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Field School For Cacao Farmers in Bulili Village as An Effort to Improve Cacao Productivity in Sigi Regency, Central Sulawesi

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ABSTRACT

Background: Limited knowledge and skills among farmers are one of the main factors contributing to suboptimal cocoa productivity in Bulili Village, Nokilalaki District, Sigi Regency. Inadequate understanding of proper cocoa cultivation techniques and weak farm financial management practices hinder farmers' ability to optimize production and income. Therefore, targeted capacity-building efforts are required to address these constraints and improve the sustainability of cocoa farming systems in the area.
Aims: This community service activity aimed to enhance the knowledge and practical skills of cocoa farmers in Bulili Village regarding good cocoa cultivation practices and farm financial management. Ultimately, the program sought to increase cocoa productivity and improve farmers' income.
Method: The activity was conducted in Bulili Village, Nokilalaki District, Sigi Regency, from September to December 2023. The program was implemented in the form of a cocoa farmer field school. The stages of the activity included an initial survey through observations and interviews to identify farmers' needs and problems, followed by five field school sessions (Field School 1–5) with materials tailored to the issues identified during the initial survey. An evaluation phase was conducted at the end of the program to assess participant satisfaction and the effectiveness of the activities.
Results: The field school program was implemented successfully and ran smoothly throughout the activity period. The program received a very positive response from participants, as indicated by high levels of enthusiasm and active participation during all field school sessions. Participants also demonstrated a cooperative attitude in supporting the implementation of the activities until completion. Based on the evaluation results, farmers expressed satisfaction with the program and hoped that similar activities would continue in the future to help address agricultural challenges faced by cocoa farmers.

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1. Introduction

The agricultural sector is a key sector, as it continues to play a crucial role in supporting the national economy (Alam *et al.,* 2018). It also plays a crucial role in poverty alleviation. Agricultural development is directly and indirectly linked to efforts to improve farmer welfare and alleviate poverty, particularly in rural areas (Budiarto *et al.,* 2025a; Budiarto *et al.,* 2024a).

Cocoa is a leading commodity in Central Sulawesi Province, currently the third-largest plantation commodity after palm oil and rubber. Cocoa is a key plantation commodity that can increase farmers' incomes and living standards, as well as boost exports for Indonesia's foreign exchange earnings. Indonesia is the third-largest cocoa producer after Ivory Coast and Ghana. Currently, Indonesia is the second-highest producer of cocoa raw materials after Ivory Coast, with a 6% global market share (ICCO, 2014). Cocoa's development is inextricably linked to its role as a key plantation commodity for export activities. High cocoa exports are driven by demand, driven by global cocoa consumption growth over the past ten years, averaging 3% per year (Damayanti, 2012).

To date, increased cocoa productivity has not been supported by efforts to improve technology appropriate to location specifications, including cultivation, processing of dry cocoa beans, and marketing. This increased productivity requires support from improved farmer competencies, with the goal of increasing farmer income and welfare. This increase in farmer income and welfare is expected to be enhanced through improvements in cultivation, harvesting, post-harvest, processing, and marketing techniques. This low level of income and welfare is thought to be due to the lack of efforts to improve cocoa farmer competency.

Farmers have not consistently followed cocoa cultivation patterns according to Standard Operating Procedures (SOPs). Extreme weather changes, such as drought and high rainfall, attacks by the Cocoa Pod Borer (CPB), and fruit rot disease are factors contributing to low cocoa production (Utami, 2016). Cocoa productivity begins to decline after the cocoa plant is 25 years old. Therefore, the need for large quantities of vigorous cocoa seeds is crucial for rehabilitation and replanting. However, seed stock producing superior seeds remains very limited (Baharudin & Rubiyo, 2013).

The lack of knowledge and skills of cocoa farmers regarding good cocoa cultivation technology is a major cause of suboptimal cocoa productivity. One way to improve farmers' knowledge and skills is by providing them with access to both formal and informal education. Education is a crucial factor in holistic human development, enabling people to develop and improve the nation's life (Sujana, 2019). Limited education and low levels of education and skills are complex issues to address in the development process. Lower-income communities become increasingly distant from educational centers, making it difficult to improve their knowledge and skills, thus worsening the growth structure of developing countries (Agustinova, 2015).

