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Agricultural Extension Roles and Innovation Barriers in Gorontalo Corn Farming Bontula Village

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Abstract

Agricultural extension plays an important role in strengthening farmers' capacity to adopt innovations in corn farming. This study analyzes the role of extension workers, identifies barriers to extension implementation, and examines the relationship between extension roles, perceived barriers, and corn productivity in Bontula Village, Asparaga Subdistrict, Gorontalo Regency. A survey was conducted in 2024 involving 30 corn farmers, purposively selected based on their participation in extension activities and membership in farmer groups. Data were collected using structured questionnaires and analyzed through descriptive statistics, a three-point Likert scale, and Spearman correlation. The findings show that extension workers were perceived to play an active role, particularly as motivators, with a mean score of 2.67, followed by facilitator and liaison roles, each with a mean score of 2.60. The main barriers were limited facilities and infrastructure, limited access to information, weak marketing networks, and uneven farmer participation. Spearman correlation results indicate positive but non-significant relationships between extension roles and corn productivity. These findings suggest that extension services have contributed to farmers' motivation and knowledge, but their facilitation and liaison functions need strengthening to support the adoption of practical innovations.

Keywords: agricultural extension, corn production, innovation adoption, corn productivity, farming.

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INTRODUCTION

Indonesia is an agrarian country with significant potential in the agricultural sector, both in terms of natural resources and labor. This sector plays a strategic role in supporting food security and improving community welfare, particularly in rural areas (Rhofita, 2022). One of the key commodities in agricultural development is corn, which serves not only as a food source but also as an industrial raw material and livestock feed. Corn is the primary non-rice crop in Indonesia in terms of cultivation and the use of its products, namely as a raw material for food and feed (FAO et al., 2023). The increasing demand for corn each year necessitates the development of sustainable farming practices through the application of agricultural technology and innovation (Sukratman, 2022).

Efforts to develop corn farming are inseparable from the role of agricultural extension workers as agents of change within the agribusiness system. Agricultural extension workers play a vital role in transferring knowledge, technology, and skills to farmers to improve the productivity and efficiency of their farming operations (Tobing et al., 2023). Agricultural extension plays a vital role in boosting agricultural production, particularly in Indonesia (Li et al., 2020). From a diffusion theory perspective, extension workers act as change agents who facilitate innovation diffusion through the stages of knowledge, persuasion, decision, implementation, and confirmation. The success of this diffusion process is largely determined by the effectiveness of communication between extension workers and farmers, as well as supportive socioeconomic conditions (Rogers, 2003).

In practice, agricultural extension serves not only as a means of conveying information but also as a process of empowering farmers. Extension workers are expected to act as motivators, facilitators, and liaisons between farmers and various stakeholders, such as the government, financial institutions, and the market. Research by Sapbamrer & Thammachai (2021) indicates that the role of extension workers in motivating farmers significantly affects the adoption of agricultural innovations. However, other studies indicate that the roles of facilitation and network access remain major weaknesses in agricultural extension, leading to low levels of innovation implementation at the farmer level (Abdullah et al., 2023).

This situation is also relevant to the conditions in Bontula Village, Asparaga Subdistrict, Gorontalo Regency, where some farmers still face limitations in accessing information, technology, and marketing networks. Although extension activities have been conducted, their effectiveness in supporting the development of corn farming still needs to be examined more thoroughly. This indicates that the success of extension services is not solely determined by the

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intensity of activities but also by the quality of the extension workers' roles and the support of the existing system.

Extension workers with strong competencies can make a significant contribution to improving productivity, quality, and the sustainability of agricultural production (Hermadan et al., 2024). Based on the above, this study aims to analyze the role of agricultural extension workers in supporting corn farming, identify barriers to the implementation of extension services, and examine the relationship between extension workers' roles, barriers, and corn farming productivity in Bontula Village, Asparaga Subdistrict, Gorontalo Regency. This study is expected to contribute to the development of more effective extension strategies to improve agricultural productivity and farmers' welfare.

Previous research has extensively discussed the role of agricultural extension workers in supporting farming operations or the adoption of innovations in the corn sector. However, studies that specifically examine the imbalance in the roles of extension workers as motivators, facilitators, and liaisons in supporting the innovation adoption process at the farm level remain limited. In the context of Bontula Village, this issue is particularly significant because farmers still face limited access to production inputs, information, and marketing networks, thereby affecting the effectiveness of agricultural extension activities (Blum et al., 2020).

