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Effectiveness of the role of agricultural extension workers in clove cultivation in Enrekang Regency (Case study in Buntu Barana Village, Curio District, Enrekang Regency)

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Abstract: Extension workers are among the contributors to agricultural activities. They are to provide guidance and knowledge through the latest information or innovation to enhance farming systems, which ultimately increases crop yields. Additionally, extension workers pursue to transform the behavior of farmers, for instance, their ability to adapt to continually changing situations and conditions. This research aims to analyze the role and effectiveness of agricultural extension in clove plantations in Enrekang Regency. The research was carried out in Buntu Barana Village, Curio District, Enrekang Regency, with 100 farmers as respondents. The results revealed that the extension process employing a group approach method attended by farmers and extension workers who provide knowledge regarding clove cultivation, starting from seeding, maintenance and fertilization, pest control, and postharvest, was successful, meeting farmers' expectations. In this case, the instructor carries out his role well and effectively. The roles of agricultural instructors are facilitators, communicators, and motivators in the clove cultivation in Buntu Barana Village, Curio District, and they have been considered by the farmers effective in carrying out all roles, especially in clove cultivation activities.

Keywords: Competence; Facilitator; Farmer; Motivator

Introduction

Agriculture is one of the main contributors to the economy and the communities' welfare of countries, including Indonesia (Aryawati & Budhi, 2018). Agricultural extension workers' role can be of great contribution to the expanding agricultural productivity in Indonesia (Budi, 2018). Several activities of extension workers can be employed to increase farmer productivity and welfare, especially in terms of technology development and agricultural business management. Yoyon and Wiwik (2017) stated that extension workers are required in order to empower farmers both independently and institutionally. The role of educators, leaders, and advisors is necessary in order to identify and solve problems. Extension workers will be guiding, motivating, changing mindsets, and modeling efficiency to farmers. Furthermore, the role of agricultural instructors is to provide insight and guidance to farmers in order to provide optimal agricultural results, give innovation, and be skilled in carrying out various activities that are beneficial for productivity, income, and welfare (Oktafiani et al., 2021).

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One commodity that cannot be separated from the role of agricultural instructors is cloves (*Syzygium aromaticum* L.) in Enrekang Regency. Provinsi Sulawesi Selatan merupakan produsen urutan kedua di Indonesia sebagai penghasil komoditas cengkeh. Enrekang Regency is one of the largest clove production centers in South Sulawesi, ranking fifth and contributing 3.9% to the total production of the province (Ministry of Agriculture, 2022). Cloves are one of the plantation commodities that contribute to the country's economy, including raw materials for industries such as cigarettes, cosmetics, perfume, and spices. In addition to meeting increasing domestic needs, clove commodities from Indonesia are aimed at meeting foreign market demand (Asrawati & Antara, 2017). Enrekang Regency has 12 subdistricts that produce cloves, one of which is the Curio Sub-district. This subdistrict has dominant clove farmers in 11 villages, one of which is Buntu Barana Village. Clove farming in Buntu Barana Village is an agricultural business that has been operating for a long time. During 2017–2021, the average harvest area was 2,954.4 ha, with production and productivity average of 543.3 and 0.18 tons/ha, respectively (BPS, 2023). The potential of cloves must be developed by optimizing the role of extension workers. Extension workers' performance can improve if they have program development competence and there is continuous assessment (Tiraieyari et al., 2010). The effectiveness of extension services also depends greatly on the extension officer's ability to transfer information from institutions to farmers. The intensity of extension activities, where the more frequent the extension activities are conducted, the faster the process of adopting technological innovations will be. Intensive mentoring will make it easier for farmers to communicate (Sofia et al., 2022). Hence, leadership, communication, technology dissemination, and mastery of the technical fields that will be provided must be mastered by instructors (Sapar et al., 2012).