Therefore, farmers' access to education must be expanded by providing Farmer Field Schools (FSFs) held on-site to provide knowledge and skills tailored to local farmers' needs (Budiarto *et al.,* 2025b; Budiarto *et al.,* 2024b). Bulili Village, Nokilalaki District, Sigi Regency, is one such village with a majority cocoa farming population. The Farmer Field School, implemented in Bulili Village, is expected to provide access to cocoa farming education for the village's cocoa farmers. This activity aims to provide knowledge and skills to cocoa farmers in Bulili Village regarding cocoa cultivation practices and good farm financial management to increase cocoa productivity and farm income.

2. Methods

The Farmer Field School (Farmer Field School) was held from September to December 2023 in Bulili Village, Nokilalaki District, Sigi Regency, Central Sulawesi Province. This program is part of the Edu Farmers International Foundation's "Farming for the Nation" program, involving students from three universities: Muhammadiyah University of Jakarta, Bogor Agricultural Institute, and Pontianak State

Polytechnic. The target participants were cocoa farmers in Bulili Village. The initial activities before the field school began included site observations and farmer interviews regarding the condition of cocoa farming in Bulili Village. The observations and interviews were conducted to understand the actual conditions and challenges faced by cocoa farmers in Bulili Village. Based on the information obtained from the observations and interviews, a field school program was developed with materials appropriate for the conditions of cocoa farmers in Bulili Village.

The field school activities were conducted using extension and training methods delivered by a team of students. The field school was held every two weeks for five sessions, with different materials tailored to the program. The target number of participants for each field school session was 20. Activity evaluations are conducted periodically for each activity using a questionnaire to assess participants' impressions and satisfaction, as well as to identify any obstacles encountered during implementation for future improvement. The materials presented in each field school session are:

- Farmer Field School 1: Cocoa Replanting and Rehabilitation
- Farmer Field School 2: Cocoa Good Agricultural Practices
- Farmer Field School 3: Cocoa Pest and Disease Control
- Farmer Field School 4: Liquid Organic Fertilizer
- Farmer Field School 5: Cocoa Post-Harvest and Financial Management

3. Results and Discussion

3.1 Observations and interviews

Observations and interviews were conducted as a preliminary survey of the condition of cocoa farming in Bulili Village. The activity was carried out for one month in September 2023. Observations examined the physical and social conditions of cocoa farming in Bulili Village, while interviews were conducted with cocoa farmers. The observations and interviews yielded the following information:

1. The cocoa plants owned by farmers are old, resulting in declining productivity.
2. Agricultural practices are not yet in accordance with operational standards for cultivation, resulting in cultivation techniques not producing optimal productivity. Farmers expect further information regarding these standards.
3. Cocoa pests and diseases remain an issue, and they cannot be optimally controlled.
4. Limited subsidized fertilizer is available for farmers to use in cocoa cultivation.
5. Lack of post-harvest cocoa management.
6. Farmers lack understanding of financial management in cocoa farming.

3.2 Farmer Field School 1: Cocoa Replanting and Rehabilitation

Farmer Field School 1 was held on October 9, 2023. 16 participants attended. The topic presented at Farmer Field School 1 was Replanting and Rehabilitating Cocoa Plants. This topic was chosen because many farmers have cocoa trees that are past their productive fruiting age, so this topic was necessary to inform farmers about the causes of decreased cocoa tree productivity. In addition to replanting activities, the team also provided information that cocoa plants can be rehabilitated or rejuvenated through side grafting and top grafting (scion grafting). The team explained the growth requirements of cocoa plants, the age limit for replanting or rehabilitation, the requirements for cocoa plant rehabilitation, and the steps for side grafting and top grafting (scion grafting). In accordance with recommendations from the Ministry of Agriculture, the planting hole depth for cocoa plants is 60 cm x 60 cm x 60 cm. This hole can be enlarged in soil with a heavier or more clayey texture. The team also explained the various superior cocoa clones developed through research that are resistant to Vascular Streak Dieback (VSD) and Cocoa Pod Borer (CPB), resulting in fewer fruit infestations. The clone the team recommended for

planting was the MCC 45 clone. This clone can bear fruit at two years old and produces heavier beans than other clones. However, this clone has the disadvantage of having to be planted with two or three other clones. MCC 45 requires cross-breeding with other clones, such as ICCRI/KW or BB01, for optimal fruiting. If not planted with other clones, the MCC 45 clone will not produce as much fruit.