Research on the role of agricultural extension workers in corn farming has been widely conducted, particularly in explaining their functions as sources of information, technical advisors, and motivators for farmers. However, most studies still treat the extension worker's role as a single, generalized entity, so few have distinguished the imbalance in the extension worker's functions as a motivator, facilitator, and connector in the innovation adoption process. In fact, the success of extension is determined not only by the extension workers' ability to increase farmers' knowledge and motivation but also by their capacity to facilitate farmers' access to production inputs, technology, institutions, and markets. Therefore, this study is important for examining the extent to which the role of agricultural extension workers is balanced and for identifying the factors that hinder the implementation of innovations in corn farming in Bontula Village.

Numerous studies have examined the role of agricultural extension workers in corn farming, particularly in elucidating their functions as sources of information, technical advisors, and motivators for farmers. However, most studies still treat extension workers as a single, generalized category, so few have distinguished among their functions as motivators, facilitators, and intermediaries in the innovation adoption process. In fact, the success of extension is determined not only by the extension workers' ability to increase farmers' knowledge and

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motivation, but also by their capacity to facilitate farmers' access to production inputs, technology, institutions, and markets. Therefore, this study is important for examining the extent to which the roles of agricultural extension workers are balanced and for identifying the factors that hinder the implementation of innovations in corn farming in Bontula Village.

Previous studies on agricultural extension in corn farming have generally examined extension workers' roles as a unified function. Limited attention has been given to the imbalance among the motivational, facilitative, and liaison functions in supporting farmers' adoption of innovation. This gap is important because innovation adoption depends not only on farmers' awareness and motivation, but also on access to inputs, technical assistance, institutions, and markets. Therefore, this study contributes by distinguishing the three extension roles and linking them with perceived barriers and corn productivity in a rural farming context.

RESEARCH METHODOLOGY

This study was conducted in Bontula Village, Asparaga Subdistrict, Gorontalo Regency, in 2024. The location was selected purposively because it is one of the corn-farming areas where agricultural extension activities have been regularly implemented. The study employed a descriptive, quantitative survey to examine farmers' perceptions of the role of agricultural extension workers and the barriers to adopting innovation in corn farming.

Respondents were selected using a criterion-based purposive sampling approach. This technique was considered appropriate because the study required respondents with direct experience in corn farming and agricultural extension activities. A total of 30 corn farmers were selected based on the following criteria: active in corn farming, members of farmer groups, and had participated in agricultural extension activities during the 2024 growing season (Etikan et al., 2015). These criteria ensured that respondents could provide relevant information on the motivational, facilitative, and liaison roles of extension workers (Etikan et al., 2015).

Data were collected using a structured questionnaire supported by field observation and documentation. The questionnaire was developed based on the theoretical framework of agricultural extension and innovation diffusion (Rogers, 2003). The role of extension workers was measured through three indicators: motivator, facilitator, and liaison. The barriers to extension implementation were measured through four indicators: limited facilities and infrastructure, limited access to information, limited marketing networks, and uneven farmer participation (Blum et al., 2020; Pitri, Marna Adisa, 2025). The mean value was calculated using the formula:

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$$\bar{X} = \frac{\sum Xi}{n}$$

Each item was measured using a three-point Likert scale: 3 = active role/inhibiting, 2 = limited role/less inhibiting, and 1 = no role/not inhibiting (Rössert et al., 2022; Koo & Yang, 2025). The data were analyzed using descriptive statistics, including frequency distributions, percentages, and mean scores. The mean scores were classified into three categories: 1.00–1.66 = low, 1.67–2.33 = moderate, and 2.34–3.00 = high. Spearman's rank correlation was also used to examine the simple relationship between the role of extension workers, extension barriers, and corn productivity. This method was selected because the main variables were measured using ordinal perception data, and the number of respondents was relatively limited.

