through the Indonesian Food Producers Community Program provided assistance in the form of loan funds to increase the capital of the farming business at that time, and did not continue into the following years. Farmers' interactions with ACT used interpersonal media (2.14%) and hybrid media (0.36%) to interact with ACT. Most farmers, 96.80%, stated that they did not interact at all, indicating that the majority of farmers did not receive assistance. These findings indicate a potential lack of aid distribution to farmers in the region.

These findings are the basis for stakeholders to evaluate the existing aid distribution system. Increasing the accessibility of assistance is urgently needed to reach more farmers in need. In addition, socialization and education about the available assistance programs must also be increased so that farmers are more aware and can make optimal use of the assistance. In fact, private companies play an important role in increasing agricultural productivity and market access and encouraging collaboration among stakeholders, expanding access to resources, and facilitating investment in agricultural products (ter Steeg and Louwaars 2024; Gondwe et al. 2024). Therefore, the private sector should be involved in a sustainable manner so that the activities distributed have a real impact in improving the welfare of farmers and their families and strengthening farmer corporations.

Change Agent Support

Change agents in agriculture play an important role in providing support to ensure the adoption of new technologies and better agricultural practices by farmers. In this study, agents of change that contribute to increasing the capacity of farmers are divided into three categories, namely civil servant extension workers, private extension workers, voluntary agricultural extension workers. The perception of farmers' interaction with change agents can be seen in Table 7.

Civil servant extension workers actively assist farmers before, during and after the farmer corporation program by facilitating access to seeds, training, and farming skills. Civil servant extension workers act as a liaison between farmers and government technical resources, as well as encourage the formation and strengthening of farmer groups and corporations (Effendi et al. 2024; Jamil et al. 2021; Akbar et al. 2023). The results of the study showed that 67.26 % farmers use interpersonal media to interact with civil servant extension workers through face-to-face meetings. Only a small percentage of farmers use hybrid media (18,15 %) and some of them did not interact (14,23 %) because they do not meet directly with farmers except in training activities. This indicates that there is still a low interaction and utilization of information technology and digitalization among farmers. Experience shows that digitalization can improve access to agricultural information, for example in India, the use of the FarmED application increases farmers' access to information Real-time up to 40 %, as well as strengthening interaction with extension workers and experts (Palaniswamy and R, 2025). Meanwhile, the study Ma, Marini, and Rahut (2023) in six countries it was found that communication technology strengthens the adoption of sustainable practices, production efficiency, and the bargaining power of farmers in the market.

Table 7. Perception of farmers' interaction with agents of change

Interaction	Frequency (n)	Percentage (%)
Civil Servant Extension Worker		
Media Interpersonal	190	67,26
Hybrid Media	51	18,15
None	40	14,23
Private Extension Worker		
Media Interpersonal	92	32,74
Hybrid Media	8	2,85
None	181	64,41
Voluntary Agricultural Extension Worker		
Media Interpersonal	189	67,26
Hybrid Media	90	32,03
None	2	0,71

Private extension workers provide assistance in the form of knowledge of pesticides, seeds, herbicides and technical training in the form of pilot land Demonstration Plot and distribute Saprodi to farmers. Farmers' interaction with Private Extension Workers was lower, with 32.74 % farmers use interpersonal media. Only 2.85 % interacted using hybrid media and most farmers (64,41 %) do not interact with private extension workers. In contrast to other countries, according to Tham-Agyekum et al. (2024), private extension has advantages in the quality of human resources, responsiveness, understanding of farmers' needs, and product safety assurance. The approach is more personalized and interactive through workshops, demonstrations, and hands-on consultations. Therefore, through consistent mentoring, private counseling has the potential to build farmer trust and increase overall satisfaction.