One of the most crucial tasks to consider is to ensure that the use of agricultural extension and education programs has a positive impact on farmers. This is shown by the role of extension workers, that is, to increase sustainable agricultural productivity and food security (Olorunfemi et al., 2020). Various studies have identified how agricultural extension workers influence agricultural performance in various commodities. Ragasa and Mazunda (2018) found that agricultural extension workers were closely related to the productivity of corn and bean farmers. Agricultural instructors also have a positive influence on farmer performance and productivity of rice, spinach, and other vegetable crops (Hernalius et al., 2018; Pasaribu & Novanda, 2022; Prihatin et al., 2018).

The literature shows that agricultural extension workers play an important role in farming system productivity, including that of clove plants. This study evaluates how effective agricultural extension workers successfully integrate their roles as facilitators, communicators, and motivators to enhance the productivity and quality of cloves. Based on actual conditions in the field, the low level of extension services is due to of lack of human resources. Thus, various problems are likely to arise from various interactions between extension workers and farmers. Therefore, this research must be carried out to determine the scope of the extension worker role of agricultural instructors in clove plants. This research mainly determines the role and effectiveness of agricultural extension to clove farmers in Enrekang Regency.

Method

The research was carried out in Buntu Barana Village, Curio District, Enrekang Regency, which is one of the villages whose residents cultivate cloves. This research will be conducted from May to July 2023. According to Field Agricultural Extension (PPL), there are 529 clove farmers in Buntu Barana Village. Buntu Barana Village is a clove production center in Enrekang Regency. According to Sugiyono (2017), if the population size is less than 100 people, the entire population is used as the sample. If the population size exceeds 100 people, the sample size is selected to be 10–20% of the total population. The sample number was determined based on the Slovin Formula as follows:

$$n = \frac{N}{1 + N(e)^2} = \frac{529}{1 + 529\ (0.10)^2} = 99.81 = 100 \ldots\ldots \quad 1)$$

where
n: Sample size/number of respondents
N: Population size
e: Margin of error which is the expected or set amount of error (10%)

Accordingly, the total sample is 100 clove farmers identified via simple random sampling methods; all farmers have the same opportunity to be selected. Data were collected in various ways, such as questionnaires, observations, and documentation. Qualitative–descriptive methods were employed to analyze the role and effectiveness of agricultural extension in clove cultivation. The analysis used was a Likert scale technique suitable to the indicator variables in Table 1 (Maulana et al., 2016; Sugiyono, 2017). The weighting of answers in terms of the role of extension workers in clove cultivation based on Likert comprises three criteria,

namely, scale 1 (no role), scale 2 (less role), and scale 3 (suitable role). Quantitative descriptive analysis using a Likert scale is a measurement tool used to assess the attitudes, opinions, and perceptions of an individual or a group of people regarding social phenomena. This scale is utilized to obtain data on the weight of each response provided by the respondents (Pasolong, 2020). To assess the role of extension workers, score interval calculations and recapitulation are conducted on variables X1.1, X1.2, and X1.3. Then, the extension worker criteria will be known with the values in Tables 2 and 3.

$$Interval\ score\ (\%) = \frac{\max \text{value} - \min value}{number\ of\ class} \times 100 \ldots\ldots 2)$$

$$= \frac{300-100}{3} \times 100 = 67\ \%$$

$$Recapitulation\ score\ (\%) = \frac{\max \text{value} - \min value}{number\ of\ class} \times 100..3)$$

$$= \frac{4200-1400}{3} \times 100 = 93{,}3\ \%$$

where

Max score for a question: Max score × respondents number × indicator number

Minimum question score: MinCscore × respondents number × indicator number

Table 1. Indicators of the role of agricultural extension workers (X1)

Subvariable	Indicator	Scale
Facilitator X1.1	1. Provision of a place for the teaching and learning process 2. Facilitation of farmers in accessing markets 3. Facilitation of farmers with capital 4. Facilitation of farmers in business partnerships	1–3
Communicator X1.2	1. Delivery of material by the instructor that is easy to understand 2. Provision of the latest information regarding clove farming 3. Behavior of instructors in conveying information (not polite, polite, and very polite) 4. Use of appropriate language in delivering the material 5. Potential to deliver material effectively	1-3
Motivator X1.3	1. Encouragement of farmers to advance their business clove farming 2. Encouragement of farmers to follow agricultural extension services 3. Encouragement of farmers to remain active in farmer groups 4. Support to farmer group activities 5. Encouragement of farmers to improve their entrepreneurial skills	1-3