Table 1. Measurement Indicators and Item Distribution

Variable	Indicator	Total Item	Scale
Extension role	Motivator	3–5 items	1–3
Extension role	Facilitator	3–5 items	1–3
Extension role	Liaison	3–5 items	1–3
Barriers	Facilities, information, market, participation	4 items	1–3

The research instrument was developed based on theoretical foundations and has undergone substantive feasibility testing. The questionnaire was developed based on the theoretical framework of agricultural extension and innovation diffusion. The indicators were constructed to represent the three main roles of extension workers as motivators, facilitators, and liaisons, as well as the major barriers to extension implementation. Before data collection, the instrument was reviewed substantively to ensure that each item was consistent with the research objectives and understandable to respondents. Since the study focused on descriptive perception measurement rather than latent-construct modeling, the analysis emphasized frequency distributions, percentages, mean scores, and Spearman correlations.

The analysis results were interpreted descriptively to provide an overview of the state of agricultural extension and the challenges in supporting corn farming in the study area. In addition to descriptive analysis, this study employed Spearman's correlation test to analyze the relationships among the role of agricultural extension workers, barriers to extension, and corn farming productivity.

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$$rs = 1 - \frac{6 \sum Di^2}{n(n^2 - 1)}$$

Spearman's test was used because the data on the role of extension workers and barriers were ordinal, and the number of respondents was relatively limited. The variables tested included the relationships among the roles of motivator, facilitator, and liaison, the index of barriers, and corn productivity. Corn productivity was calculated as the ratio of corn production to cultivated land area, expressed in kilograms per hectare. The interpretation of correlation coefficients was based on the direction and strength of the relationship, as well as the significance level at $\alpha = 0.05$ (Dwijatenaya et al., 2024; Sulaksana et al., 2024; Samaria et al., 2025).

DISCUSSION

Overview of the Research Location

Bontula Village, Asparaga Subdistrict, Gorontalo Regency, has considerable agricultural potential, particularly for corn. Most residents earn their livelihoods as farmers, making the agricultural sector the mainstay of the village economy. This situation indicates that the development of corn farming holds significant potential, although it still faces various constraints.

Agricultural extension activities in this village have been conducted regularly to improve farmers' knowledge and skills. However, the level of innovation adoption by farmers has not yet been fully optimized. This indicates that the effectiveness of extension is determined not only by the intensity of activities but also by extension workers' ability to address farmers' needs and by supportive socio-economic conditions.

From the perspective of innovation diffusion theory, this situation indicates that the innovation adoption process has reached the knowledge and persuasion stages but has not yet reached an optimal level in the implementation stage. Limited access to production inputs, information, and marketing networks is the primary factor hindering the implementation of innovations in corn farming.

Respondent Profile

Table 1 presents the profiles of the 30 respondents in this study and the diversity of their characteristics. These characteristics were obtained through questionnaires and face-to-face interviews with respondents (Etikan et al., 2015). Table 1 shows that the majority of respondents fall within the productive to older age groups, with a predominance in the 36–50 age range, followed by farmers aged 50 and older. This indicates that corn farming in Bontula Village is still

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dominated by experienced farmers, with the younger generation's involvement relatively minimal. This phenomenon aligns with the research by Arvianti et al. (2019), which states that the agricultural sector faces a farmer regeneration crisis due to the younger generation's low interest in entering the sector.

Table 2. Respondent Characteristics Based on Age, Education, and Farming Experience

No.	Characteristics	Category	Number (People)	Percentage (%)
1	Age	20–35 years	8	26.67
		36–50 years	12	40.00
		>50 years	10	33.33
		Total	30	100
2	Education	Elementary School	12	40.00
		Junior High School	10	33.33
		Senior High School	8	26.67
		Total	30	100
3	Farming Experience	< 5 years	6	20.00
		5–10 years	11	36.67
		>10 years	13	43.33
		Total	30	100

The predominance of older farmers affects the effectiveness of agricultural extension services. Older farmers tend to have extensive experience but, in some cases, are less adaptable to new innovations. From the perspective of the theory of innovation diffusion by Pilowani, Halid, and Saleh (2024), this group generally falls into the late adopter category, that is, a group that tends to be more cautious in adopting innovations. This impacts the role of agricultural extension workers, who need to be more proactive in employing persuasive approaches and providing guidance so that innovations can be accepted and implemented by farmers.