Voluntary agricultural extension workers bridge the provision of various assistance such as seeds, fertilizers, agricultural tools and machinery, farming training, marketing, and leadership. It can be seen that interaction with voluntary agricultural extension workers is more even, as many as 36.30 % of farmers use interpersonal media, 32.03 % use hybrid media. Only 0.71 % of farmers do not interact, generally farmers who are farm laborers and rent land. Overall, voluntary agricultural extension workers are widely involved and become important pillars in local communication networks, especially as key figures such as the head of farmer groups.

These findings show that voluntary agricultural extension workers have the most significant contribution, followed by civil servant extension workers, while private extension workers are in the last position. Although the most assistance comes from civil servant extension workers, voluntary agricultural extension workers as local actors make it very important in strengthening networks and disseminating information. This role makes voluntary agricultural extension worker a central actor in the institutional structure of farmers, as highlighted Monticone et al. (2024) because it also affects the dynamics of the network and the sustainability of the local community. Jäckering, Gödecke, and Wollni (2019) It found that information exchange often takes place through farmer groups, with communication flows connected in extension networks. Therefore, an extension system-based approach remains relevant in increasing the capacity and knowledge of farmers. However, the limited number of civil servant extension workers is the main obstacle, thus reinforcing the importance of the role of voluntary agricultural extension workers as partners. As explained by Indraningsih et al. (2023) that the effectiveness of voluntary agricultural extension worker needs to be continuously supported in order to be able to answer the needs of farmers as a whole.

3.3. Farmer Corporation Communication Network

The analysis of information exchange communication networks was carried out to see the interaction between farmers and farmer corporation members which are divided into two, namely cultivation information and marketing. Cultivation information includes seeds, production and harvesting facilities while marketing information includes the sale of crops in the form of grain and rice. This can show how communication behavior is formed both in giving and receiving and disseminating information among fellow members of farmer corporations. The analysis of communication networks in this study is to see the degree centrality, the closeness centrality and the betweenness centrality. This analysis will help identify key actors in the network as well as understand their strategic role in information exchange. The average, maximum, minimum degree centrality, closeness centrality and betweenness centrality neutrality of the respondents' intermediary based on the topic of conversation in the information communication network are clearly presented in Table 8.

Table 8. Index of communication networks of degree centrality, the closeness centrality and the betweenness centrality

Communication Network Index	Topics Communication Networks Information Exchange	
	Marketing	Production
Degree Centrality		
Low	191	23
Keep	74	194
Tall	16	64
Closeness Centrality		
Low	222	150
Keep	38	78
Tall	21	53
Betweenness Centrality		
Low	195	97
Keep	31	93
Tall	55	92

Table 8 shows that in the centrality dimension of the level, it can be seen that farmers with low central positions are looking for marketing information more (191 people), while those in high central positions are looking for more production information (64 people). A similar pattern was found in the closeness centrality, where farmers with high closeness were more involved in seeking production information (53 people), compared to farmers with low levels of closeness ere more dominant in seeking marketing information (222 people). Meanwhile, in the centrality of intermediaries, farmers with high liaison positions showed a relatively balanced distribution between marketing information (55 people) and production (92 people), in contrast to farmers with low intermediary levels who were more focused on marketing (195 people). These findings suggest that the higher the position of farmers in communication networks, the greater the tendency of farmers to engage in the exchange of information that is technical and strategic in nature, such as production, while farmers who are less connected are more limited to general marketing topics.

Overall, these findings show that the higher the position of farmers in communication networks, both in terms of degree centrality, closeness centrality, and betweenness centrality, the greater the tendency of farmers to access and distribute information that is technical and strategic, such as production. In contrast, farmers with more peripheral or strongly disconnected positions are more limited to the exchange of information of a general

and practical nature, such as marketing. This emphasizes the importance of strengthening the capacity of farmers' communication networks as a means of increasing access to production knowledge, innovation, and information-based decision-making.

