



Effectiveness of public service program related cocoa fermentation sop in increasing the knowledge of cocoa farmer

Hanif Alamudin Mansur ^{a,1}, Noor Harini ^{a,2}, Elfi Anis Saati ^{a,3}, D. Damat ^{a,4}, W. Warkoyo ^{a,5}, S. Sukardi ^{a,6}, Vritta Amroini ^{a,7}, Rista Anggriani ^{a,8,*}, Devi Dwi Siskawardani ^{a,9}, Afifah Husna ^{a,10}, Desiana Nuriza Putri ^{a,11}, Nafidzah Nur ^{a,12}, Ayu Lestari ^{a,13}

^a Department of Food Technology, Agriculture and Animal Science Faculty, Universitas Muhammadiyah Malang, Jalan Raya Tlogomas No. 246 Malang East Java 65144, Indonesia

¹ hanifalamudin@umm.ac.id; ² noorhum@yahoo.co.id; ³ elfisaati@gmail.com; ⁴ damatumm@gmail.com; ⁵ warkoyo@umm.ac.id; ⁶ sukardi@umm.ac.id; ⁷ vritta@umm.ac.id; ⁸ rista@umm.ac.id; ⁹ devi@umm.ac.id; ¹⁰ afifahusna@umm.ac.id; ¹¹ desiana@umm.ac.id; ¹² nafidzahnur5@gmail.com; ¹³ ayulest25@gmail.com

*Corresponding author

ARTICLE INFO	ABSTRACT
<p>Article history Received: 2023-05-02 Revised: 2023-07-03 Accepted: 2023-07-06 Published: 2023-11-08</p> <p>Keywords Cocoa farmers Counseling Harvest capacity Human resources</p>	<p>Cocoa farmers in this area were not familiar with post-harvest processing, usually, the cocoa bean was sold directly without any fermentation. This public service objective provides information on good quality control of cocoa plant beans, such as fermentation pH, sorting, and contained water content. Followed to improve the knowledge about fermented cocoa bean's characteristics, especially about fine flavor cocoa (FFC) which has a flavor profile and also several active compounds for healthy. Data collection was carried out by filling out questionnaires from 25 farmer respondents. The results of the service showed that as many as 52% of the respondents have been cocoa farmers for more than 5 years. Most of the cocoa farmers produced more than 500 kg/harvest. Many farmers do not ferment cocoa beans because the fermentation process takes a long time, while farmers want to sell cocoa beans quickly. This causes the selling price of cocoa beans to become low.</p>
<p>Kata Kunci Kapasitas panen Penyuluhan Petani kakao Sumber daya manusia</p>	<p>Efektivitas program sosialisasi sop fermentasi kakao dalam meningkatkan pengetahuan kelompok tani kakao. Kakao merupakan salah satu komoditi unggulan di daerah Sumbermanjing Wetan, Malang Selatan, Indonesia. Petani kakao di daerah tersebut belum terbiasa dengan pengolahan pasca panen dari kakao, biasanya hasil panen kakao dijual tanpa adanya proses fermentasi. Pengabdian ini dilakukan untuk memperoleh gambaran tentang tahapan mekanisme pada teknologi fermentasi dan pengolahan biji kakao. Pengumpulan data dilakukan melalui pengisian kuisioner kepada 25 responden petani. Hasil pengabdian menunjukkan bahwa terhitung sebanyak 52% responden sudah menjadi petani kakao selama lebih dari 5 tahun. Sebagian besar petani kakao dalam sekali panen dapat menghasilkan lebih dari 500 kg. Banyaknya petani yang tidak melakukan fermentasi biji kakao karena proses fermentasi memerlukan waktu yang cukup lama, sedangkan petani ingin menjual biji kakao dengan cepat. Hal tersebut menyebabkan harga jual biji kakao rendah.</p>