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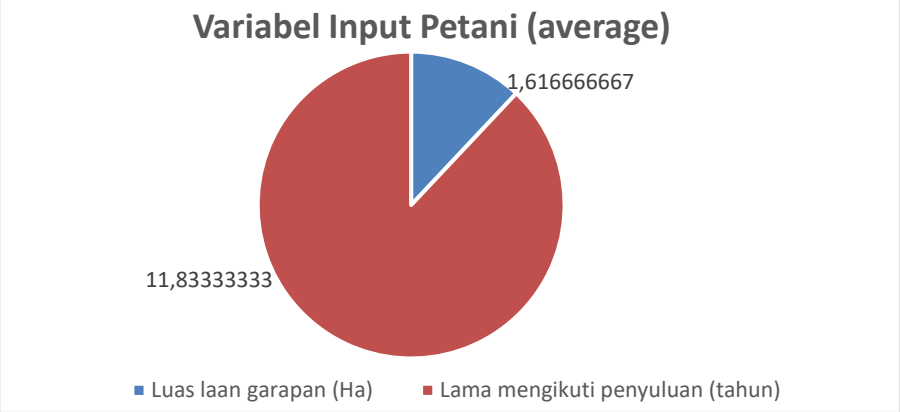


Figure 1. Farmer Input Variables

In terms of education, the majority of respondents had a primary school education, followed by junior high school and senior high school. This low level of education may affect farmers' ability to understand extension materials, particularly those related to new technologies or innovations in corn cultivation. Research by Charina et al. (2018) indicates that educational level significantly influences the adoption rate of agricultural innovations. Therefore, the role of extension workers as motivators is crucial in conveying information through simple, easily understood methods.

Meanwhile, regarding farming experience, the majority of respondents have over 10 years. This indicates that farmers possess fairly good practical knowledge in agricultural activities. However, extensive experience does not always guarantee openness to innovation, as farmers tend to stick to cultivation practices they have deemed successful. This situation can act as a barrier in the implementation of agricultural extension, particularly during the innovation implementation phase.

Overall, the characteristics of the respondents in this study indicate that the success of agricultural extension in Bontula Village is heavily associated by the farmers' socioeconomic conditions. The role of extension workers as motivators is more readily accepted by farmers, but their roles as facilitators and liaisons are more challenging because farmers have limited ability to access and implement innovations. Additionally, factors such as age, education, and experience act as barriers to the extension process, as they influence farmers' mindsets, levels of participation, and abilities to adopt new technologies.

Thus, the characteristics of the respondents indicate that the success of agricultural extension is significantly influenced by farmers' socioeconomic conditions. The extension worker's

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role as a motivator is relatively more readily accepted, whereas the roles as a facilitator and liaison are more challenging due to limited access to resources. Therefore, the extension approach needs to be tailored to farmers' characteristics to be more effective in promoting the adoption of corn-farming innovations.

The Role of Agricultural Extension Agents in Corn Farming

Agricultural extension agents play a crucial role in supporting the development of corn farming by serving as motivators, facilitators, and liaisons. This role is closely linked to the process of innovation adoption at the farmer level (Blum et al., 2020; Fajriani & Hayati, 2024).

Table 3. Roles of Agricultural Extension Agents

Indicators	Active Role (%)	Less Active Role (%)	No Role (%)	Mean	Category
Motivator	66.67	33.33	0.00	2.67	Active Role
Facilitator	60.00	40.00	0.00	2.60	Active Role
Liaison	60.00	40.00	0.00	2.60	Active Role

Table 2 shows that agricultural extension workers are generally considered to play a role in supporting corn farming in Bontula Village. All indicators of the extension workers' role fall into the "play a role" category, with average scores ranging from 2.60 to 2.67. The role as a motivator received the highest score, 2.67, with 66.67% of respondents stating that extension workers play a role in providing encouragement, building enthusiasm, and raising farmers' awareness of the importance of developing corn farming. This finding indicates that the motivational function is relatively more readily accepted by farmers because it is directly related to improving farmers' knowledge, attitudes, and willingness to participate in extension activities.

Meanwhile, the roles of extension workers as facilitators and liaisons each received an average score of 2.60, with 60.00% of respondents stating that they "play a role." Although both indicators still fall within the "play a role" category, their scores are lower than those of the motivator role. This situation indicates that extension workers have not yet fully optimized their roles in meeting farmers' needs, particularly in access to production inputs, cultivation technologies, agricultural information, institutional support, and marketing networks. Thus, the role of extension workers in Bontula Village is stronger in building farmers' motivation and awareness, but still needs to be strengthened in terms of facilitation and linking with external parties.