3.4. Internal Factors and Stakeholder Support with Farmer Communication Network

In this case, to determine the relationship between the free variable and the bound variable in this study, a correlation analysis was carried out using the Spearman's rho test. This analysis is used because the data is ordinal-scale and does not meet the assumptions of normal distributions. The aim is to test the extent to which the internal factors of farmers (X1) and stakeholder support (X2) relate to the farmer communication network (Y1). The results of this correlation test are presented in Table 9.

Table 9. Correlation coefficient of internal factors and stakeholder support with farmer communication networks

No	Hypothesis	Variable Relationships	Correlation Coefficient (Spearman's rho)	Sig. (2-tailed)	Information
1	H1	X1 (Farmer Internal Factors) → Y1 (Communication Network)	0.072	0.229	Insignificant (p > 0.05)
2	H2	X2 (Stakeholder support → Y1 (Communication Network)	-0.128*	0.031	Significant (p < 0.05), negative correlation

*. Correlation is significant at the 0.05 level (2-tailed)

Spearman's correlation analysis showed that two of the three research hypotheses were statistically supported with varying results. In hypothesis 1, the relationship between X1 (farmer internal factors) and Y1 (communication network) showed a correlation coefficient of 0.072 with a significance value of 0.229 (p > 0.05). These results indicate that there is no statistically significant relationship, so the H1 hypothesis is rejected. These findings suggest that the internal characteristics of farmers such as age, education level, farming experience and number of family members do not directly correlate with the quality of the communication networks built. This indicates that the formation of an effective communication network is influenced more by external factors than by the individual capacity of farmers. Therefore, a structural approach is needed in building communication networks, not just relying on increasing the capacity of individual farmers.

In hypothesis 2, the relationship between X2 (stakeholder support) and Y1 (communication network) has a correlation coefficient of -0.128 with a significance of 0.031 (p < 0.05). Although it indicates a negative relationship direction, this outcome is significant at a confidence level of 95 %, so that the H2 hypothesis is accepted. A significant negative correlation shows that the current form of stakeholder support is actually hindering the development of farmers' communication networks. The inhibition of establishing an effective communication network is due to diversity and potential conflicts of interest among stakeholders such as government agencies, educational institutions, and organizations (Kelliher, Aylward and Lynch, 2014; Flor *et al.*, 2023). The involvement of many actors without clear coordination also leads to a lack of a consistent and accessible flow of information by farmers (Valujeva *et al.*, 2023; Sospeter and Maselle, 2024). This phenomenon can be explained through several mechanisms, namely: (1) Program inconsistency where stakeholder support such as equipment subsidies, modern

technology, and fertilizer distribution is not in line with the needs of farmers; (2) Network fragmentation where the formation of farmer corporations with the concept of multi-commodities and various business units, which should facilitate the exchange of resources between farmers in practice is not optimal. This is due to the ineffective coordination between business units in the corporation; (3) Structural barriers in the form of top-down support can reduce horizontal communication initiatives between farmers, as farmers tend to rely on formal channels rather than building more adaptive informal communication networks. This can also be interpreted as an indication of coordination fragmentation and suboptimal cross-actor synergy.

The existence of stakeholders should be based on common interests so that it has the potential to build collaborative relationships, encourage constructive information exchange, and strengthen the social learning process and coordination skills between actors (Guo, Marquart-Pyatt and Robertson, 2025). In line with opinion Saliem et al. (2024) which emphasizes the importance of strategic collaboration between farmers, governments, companies, and rural cooperatives that serve as intermediaries that connect farmers to industrial markets and increase farmers' incomes through collaborative networks that support sustainable farming systems. The results of the analysis confirm that communication networks are a key mediating variable between external support and institutional growth of farmers. However, a reformulation of stakeholder support strategies is needed to be more responsive to the needs of farmers and not hinder the formation of more effective organic communication networks.

The findings of the study confirm the relevance of Parsons' Social Systems Theor, which states that the effectiveness of social systems depends on the functions of adaptation, integration, and coordination. In the context of farmer communication, this theory explains that: (1) Adaptation is the ability of communication networks to adapt to technological changes and farmers' needs; (2) Integration is the process of unifying various communication elements in one coherent system; (3) Coordination in the form of alignment of communication activities between various actors to achieve common goals.