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INTRODUCTION

Cocoa is one of the leading commodities in the Ringin kembar villages of Sumbermanjing Wetan, Malang District Indonesia. Based on the International Cocoa Organization (2012), defined Indonesia is one of the third largest cocoa producers, after Gading and Ghana. It means that cocoa in Indonesia can compete in the world, but improvement in the fermentation process is needed. Indonesia has extensive cocoa plantations which spread at Sumatra (16.3%), East Nusa Tenggara, West Nusa Tenggara, and Bali (4%), Sulawesi (63.8%), Maluku and Papua (7.1%), Java (5.3%), Kalimantan (3.6%) (Ditjenbun, 2013; Ditjenbun 2012). The total area of cocoa plantations in 2018 was 1,678,268 hectares which had a total yield of cocoa pods of 593,833 tons. Meanwhile, the productivity level was 756 kg/hectare (Ministry of Agriculture Indonesia, 2019). Martiningsih et al., (2018), Sari et al., (2017), and Rinaldi et al., (2013) described that the main problems of cocoa management in Indonesia namely, the productivity of cocoa plants are quite low, low yield, pests, and unfermented cocoa pods. The unique cacao aroma, brightly colored, hollow seeds, reducing bitter and astringent taste were affected by fermentation and roasting (Manalu, 2019). Unfermented cocoa pods affected the low yield quality compared to the Gading, Swiss, Nigeria, dan Ghana (LIPI, 2017; Onumah et al., 2013; Besseah, & Kim, 2014).

The efforts to increase yield quality and production are tough challenges for farmers, such as the high costs of production and facilities, especially labor and seed costs. Therefore the accurate and efficient post-harvest process, knowledge and welfare of farmers, and proper management should be sustainably improved (Effendy, 2015). In this case, farmers need a lot of technical guidance about, managing cocoa properly and the post-harvest process correctly (Aneani & Ofori-Frimpong, 2013; Awotide, et al., 2015). If the quality of cocoa beans from farmers is more guaranteed, expected to increase the marketing and promotion to the supplier of raw materials. The existence of guidance or an educational process for cocoa cultivators is certainly causal to the quality of the cocoa beans that comply with the standards in Indonesia and can spread in the international market. By improving and increasing technology every joint production process can provide a high probability of opening the gate to perfection in the quality and quantity of cocoa beans produced. Therefore an increase in land productivity, the yield of product, and waste treatment could improve quality and be very useful for increasing the value of the product (Manalu, 2019; Towaha, 2013).

Ringinkembar Village is one of the highest cocoa producers in Indonesia that has yield of 8 ton/month, with the highest yields from July to October. The local farmers are not familiar with post-harvest processing. The harvested cocoa is usually sold to chocolate industries without any fermentation process. But, the farmers just fermented when the industries request it. However, the fermentation carried out by farmers has not implemented the Minimum Standards for Postharvest Processing of Cocoa Beans (SNI 2323: 2008) and International Cocoa Bean Quality Standards (ISO 2292: 2017). Therefore, this public service aims to provide information on good quality control of cocoa plant beans, such as fermentation pH, sorting, and contained water content. Followed to improve the knowledge about fermented cocoa beans characteristics, especially about fine flavor cocoa (FFC) which has a flavor profile and also several active compounds for healthy.

This community service program is relevant in the context of achieving the Sustainable Development Goals (SDGs) with a focus on the Sumbermanjing Wetan area, South Malang, Indonesia. In relation to SDG 1, this program discusses efforts to increase the knowledge of cocoa farming groups about the importance of fermenting cocoa beans in an effort to reduce poverty by improving the selling price of their products. This program also supports the achievement of SDG 2 by increasing food security through increasing crop yields and cocoa bean quality. In addition, these community service activities also have the potential to contribute to SDG 8 and SDG 12 by helping cocoa farmers increase their income and promote sustainable agricultural practices.

METHOD

Ringinkembar Village, Sumbermanjing Wetan, Malang District, East Java Province is one of the highest cocoa producers in Indonesia. Based on the Malang Statistics, Sumbermanjing Wetan has a cocoa plantation area of about 512 Ha (2020) and 455 Ha (2021) with a total production of 609 kg (2020) and 532 kg (2021). Ringin kembar village has 125 Ha of cocoa land with a yield of 8 tons/month. The location of Ringinkembar village could be observed in Figure 1.