Source: Modification from Maulana et al. (2016)

Table 2. Weighting scores for indicators X1.1, X1.2 and X1.3

Score indicator	Score variable			Criterion
	X1.1	X1.2	X1.3	
100–166	400–666	500–833	500–833	No role
167–233	667–933	834–1167	834–1167	Less role
234–300	934–1200	1168–1500	1168–1500	Suitable role

Table 3. Recapitulation of agricultural instructor role variables X1.1, X1.2, and X1.3

Score	Criterion
1400–2332	No role
2333–3266	Less role
3267–4200	Suitable role

Similar to the assessment of the role of worker extension, testing the effectiveness of the role in the implementation of clove cultivation is based on Likert and comprises three criteria, namely, scale 1 (ineffective), scale 2 (less effective), and scale 3 (effective) by looking at the indicators in Table 4 (Asrawati & Antara, 2017). To assess the effectiveness of extension workers, score interval calculations and recapitulation are carried out on variable Y. Then, the extension worker criteria will be known with the values in Table 5. The category scores can be known with the following formula:

$$Interval\ score\ (\%) = \frac{\max \text{value} - \min value}{number\ of\ class} \times 100 \ldots\ldots\ldots 4)$$

$$= \frac{300-100}{3} \times 100 = 67\ \%$$

$$Recapitulation\ score\ (\%) = \frac{\max \text{value} - \min value}{number\ of\ class} \times 100\ldots 5)$$

$$= \frac{2700-900}{3} \times 100 = 600\ \%$$

Where:

Max score for question Y: Max score × respondent number × indicator
Min score for question Y: Min score × respondent number × indicator

Table 4. The effectiveness of agricultural extension is assessed based on the implementation of clove cultivation practices by farmers.

Variable	Indicator	Scale
Implementation of clove cultivation (Y)	1. As recommended by agricultural instructors, use superior seeds. 2. Plant clove seeds properly as recommended by the instructor. 3. Carry out clove plant maintenance methods as recommended by the instructor. 4. Use the type of fertilizer recommended by the instructor. 5. Fertilize properly and correctly according to the instructions suggested by the instructor. 6. Carry out pest and disease control according to the instructions recommended by the instructor. 7. Use pesticides as recommended by the instructor. 8. Have processed the harvest as recommended by the extension agent. 9. Information provided by extension workers can increase farmer income.	1–3

Source: Modifications from Asrawati and Antara (2017)

Table 5. Weighting score for indicator Y and recapitulation to measure the effectiveness of the role of agricultural extension workers in clove cultivation

Interval score		Recapitulation score	
Score	Criterion	Score	Criterion
100–166	No role	900–1500	Ineffective
167–233	Less role	1501–2101	Less effective
234–300	Play a role	2102–2700	Effective

Result and Discussion

Respondents' characteristics

Table 6. Identity of respondents in Buntu Barana Village

Age group (years)	Number of people	Percentage (%)
20–37	44	44.00
38–55	37	37.00
56–75	19	19.00
Total	100	100.00
Level of education	**Number of people**	**Percentage (%)**
Elementary School	40	40.00
Junior High School	22	22.00
Senior High School	34	34.00
S1	4	4.00
Total	100	100.00
Number of family dependents	**Number of people**	**Percentage (%)**
1–2	39	39.00
3–4	37	37.00
5–7	24	24.00
Total	100	100.00
Farming for a long time	**Number of people**	**Percentage (%)**
1–18	55	55.00
19–36	27	27.00
37–55	18	18.00
Total	100	100.00

Source: Primary data analysis, 2023

Table 6 shows the demographic characteristics of farmers in Buntu Barana Village. The majority of respondents (44%) are aged 20–37 years. Age greatly influences abilities in the clove cultivation process, such as physical ability and mindset. Rohani (2004) stated that the productive age in farming ranges from 15 to 55. This shows that the respondent farmers are those of productive age as classified by extension workers.