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From the perspective of innovation adoption, these findings indicate that extension services have been effective in the knowledge-building and persuasion stages, but have not yet been fully effective in the implementation stage. Farmers can receive information and encouragement from extension workers, but the adoption of innovations at the farm level still depends on the availability of production inputs, access to capital, institutional support, and market certainty. Therefore, improving the quality of extension services is not sufficient if limited to the delivery of materials; it must also focus on practical guidance so that farmers can effectively apply innovations in their corn farming activities.

Barriers to the Implementation of Agricultural Extension

All barrier indicators fall into the "hindering" category (Table 3). The most dominant barrier is the lack of facilities and infrastructure, with a 63.33% share and an average score of 2.63. This situation indicates that most farmers still face limitations in accessing the technical support, tools, materials, and facilities needed to implement corn farming innovations. These limitations may prevent the innovations conveyed by extension workers from being fully applied in actual field cultivation practices.

The next barrier is limited access to information, with a 60.00% share and an average score of 2.60. This indicates that the dissemination of agricultural information has not yet been fully equitable among all farmers. Limited access to information can slow the adoption of innovation because farmers do not receive sufficient information on cultivation technologies, the use of production inputs, pest and disease control, or market opportunities. In the context of extension services, this situation indicates that communication channels between extension workers and farmers still need to be strengthened.

Limitations in marketing networks also represent a significant barrier, with a 56.67% share and an average score of 2.57. This barrier indicates that some farmers still face difficulties in accessing more profitable markets. In fact, the success of innovation adoption is determined not only by farmers' ability to increase production but also by the availability of market guarantees and fair selling prices. If marketing networks are not yet robust, farmers' motivation to adopt innovations may decline because increased production does not necessarily translate into higher income.

Meanwhile, uneven farmer participation accounted for 53.33% and had an average score of 2.53. This situation indicates that not all farmers are equally engaged in extension activities. Some farmers may actively participate in extension activities, but others have not yet been fully

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engaged. Consequently, there is a knowledge and skills gap among farmers in implementing corn farming innovations. Thus, the barriers to extension in Bontula Village are not only technical but also related to access to information, institutional factors, marketing, and farmer participation.

Table 4. Inhibiting Factors of Agricultural Extension Services

Inhibiting Factors	Inhibiting (%)	Less Inhibiting (%)	Not Inhibiting (%)	Mean	Category
Limited facilities and infrastructure	63.33	36.67	0.00	2.63	Inhibiting
Limited access to information	60.00	40.00	0.00	2.60	Inhibiting
Limited marketing networks	56.67	43.33	0.00	2.57	Inhibiting
Uneven farmer participation	53.33	46.67	0.00	2.53	Inhibiting

Overall, these results indicate that the effectiveness of agricultural extension is determined not only by the presence of extension workers but also by the support of an agribusiness system that enables farmers to adopt innovations effectively. Therefore, efforts to strengthen extension services should focus on providing access to production inputs, improving agricultural information services, strengthening farmer groups, and expanding marketing networks.

Overall, these findings indicate that barriers to extension implementation are multidimensional. Limited facilities and infrastructure, information access, marketing networks, and uneven farmer participation jointly weaken the effectiveness of extension services. Therefore, strengthening agricultural extension should not focus only on increasing the frequency of extension meetings, but also on improving farmers' access to inputs, information, institutional support, and markets.

Table 5. Results of the Spearman Correlation Test

Relationship Tested	Variable X	Variable Y	n	Spearman	Value	Decision/ Interpretation
Role of motivator and corn productivity	Motivator	Productivity (kg) per ha	30	0.343	0.063	Not significant at α = 5%; positive direction, weak strength

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Role of facilitator and corn productivity	Facilitator	Productivity (kg) per ha	30	0.189	0.318	Not significant at α = 5%; positive direction, very weak strength
Role of liaison and corn productivity	Liaison	Productivity (kg) per ha	30	0.157	0.407	Not significant at α = 5%; positive direction, very weak strength
Inhibiting factors and corn productivity	Inhibiting Factors Index	Productivity (kg) per ha	30	0.278	0.138	Not significant at α = 5%; positive direction, weak strength

To estimate the aggregate level of constraints, the arithmetic mean approach was used as a linear aggregation function, namely $H_{agg} = \frac{1}{n}\sum_{i=1}^{n} H_i$, with $n = 4$. Substitution of the empirical values produced $H_{agg} = 58.33$. Interpretatively, this value indicates that the agricultural extension system faces moderately high constraints, suggesting that more than half of its optimal capacity has not yet been effectively operationalized due to internal and external limitations.