The implementation of this program was 2 weeks and consisted of (1) a location survey and discussion with representatives of farmers and extension workers regarding the problems encountered. (2) Focus Group Discussion (FGD) with cocoa farmers. FGD activities conducted by the University of Muhammadiyah Malang consisted of 4 teams. The counseling discusses the process of fermenting cocoa beans consisted mechanization stages, reaction stages, formation of active compounds, and halal critical points. After that, filling the questionnaire containing the experiences of cocoa farmers. The respondents were 25 cocoa farmers. Analysis of the data used is the collection of data on quantitative service.

The questionnaire content included (1) The size of the cultivated land, (2) the Duration as a cocoa farmer, (3) the Type of cocoa seed used, (4) The harvest results obtained at one time, (5) Sales distribution of cocoa yields, (6) Selling price of cocoa in 1 kg, (7) The reason for not carrying out the fermentation process, (8) Constraints in the cocoa fermentation process. While, the results of identifying problems during the survey in Sumbermanjing Wetan village described that

quality of cocoa beans that were not standard, the selling price of cocoa beans was cheap and unstable, inhomogeneous fermentation SOP, the production of cocoa beans every farmer was insufficient for their fermentation, and several diseases attack cocoa.

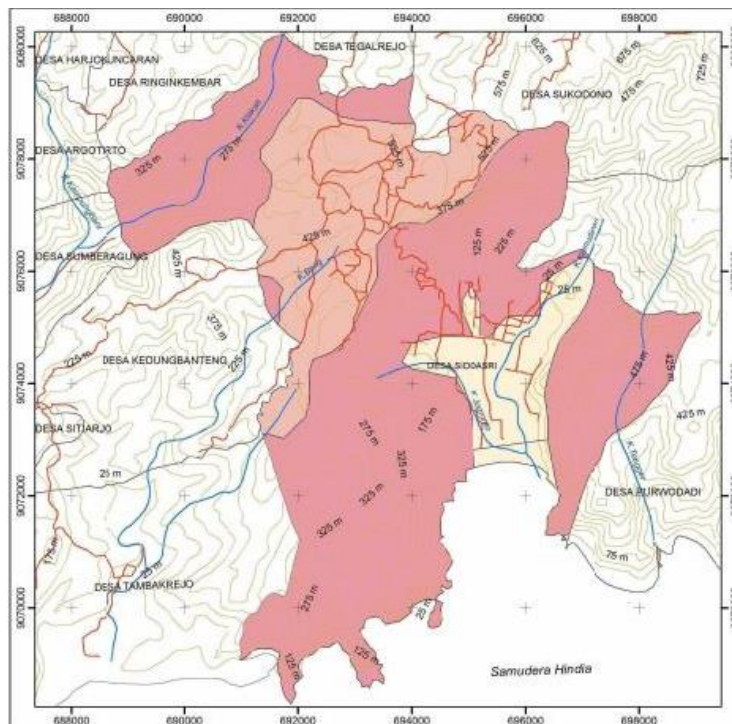


Figure 1. Map of Ringinkembar village

Notice some problems, it was agreed for the next program FGD issues related to post-harvest cocoa beans, while pre-harvest issues such as cocoa bean disease. The existence of guidance or an educational process, technical guidance, strict supervision, and control of cocoa beans for farmers or industries who are involved in buying and selling cocoa is very much needed to indoctrinate the importance of quality cocoa beans that can compete internationally which will certainly provide benefits to the country's micro-economy. Standardization of patents to maintain the quality of food that will be consumed by humans is needed. The regulations that cover the standardization of cocoa beans have been clearly stated in the Regulation of the Minister of Agriculture Number 51/Permentan/OT.140/9/2012 concerning Guidelines for Postharvest Handling of Cocoa. The existence of legal certainty over an object has its urgency, the existence of this regulation is a form of effort to maintain, improve and monitor the quality of cocoa beans to produce cocoa beans that can compete in the international trade market with guaranteed quality which will have direct causality on state income. To realize this expectation, the farmers and contributors to maintaining cocoa quality are needed, even though regulations have been issued, these regulations cannot be perfectly actualized due to educational inequality and a lack of work ethic of the cocoa cultivation success team. The lack of enforcement and the absence of sanctions against cocoa bean cultivators has contributed to the atmosphere of a lack of quality cocoa beans, so it is strongly recommended that local governments intervene to quell the banality of intellectual decline regarding the importance of maintaining and establishing standards for each cocoa bean product to be sold for the sake of income.