In general, 40% of respondents have elementary school education. This shows that there is a chance that respondent farmers will have challenges accepting new innovations related to clove technological processes. This is in line with the opinion of Ichwan (2015) who stated that the ease of adopting technology and innovation will be directly proportional to the farmer's education level. The number of families supported by farmers between 1 and 4 reaches 76%. These family dependents will affect the level of welfare because the cost of living will be linear with the number of dependents in the family (Purwanto & Taftazani, 2018).

The length of time farming shows the experience and level of interaction experienced in a person's life in their environment. Through experience, a person will gain knowledge, skills, or even an understanding of something, in this case, the management of clove

plantations, which he has been involved in for a long time. Table 6 shows that 55% have experience in farming for up to 18 years, and the rest have years of experience that are even more. This shows that the respondent farmers are experienced. This will have an impact on the ability to understand something (Erliadi, 2015), in this case, the information provided by the instructor. Hence, they are categorized as very experienced in managing clove farming.

Agricultural extension process in implementing clove plant cultivation

Extension activities conducted by extension workers through various trainings aim to increase agricultural yields, farmer income, and food security, thereby enhancing farmer welfare. This necessitates a process that considers that farmers in Buntu Barana Village have a low level of education although they are of productive age. Activities by extension workers provide positive results including improving leadership skills, communication, and transfer of innovative information in clove cultivation. Extension workers initiate various activities in the form of groups so that farmers can discuss and share experiences with their fellow farmers. Discussion and sharing methods initiated by agricultural instructors have numerous benefits. Scarborough et al. (1997) stated that the farmer-to-farmer (F2F) method is the delivery of knowledge and information by farmers to their fellow farmers, usually using farmer leaders and farmer extension workers. F2F is regarded to be a useful approach in technology dissemination and was built on confidence (Kiptot and Franzel 2014). Various knowledge can spread to numerous farmers without spending much money. Farmers become more open to trying new technologies after being recommended by trusted and reliable sources (Bentley et al., 2013; Hird-Younger & Simpson, 2013). Apart from being a fun method, the extension material provided is considered appropriate to farmers' needs. This material includes seeding, maintenance and fertilization of cloves, pest and disease control, harvest, and postharvest. Hamasalih and Layeeq (2023) stated that the establishment of an agricultural extension program must be developed because it will increase farmer value. Various discussion activities initiated by extension workers provide a forum for sharing experiences and information for farmers.

Extension Method

The extension method is the way in which an extension worker carries out consulting activities. Extension activities in Buntu Barana Village are carried out in groups. This extension is attended by farmers and Field Extension Workers (PPL), as stated by one of the respondents in one of the interview quotes:

> "The extension is attended by many farmers. I've never received individual extension. Group discussion is good because we can share thoughts, especially since there are many people here who have been farming cloves for decades, so it's good to be accompanied and share their opinions" (Mardan, 28 years old).

The results of the interview above can be concluded that the group extension that is carried out in Buntu Barana Village beside gaining knowledge from the extension worker, it also provides its own benefits such as sharing experiences with other farmers. This is in line with Kusnadi (2011), extension based on benefits is when extension workers have a very noble nature in giving and sharing experiences with farmers. It is necessary to continue to enhance their role in helping farmers solve their own problems, especially in the overall farming aspects.

Extension Material

Extension material is delivered to farmers as the main target of agricultural extension activities, especially for clove cultivation starting from seedling, clove maintenance and fertilization, pest and disease control, harvesting until post-harvest. Therefore, according to Hamasalih and Layeeq (2023), agricultural extension programs need to be set up to assist farmers in developing their farming skills, teach them how to communicate with producers in an efficient manner, and motivate them to pursue new knowledge.

The results of interviews with respondents regarding extension materials provided by extension workers are:

> "For clove seedlings, almost all farmers are already experienced and independent. But the extension worker still often delivers the material because there are also those who fail in seedling, especially for beginners. Sometimes there is also failure because they said the soil is not good, the pH is wrong, and that is what many people do not know" (Muh Amma, 54 years old).