The session also explained side grafting and cup grafting, as well as the tools and materials needed for the grafting process. For the side grafting technique, it was stated that the triangular incision is preferred because it is considered superior. This technique allows the scions to fuse more perfectly and leaves a less severe wound after grafting compared to the square incision. The team also explained that the best time to carry out these rehabilitation activities is during the summer to prevent water from entering the cover. The team also demonstrated the process of side grafting and scion grafting of cocoa plants to the participants (Figure 1).

Figure 1. The grafting demo of cacao plant.

3.3 Farmer Field School 2: Good Agriculture Practice Cacao

The activity took place on October 23, 2023, and was attended by 17 participants. Farmer Field School 2 discussed Good Agricultural Practices (GAP) for cocoa plants, chosen to address the issue of substandard cocoa cultivation practices. The material covered cocoa plant growth requirements and the stages of cocoa cultivation in accordance with GAP standards, including land preparation, tillage, seedling preparation, planting, pest control, fertilization, harvesting, and post-harvest application. The GAP material for cocoa plants is based on the Technical Guidelines for Good Agricultural Practices (GAP) on Cocoa from the Ministry of Agriculture of the Republic of Indonesia (Kementan, 2014).

GAP is a general guideline for properly and appropriately cultivating agricultural crops to achieve high productivity, good product quality, optimum profitability, environmental friendliness, and attention to farmer safety, security, and welfare, as well as sustainable production (Kementan, 2012). GAP for cocoa plants relates to production, both in cultivation and maintenance, to produce quality cocoa beans (Rosyady *et al.,* 2022). GAP in cocoa plants has been proven to significantly increase cocoa production (Wahyuni and Ndewes, 2023).

3.4 Farmer Field School 3: Controlling Cocoa Pests and Diseases

Farmer Field School 3 was held on November 6, 2023, and was attended by 18 participants. The material presented at this activity covered controlling cocoa pests and diseases. Training was also provided on the production of botanical pesticides. Current pest control methods often use inexpensive chemicals that can potentially pollute the environment and contaminate the harvest. The team explained

that pest and disease control in cocoa plants can be carried out in a more environmentally friendly manner using natural ingredients.

The botanical pesticide was recommended to be made from papaya leaves, as papaya plants are readily available around farmers' fields. The Directorate of Horticultural Protection of the Ministry of Agriculture (2023) stated that papaya leaf sap is also considered to contain cysteine protease enzymes such as papain and chymopapain and can produce compounds of the alkaloid, terpenoid, flavonoid, and non-protein amino acid groups, which are highly toxic to plant-eating insects. The residue produced from this botanical pesticide is more easily decomposed, making it safer for the environment (Sutiharni *et al., 2022*; Efriyanti, *et al.,* 2022; Silalahi *et al.,* 2025; Nurlailah *et al.,* 2025).

Figure 2. Botanical pesticide production training

This activity presented the advantages and disadvantages of botanical pesticides for controlling plant pests and diseases. The botanical pesticide production training was conducted in a participatory manner, directly involving participants in the process (Figure 2). The procedure for making botanical pesticides is as follows:

1. Tools and Materials

The tools and materials used include a bucket, knife, spoon, filter cloth, 1 kg of papaya leaves, 2 tablespoons of kerosene, 1 tablespoon of detergent, and 10 L of water.

2. Preparation Method

Finely chop or blend 1 kg of papaya leaves, soak in 10 L of water for one day, then filter. Mix 2 tablespoons of kerosene and 1 tablespoon of detergent into the filtered water and stir until evenly distributed. The botanical pesticide is now ready to use.