RESULTS AND DISCUSSION

The public service implementing on Sunday, September 25, 2022, at Ringinkembar Village. It started with one of the lecturers from the Food Technology Program at the University of Muhammadiyah Malang delivering counseling material on academic synergy and the real application of cocoa farmer groups. It was followed by a Focus Group Discussion session which was following the expectations of the authors, this session was very active as evidenced by the nuances of argumentation warfare from the cocoa farmers, this showed that the farmers were enthusiastic about the topic of discussion given (Figure 2). The topic of discussion in the Focus Group Discussion included four stages of fermentation including the stages of mechanization, reaction stages, formation of active compounds, and halal critical points.

The Head of the Food Technology Study Program explained that the fermentation process has an important role in the cocoa industry because it improves the taste of cocoa beans. This process is important, but many cocoa farmers in Indonesia do not know about it. Therefore, the counseling focused on the stages of cocoa fermentation. This activity had high enthusiasm of farmers because of the exchange of experiences. At the end of the activity, farmers were asked to filling a questionnaire (Figure 3), after which they continued to see the existing cocoa plantations in the village which can be seen in Figure 4 and Figure 5.



Figure 2. Focus Group Discussion



Figure 3. Filling questioners



Figure 4. Fermentation box



Figure 5. Land survey

The results showed that most respondents were aged 30-49 years with 64% of 25 respondents (Table 1). In this case mean that the farmer was categorized as elderly, who had a lot more experienced than young farmers. It also defined that the farmers have a prefrontal cortex with primordial experience that is accurate in calculating risks and benefits in cocoa production. In the dynamics of the agricultural world, there is a very significant disparity between old and young farmers. It was proven that old farmers have used their prefrontal cortex for peeling all the planting exordium of obstacles and risks, while young farmers tend to produce various kinds of post-harvest innovations (Idawati, 2016).

Table 1. Respondent identity

Variables	Group	Total	Percentage (%)
Age (years)	15-29	2	8
	30-49	16	64
	50-69	7	28
Gender	Female	23	92
	Male	2	8
Education	Elementary School	6	24
	Middle School	6	24
	High School	13	52

Table 1 also defined that the cultivation of cocoa plants is close to patriarchal principles, which require male masculinity for its success. According to the large number of male cocoa farmers respondents dominated by 92% or 23 people compared to female farmers (Table 1). The lack of optimal performance of these female cocoa cultivators is affected by a lack of physical abilities when compared to the masculinity of the men working on the land (Karmila, 2020). Although it slightly demonstrated the principle of gender equality in cocoa cultivation, the field identified that the performance of female farmers is less efficient in realizing the expected cocoa cultivation production. Gender is an indirect factor because there are no feminist principles of planting that absorb the notion of masculinity to be implemented so that male farmers control the dynamics of cocoa culture production. The results of the questionnaire also showed that based on level of education, the highest percentage of cocoa farmer respondents was obtained by high school level with 52%. It means that the farmers will have causality on how to think and easily understand theories before to be actualized. This is following Robiyan et al., (2014), that farmers would be more capable to work effectively because of their educational background.

Table 2. The land ownership

No.	Land Area	Respondents	Percentage (%)
1	< 50 m ²	9	36
2	50-100 m ²	4	16
3	100-1 Ha	7	28
4	other	3	12
5	unidentified	2	8
	Total	25	100

Land area is one of the vital points for the cocoa production accumulation, and yield productivity in Sumbermanjing Wetan. The area has several problems that must be considered by cocoa land contributors such as increasing the knowledge from plantation experts to utilize effective and efficient for utilize and create high-quality seeds, that are useful for forming a better production stability chain. In terms of land area, some farmers did haven't large land with simple technology. These farmers also contributed not only to families but also to provide income to the state and the international area when succeed in exporting products. However, this plan is not easily achieved because cocoa production lacks the technology and human resources capability to penetrate global markets (Najera, 2017). The causality effect between land area and accumulated production is related because large land can produce more cacao than narrow land. Based on the Table 2 described that 36% or 9 farmers managed <50 m² of land and 8% or 2 farmers didn't know the size of the managed land. This was related to the interest in cocoa cultivation in Ringinkembar village had decreased and switched to coffee cultivation. These factors cause the amount of cocoa produced to be < 500 kg in one harvest was the highest yield of 72% (Table 3).