> "The extension worker always delivers materials about clove maintenance. That is s also what farmers always ask because usually the clove plants that were initially good suddenly have wilting leaves, and some even have broken branches (Sulaeman, 40 years old)."

> "Pest control materials are often delivered because that iss what usually kills clove plants, even though the trees are already big. If there are pests in the stem and leaves, it is very dangerous and must be handled immediately. Information on

pest control, especially the type of pesticide, is very much needed (Baharuddin, 65 years old)."

"During the clove season, it rains frequently. The extension worker suggests using plastic greenhouses, so now many farmers have replaced their roofs with plastic greenhouses and use the house ceiling as a place to dry cloves. The material delivered by the extension worker is very useful because now farmers are no longer afraid of the cloves getting wet from the rain" (Muh Saleh, 40 years old).

Role of agricultural instructors in implementing clove cultivation

Agricultural extension workers are agents of change who deal directly with farmers. Their function is to change farmers' behavior via non-formal education, making farmers better at sustaining their livelihood. This is based on Rickards et al. (2018) who stated that agricultural extension plays a role in educational programs that increase farmers' capacity, one of which is to overcome the impacts of climate change. Mustapha et al. (2012) mentioned three ways that extension workers' role is carried out: facilitating and implementing policies and programs, providing information and guiding the management of new agricultural methods, and developing capacity. These can also be observed from the role of agricultural extension workers carried out by clove farmers in Buntu Burana Village during this research.

Facilitator

Agricultural instructors as facilitators can provide farmers with various access to their needs. The total score was 1031, which shows that the instructor played the role as intended. The indicators include the following: Extension workers as facilitators provide a learning process and facilitate accessing markets and capital, as well as business partnerships (Table 7). These results are in line with the findings of Seran et al. (2023), who stated that 60% felt the benefits that the assistance of extension workers brought.

Table 7. Recapitulation of the total score of the extension worker's role as a facilitator

Role of extension workers as facilitators	Total score	Category
The instructor provides a place for the teaching and learning process.	269	Suitable role
Extension workers facilitate farmers in accessing markets.	222	Less involved
Extension workers facilitate farmers with capital.	242	Suitable role
Extension workers facilitate farmers in business partnerships	298	Suitable role
Amount	1.031	Play a role

Source: Primary data analysis, 2023.

Communicator

Extension workers as communicators are considered effective by farmers. This can be seen from the score capitulation obtained from various indicators, reaching 1385 (Table 8). Politeness and mastery of language are the indicators that received the highest scores given by farmers to extension workers. Veithzal Revai (2004) in Sapar et al. (2012) stated that extension workers must be able to interact well and should prioritize local wisdom values. Extension workers' communication skills are a strategic asset to increase farmers' adaptive capacity to environmental changes (Alï et al., 2018; Mustapha et al., 2012; Prokopy et al., 2015). To enhance instructors' communication skills, various workshops must be carried out (Chowdhury et al., 2014). Thus, the increased ability of instructors to interact with farmers will benefit clove farmers in Buntu Barana village.

Table 8. Recapitulation of the total score of the extension worker's role as a communicator

Role of extension workers as communicators	Total score	Category
Presentation of material by the instructor that is easy to understand	289	Suitable role
Provision of the latest information	299	Suitable role
Behavior of instructors in conveying information (very polite, polite, and impolite)	300	Suitable role
Use appropriate language in delivering the material	300	Suitable role
Potential to deliver material effectively	291	Suitable role
Amount	1.385	Play a role

Motivator

Extension workers as motivators act as companions and distribute information to farmers. Additionally, they provide encouragement to farmers to achieve the expected clove yields, including providing examples of operational standards for clove cultivation. The recapitulation value of the instructor's role as a motivator is 1498 (Table 9). Indicators that make the

instructor act as a motivator are as follows: becoming an incentive for farmers to cultivate cloves according to procedures, encouraging farmers to take part in agricultural extension activities, and remaining active in farmer groups. Extension workers support farmer group activities and improve their entrepreneurial skills. Seran et al. (2023) stated that the motivation of extension workers encourages farmers to advance farmer groups, join, and improve their entrepreneurial abilities.