3. Application method

Dilute the botanical pesticide solution to 500 mL with 10 L of water for one sprayer tank. The pesticide is ready to be applied once a week

3.5 Farmer Field School 4: Liquid Organic Fertilizer

The activity was conducted on November 20, 2023, and was attended by 15 participants. The training focused on liquid organic fertilizer (LOF), including instruction on its production and application. The

issue of fertilizer scarcity and high prices, coupled with insufficient government subsidies to meet farmers' land requirements, motivated the implementation team to select this topic. Through this activity, farmers were expected to be able to independently produce liquid organic fertilizer, thereby reducing dependency on commercial fertilizers and lowering production costs (Widyastuti *et al.,* 2022).

The recommended liquid organic fertilizer (LOF) introduced in this activity was formulated using eggs, shrimp paste, and monosodium glutamate (MSG), which are materials that are easily obtained from household kitchens. This LOF can be utilized to support plant fertilization (Muzakki *et al.,* 2023; Marpaung *et al.,* 2025). Although its nutrient content is lower than that of chemical fertilizers, its natural composition is more environmentally friendly and compatible with soil systems, allowing nutrients to be more readily absorbed by plants. The training also discussed the benefits, advantages, and limitations of using LOF in cocoa cultivation.

1. Tools and Materials

The tools and materials used included a bucket, spoon, stirrer, bottle, one egg, one tablespoon of MSG, one small packet of shrimp paste, and 5 L of water.

2. Preparation Method

The egg, MSG, and shrimp paste were mixed into the water in a bucket and stirred until homogeneous. The resulting mixture was then transferred into a thin, transparent bottle and exposed to sunlight for approximately one month. The LOF was considered ready for use once the solution changed color to brick red.

3. Application Method

The LOF solution was diluted at a concentration of 250 mL for 16 L of water per sprayer tank. The application was carried out once a week by spraying the solution onto cocoa leaves between 07:00 and 09:00 a.m.

Figure 3. LOF production training.

3.6 Farmer Field School 5: Cocoa Post-Harvest and Financial Management

The final activity was held on December 4, 2023, and was attended by 17 participants (Figure 4). This activity covered cocoa post-harvest and financial management. This material was chosen to ensure

farmers carry out post-harvest activities appropriately to prevent declines in the quality and price of cocoa beans. Furthermore, it is hoped that farmers will improve the financial records of their farming activities to identify profit and loss and income. Based on the initial survey, farmers have not yet implemented proper post-harvest management and financial records, so this activity is necessary to help them manage their farming businesses better. The team recommends recording incoming and outgoing budgets to ensure optimal use of funds. Proper financial planning can help estimate losses and profits from farming.

Figure 4. Team and Participant of Farmer Field Photo

3.7 Program Evaluation

Participants were very enthusiastic about participating in the field school activities. Evaluations showed that the farmers assisted in each field school activity were satisfied with the material and implementation of the activities. Participants also stated that the field school was very beneficial for farmers in strengthening their existing knowledge so they could apply it to their own land according to their needs and farming conditions.

The Edu Farmers International Foundation provided input on the implementation of each field school program, ensuring a tangible impact for farmers. Although no quantitative evaluation was conducted, participants reported that the activities had broadened farmers' horizons regarding proper cocoa cultivation, from nursery to post-harvest, and farm financial management. Many farmers implemented the programs according to the needs and conditions of their respective land, resulting in increased productivity and business success.

The activities ran smoothly despite various obstacles and supporting factors encountered. The only obstacle the team encountered was determining the most convenient time for all participants to attend each activity. This was because each farmer had their own farming schedule, making it somewhat difficult to find the same free time. The supporting factor for this activity is the enthusiasm of the participants in participating in this activity, so that the participants are very cooperative and enthusiastic in supporting the implementation of all the activities carried out.

4. Conclusions

This field school focused on topics relevant to the needs of cocoa farmers in Bulili Village, specifically to increase cocoa productivity. The event ran smoothly and was well-received by participants. Farmers expressed satisfaction and significant assistance with the materials and hands-on practice. They also hope to see more activities in the future to help address the various agricultural challenges they face.

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