Table 3. The cacao yields

No.	The cacao yields	Respondents	Percentage (%)
1	< 500 kg	18	72
2	1-5 Ton	2	8
3	Other	5	20
Total		25	100

Based on the results of the respondents, the majority of these cocoa farmers opened a price of IDR 25,000-28,000 with a percentage of 64% (Table 4). The determining factor for the selling price of cocoa is seen in the quality and quality of the cocoa beans produced. The existence of the fermentation process can increase the selling price of cocoa (Yastika et al., 2013), for the organic acids created by the microbes of the fermenters by breaking down the sugar and citric acid in the pulp (Meersman et al., 2013; Fahrurrozi et al., 2020). The existence of the fermentation process is not empty, there is a big goal along with the process, namely the results of the fermentation process revolutionize a more perfect cocoa taste by reducing the bitter and astringent character of the original taste of cocoa beans, and there are factors that are very important for the success of the process of manifesting the perfection of taste. by greasing the cocoa beans, the mixing procedure, the fermentation time, and finally the fermentation box (Tambunan et al., 2021).

Tabel 4. The Cacao Price

No.	Cacao price (IDR)	Respondents	Percentage (%)
1	< 25.000	7	28
2	25.000-28.000	16	64
3	> 31. 000	1	4
4	Other	1	4
Total		25	100

Table 4 described that the majority of these cocoa farmers opened a price of IDR 25,000-28,000 with a percentage of 64%. The determining factor for the selling price of cocoa is the quality of the beans produced. The existence of the fermentation can increase the selling price of cocoa, from the organic acids created by the microbes of the fermenters by breaking down the sugar and citric acid in the pulp (Meersman et al., 2013). The existence of the fermentation process revolutionizes a more perfect cocoa taste by reducing the bitter and astringent character of the original taste of cocoa beans, and it is very important for the perfection of taste. The factors of successful fermentation are greasing the cocoa beans, the mixing procedure, the fermentation time, and the fermentation box (Tambunan et al., 2021).

In 2007 – 2010, the Indonesia Central Statistics Agency (CSA) stated that Indonesian cocoa beans and processed cocoa have dominated international trade flows in terms of value and volume (Ministry of Trade Indonesia, 2014). Processed cocoa beans have a greater value such as cocoa powder reaching IDR 100.000/ kg than cocoa beans IDR 23.000 to Rp27.000/ kg (Engelen & Akuba, 2016). The highest cocoa powder value was depending on the brand and quality of the powder. But in the dynamics of the cocoa bean trade, the value of the beans was determined by the level of drying and quality of the beans (Herawati et al, 2015).

The main obstacle for the farmers in Ringinkembar villages in Sumbermanjing Wetan is the incomplete implementation of the cocoa bean fermentation method which resulted in a low-income index for the cocoa bean cultivators. There was the unmotivated and instantaneous process which was the primordial thing for farmers who didn't ferment the cocoa beans cultivated. Moreover, there was a phenomenon of farmers selling directly to middlemen before harvesting. In addition, the reasons for not carrying the fermentation were the unavailability of the machine and the high price of the cocoa bean fermenter, the constraints on funds, and the improving skills and knowledge of cocoa farmers.

CONCLUSION

The results concluded that the majority of farmers in Ringinkembar village Sumbermanjing Wetan have not implemented cocoa fermentation, causing the selling price of cocoa beans to become low. Factors that influence unimplementing the of cocoa fermentation were lack of knowledge about the fermentation, the equipment availability and price was expensive, followed the fermentation took a long time.

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