3.5. Strategy to Increase Stakeholder Support for Farmer Corporations

Some of the strategies needed to increase stakeholder support in farmer corporations include through: (1) Synergy multi-stakeholder in the form of collaborative cooperation between stakeholders through program harmonization. Alignment of communication programs from various stakeholders to avoid duplication and conflicts of interest; (2) Increasing the use of information technology and digital literacy. This is because the low digital literacy of farmers is a structural obstacle that hinders the optimization of communication networks (Liu *et al.*, 2025); (3) Optimization of platforms such as WhatsApp and Zoom has proven to be effective in forming a wider communication network, both horizontal (between farmers) and vertical (with stakeholders). Communication interactions are strengthened through technical training and guidance as well as communication through social media, which creates a social information network that supports increasing farmers' efficiency and productivity (Sutata, Sadono and Marhaento, 2023). The government, the private sector, financial institutions, universities, and change agents must work together to provide integrated support in the development of farmer corporations (Rahmatika *et al.*, 2024).

Fragmented communication networks risk weakening farmers' competitiveness in agribusiness supply chains, as they hinder the flow of information needed for strategic decision-making. Strengthening communication networks between farmers and stakeholders is a key determinant in increasing productivity, sustainability, and food security. The effectiveness of communication, coordination, and collaboration has the potential to strengthen the institutional

foundations of farmer corporations and become a crucial strategy in inclusive and sustainable agricultural development.

This study contributes to the development of development communication theory and supports the utilization of Parsons' Social System Theory approach in explaining the importance of integration, adaptation, and coordination of communication in network-based agricultural development by emphasizing the importance of the centrality of local actors in distributing agricultural innovations in the development of farmer economic institutions in Indonesia. First, strengthening communication networks has proven to be the main prerequisite in building an inclusive and sustainable farmer corporation. This emphasizes that institutional development strategies are not enough to rely solely on technical approaches but also require structured and participatory communication interventions. Second, stakeholder support, which has been fragmented, needs to be reformulated in the form of cross-sector collaboration that is more synergistic and responsive to the needs of farmers. Third, the importance of empowering local actors, such as voluntary agricultural extension workers, must be recognized as a strategic element in strengthening horizontal information networks at the grassroots level. Fourth, the low digital literacy of farmers is a challenge in accelerating technology-based communication, so affirmative policies are needed in the form of digital literacy programs and strengthening communication capacity. In practical terms, these results can be the basis for designing network-based policy interventions to strengthen farmers' economic institutions.

4. Conclusion

This research confirms that the success of farmer corporations is highly dependent on the effectiveness of communication networks and the involvement of stakeholders in a sustainable and coordinated manner. The roles of stakeholders such as governments, universities, the private sector, financial institutions, and agents of change have diverse, but not fully synergistic contributions. Voluntary agricultural extension workers have proven to be key actors in strengthening information networks at the local level. Farmers who occupy a central position in the communication network from the dimensions of degree centrality level, the closeness centrality and the betweenness centrality tend to have greater capacity to access and disseminate information that is technical and strategic, especially related to production aspects. In contrast, farmers have a low level of connectivity in the network more limited to access and exchange of information that is practical and general, such as information about marketing. The hypothesis test showed that the internal factors of farmers had no significant effect on the communication network, while the support of stakeholders had a significant negative correlation, reflecting the gap between the support provided and the effectiveness of the network formed.

This study recommends that there is a need for a cross-sectoral coordination strategy so that stakeholder support is not fragmented and on target, communication transformation based on digital technology needs to be expanded to strengthen connectivity and adoption of innovation, strengthening digital literacy capacity and local actors must be a priority so that farmers are able to access and disseminate strategic information, cooperatives and business units formed need to be accompanied intensively, not only in the legal-formal aspect, but also in management, business management, and partnership network building.

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