Table 9. Recapitulation of total scores on the role of extension workers as motivators

Role of the extension workers as motivators	Total score	Category
Encourage farmers to promote clove cultivation	300	Suitable role
Encourage farmers to take part in extension activities	300	Suitable role
Encourage farmers to remain active in farmer groups	300	Suitable role
Support farmer group activities	300	Suitable role
Encourage farmers to improve their entrepreneurial skills	298	Suitable role
Amount	1.498	Play a role

Based on Table 10, the recapitulation of the role of extension workers for clove farmers as facilitators, communicators, and motivators with an overall score of 3.914 is considered appropriate to their role. The highest role is as a motivator. This is because extension workers are considered capable of accompanying the transformation process of farmers as a community in rural areas from traditional systems to agribusiness-oriented farmers. This is based on Khairunnisa (2017)'s statement, stating that extension workers are required to be able to integrate farmers' social levels and implement this with the progress of farmers in their target areas toward new, informed technology (Khairunnisa, 2017).

Table 10. Recapitulation of total scores for the role of extension workers

Role of the extension worker	Total score	Category
Facilitator	1.031	Play a role
Communicator	1.385	Play a role
Motivator	1.498	Play a role
Amount	3.914	Play a role

Effectiveness of the role of agricultural instructors in implementing clove cultivation

Various reform efforts have been made to create a professional, dynamic, and efficient extension system for agriculture, which is directed at developing the professionalism of extension workers as an independent profession, realizing the identity of extension workers as educators and partners working with farmers. The total recapitulation index for the implementation of clove cultivation was 96.37%, which is classified as effective. It is proven by the recapitulation score for the effectiveness of the role of extension workers in implementing clove cultivation reaching 2.602 (Table 11).

Given the primary focus on the effectiveness of extension activities and the role of extension services, the research is limited by the absence of income data, which can provide a more comprehensive understanding of the impact on livelihoods. The findings may not be directly applicable to other regions or contexts due to the specific case study approach and potential limitations in generalizability. Additionally, the study may not capture the long-term effects of extension activities and may face challenges in measuring effectiveness and establishing causality.

Table 11. Recapitulation of the effectiveness score value of the role of extension workers in the implementation of clove cultivation.

Implementation of clove cultivation	Total Score	Highest score	Implementation index (%)	Category
Agricultural instructors recommend using superior seeds	264	300	88	Effective
Plant clove seeds properly and according to the instructions suggested by the instructor	294	300	98	Effective
Carry out clove plant maintenance methods as recommended by the instructor	293	300	97.66	Effective
Use the type of fertilizer recommended by the instructor	300	300	100	Effective
Fertilize properly and correctly according to the instructions suggested by the instructor	288	300	96	Effective
Control pests and diseases on clove plants according to the instructions suggested by the instructor	299	300	99.7	Effective
Use pesticides as recommended by the extension agent	270	300	90	Effective
Process the clove harvest as recommended by the extension agent	297	300	99	Effective

Implementation of clove cultivation	Total Score	Highest score	Implementation index (%)	Category
The information provided by extension workers can increase clove income	297	300	99	Effective
Amount	2.602	2.700	96.37	Effective

Conclusion

The extension process using a group approach method attended by farmers and extension workers is considered to be the best method for transferring information between extension workers and farmers starting from seeding, maintenance and fertilization, pest control, and postharvest, which runs well with farmers' expectations. The roles of agricultural instructors are facilitators, communicators, and motivators in the clove cultivation in Buntu Barana Village, Curio District, and they have been considered by the farmers effective in carrying out all roles, especially in clove cultivation activities. Furthermore, to increase the effectiveness of the role of extension workers, it is reccomended to use the suggested superior seeds and pesticides.

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Author Contributions
I.R, R.R., N.L., F.D.A: Developing ideas, overseeing data collection, analyzing data, writing, reviewing, responding to reviewers' comments; S.N.S., N.H., MK: analyzing data, reviewing scripts, and writing.

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The authors declare no conflict of interest.

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