The degree of heterogeneity among the dimensions of constraints was measured using the range statistic, namely $\Delta H = H_{max} - H_{min}$. With $H_{max} = 63.33$ $H_{min} = 53.33$ yielding $\Delta H = 10.00$. This value indicates moderate variability among the components of constraints, suggesting an uneven distribution of constraints. Facilities and infrastructure constitute the dominant factor, while farmer participation represents the dimension with a relatively lower contribution to constraints, although it remains systemically significant.

Within the framework of system modeling, extension constraints can be formulated as a multivariate function $H_{system} = f(H_1, H_2, H_3, H_4)$. Under the assumption of linearity, the model can be expressed as a weighted combination $\sum w_i = 1$. Under the condition of homogeneous weights $, where\ w_i = 0.25$. The result was $H_{system} = 58.33$, which is consistent with the empirical mean. This indicates that, structurally, each dimension provides an equivalent contribution within the basic model, although empirically there are indications of potential asymmetry in contributions that may be further examined using weighted regression or the Analytical Hierarchy Process (AHP).

Furthermore, the system of constraints can also be analyzed in Euclidean space using the vector norm $\| \mathbf{H} \| = \sqrt{\sum_{i=1}^{4} H_i^2}$, which yields the value $\| \mathbf{H} \| \approx 200.25$. Conceptually, this value represents the magnitude of total systemic pressure within the agricultural extension system. The

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higher the norm value, the greater the intensity of constraints operating within the system, ultimately reducing its adaptive capacity and responsiveness to innovation.

Theoretically, the ideal condition of the agricultural extension system is expressed as the limit $\mathbf{H} \to \mathbf{0}$, which represents a constraint-free condition. However, the empirical results indicate that all components have values of $H_i \gg 0$, implying that the system is in a sub-optimal equilibrium condition, namely a stable state that is functionally inefficient in supporting knowledge transformation and innovation adoption at the farmer level.

Thus, overall, the system of constraints can be represented as $\mathbf{H} \in \mathbb{R}_{+}^{4}$, $H_{agg} = 58.33$, and $\Delta H = 10.00$. These findings indicate that improving the performance of the agricultural extension system cannot be achieved through partial interventions, but rather requires a systemic approach that targets all dimensions of constraints simultaneously to shift the system toward an efficient and adaptive state.

Relationship Between the Role of Agricultural Extension Agents and Inhibiting Factors with Corn Productivity

The results of the Spearman correlation test showed that the relationship between the role of agricultural extension agents and corn productivity was positive; however, not all relationships were yet significant at the$\alpha = 0.05$level. The role of the motivator showed the highest correlation with corn productivity, 0.343 with a p-value of 0.063. This value indicates a weak positive relationship and is close to significance at the 10% level, but it is not sufficiently strong to be declared significant at the 5% level. These findings indicate that the motivation provided by extension agents tends to be associated with corn productivity, although the relationship is not yet statistically strong. Corn productivity is influenced not only by farmer motivation but also by factors such as land area, the use of superior seeds, fertilizers, capital, farming experience, land conditions, climate, and market access.

Meanwhile, the role of the facilitator had a correlation value of 0.189 with a p-value of 0.318. This value indicates a very weak, non-significant positive relationship. This finding suggests that the facilitation function of extension agents has not yet shown a sufficiently strong relationship with corn productivity. This condition may occur because the facilitator role depends not only on the competence of extension agents but also on the availability of production facilities, program support, access to technology, and farmers' ability to implement technical recommendations in the field.

The role of the liaison also showed a very weak positive relationship with corn productivity,

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namely 0.157 with a p-value of 0.407. These results indicate that the function of extension agents as intermediaries between farmers and the government, financial institutions, input providers, and markets has not yet demonstrated a strong relationship with productivity. Thus, although extension agents are considered to play a role in supporting corn farming, the liaison function still needs to be strengthened to enable farmers to obtain better access to agribusiness institutions.

The relationship between the inhibiting factors index and corn productivity showed a correlation value of 0.278 with a p-value of 0.138. The positive, non-significant relationship indicates that the constraints perceived by farmers have not directly explained variation in productivity in this study. These findings should be interpreted cautiously because the inhibiting factors measured in this study were perception-based, whereas corn productivity is influenced by many technical and economic factors. Therefore, the Spearman correlation results in this study cannot be interpreted as causal, but rather as a simple description of the relationship between variables.

Overall, the Spearman correlation results reinforce the descriptive findings that the role of extension agents has been evident in the motivational aspect, but has not yet been sufficiently strong to encourage a real increase in productivity. This indicates that agricultural extension activities in Bontula Village should be directed not only toward improving knowledge and motivation but also toward assisting in the implementation of innovations, strengthening access to production inputs, developing farmer institutions, and expanding marketing networks.

Implications for Strengthening Agricultural Extension Services

The findings of this study imply that strengthening agricultural extension services in Bontula Village cannot be achieved merely by increasing the intensity of meetings between extension agents and farmers. Extension activities need to be directed toward approaches that are more applicable, participatory, and based on farmers' needs. Extension agents should not only serve as information providers but also as facilitators, helping farmers access production inputs, understand cultivation technologies, strengthen farmer group institutions, and build marketing networks.

The role of extension agents as motivators needs to be maintained because it is closely related to shaping farmers' attitudes and willingness to adopt innovations (Anderson & Feder, 2004; Swanson & Rajalahti, 2010). However, the functions of facilitator and liaison need to be strengthened so that the innovation adoption process does not stop at the knowledge and persuasion stages, but continues to the implementation stage at the farm level. Strengthening the

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facilitation function can be achieved through more intensive technical assistance, the provision of easy-to-understand and cultivation information, and coordination with relevant parties to supply production inputs (Wahyudi et al., 2024; Dwijatenaya et al., 2024). Meanwhile, strengthening the liaison function can be achieved by expanding farmers' access to financial institutions, input suppliers, village governments, agricultural agencies, and market actors.

Thus, the extension strategy needed in Bontula Village is not only focused on delivering materials but also on directly solving farming problems. This approach is important so that extension activities can make a more tangible contribution to improving farmers' capacity, promoting the adoption of innovation, and supporting the sustainable development of corn farming.

CONCLUSION

The study found that agricultural extension agents in Bontula Village were perceived to play a role in supporting corn farming activities. The highest role was the motivator, with an average score of 2.67, while the facilitator and liaison roles had average scores of 2.60. Overall, the average score of the extension agents' role was 2.62, which falls within the "active role" category. These findings indicate that extension agents have been fairly effective in building farmers' motivation, awareness, and positive attitudes toward innovation; however, the facilitation and liaison functions still need to be strengthened.

The main inhibiting factors in the implementation of agricultural extension activities included limited facilities and infrastructure, restricted access to information, underdeveloped marketing networks, and uneven farmer participation. The most dominant constraint was the limitation of facilities and infrastructure, with an average score of 2.63, followed by limited access to information (2.60), limited marketing networks (2.57), and uneven farmer participation (2.53). These conditions indicate that the effectiveness of agricultural extension is determined not only by the role of extension agents but also by the support of the agribusiness system that enables farmers to practically implement innovations (Anderson & Feder, 2004; Swanson & Rajalahti, 2010).

The Spearman correlation test showed that the roles of motivator, facilitator, and liaison were positively associated with corn productivity, although the relationships were not significant at the 5% level. The motivator role showed the highest relationship with corn productivity, but the strength of the relationship remained weak. Thus, the role of extension agents tends to be associated with productivity, but it is not yet strong enough to statistically explain the variation in

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farmers' productivity. Therefore, improving the quality of agricultural extension services should focus on strengthening facilitation and liaison functions, particularly by providing access to production inputs, technological information, institutional support, financing, and marketing (Wulandari et al., 2021; Wahyudi et al., 2024; Dwijatenaya et al., 2024).

This study has limitations: This study provides a contextual understanding of agricultural extension roles and innovation barriers in corn farming at the village level. Future studies may expand the sample size and include additional technical and economic variables to provide a more comprehensive explanation of productivity differences among farmers.

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