



Original Paper

Correlation between Farmers' Activeness in Farmer Groups with Productivity and Income of Cocoa Farming in Trenggalek Regency

Yuli Hariyati^{1*}, Vina Yunita Ria¹, Rena Yunita Rahman¹, Indah Ibanah¹, Muhammad Ghuftron Rosyady², Dyah Ayu Savitri², Setiyono², Gatot Subroto², Didik Suharijadi³, Sony Suwasono⁴

1) Department of Agribusiness, Faculty of Agriculture, University of Jember, Jember, East Java, 68121, Indonesia

2) Department of Agricultural Science, Faculty of Agriculture, University of Jember, Jember, East Java, 68121, Indonesia

3) Department of Indonesian Literature, Faculty of Cultural Sciences, University of Jember, Jember, East Java, 68121, Indonesia

4) Department of Agroindustry Technology, Faculty of Agricultural Technology, University of Jember, Jember, East Java, 68121, Indonesia

*) Corresponding Author: yuli.faperta@unej.ac.id

Received: 29 July 2024; Revised: 17 September 2024; Accepted: 25 September 2024

DOI: <https://doi.org/10.46676/ij-fanres.v5i3.381>

Abstract— The cocoa plantation in Suruh Village, Trenggalek Regency is the main supplier of cocoa beans to UPH Rumah Coklat owned by the Department of Agriculture and Food of Trenggalek Regency. For example, in cocoa farmers' participation in the "Tunggal Jaya" Farmers Group, farmers are taught to make rorak and worm palaces to deal with climate change which helps maintain soil moisture and increase fertility. The objectives of this study are to determine 1) the level of farmer activeness, 2) the level of productivity, 3) the level of income, and 4) the correlation between farmer activeness in farmer groups with productivity and income of cocoa farming in Suruh Village, Trenggalek Regency. The number of samples used was 111 respondents. Data analysis used the Likert scale, productivity analysis, income analysis, and Pearson correlation. The results of the study showed: 1) cocoa farmer activeness in farmer groups in Suruh Village, Trenggalek Regency is in the active category with an overall average score of 3.56; 2) the average productivity of cocoa farming is in the medium category at 0.54 tons/ha/year; 3) the average income of cocoa farming is Rp6,016,562/year; 4) the correlation between farmer activeness with productivity is 0.865, farmer activeness with income is 0.760, and productivity with income is 0.868. The direction of the three correlations is positive and significant.

Keywords— Cocoa, Farmer engagement, Farmer groups, Income analysis, Pearson correlation

I. INTRODUCTION

Guibourtia coleosperma (Benth.) J. Leonard is an evergreen Indonesia's cocoa plantations are dominated by smallholder plantations with an area of 1.42 million ha or 99.63%, but the cocoa area in Indonesia in 2022 decreased by 2.69% or 39.3 thousand ha, compared to 2021. [1]. The decline in cocoa plantation areas is partly due to land conversion to other commodities that are considered more profitable [2,3]. Along with the decrease in plantation area, cocoa bean production in Indonesia also decreased by about 5.46% in 2022 and

productivity declined by 1.1% to 715 kg/ha. [1,4]. The low productivity of cocoa is influenced by the inefficient use of production factors that have an impact on the level of farm profits [5,6].

One of the provinces in Indonesia that is famous for its cocoa smallholder plantation, namely East Java [4]. The development of cocoa plantation land in East Java will be carried out in 2023, covering an area of 5.025 ha to increase cocoa production which had experienced a decline [7]. The decline in cocoa production is caused by various factors such as the limited knowledge and skills of farmers in overcoming pest and disease attacks [8], cultivation technology, preservation, and post-harvest handling. Some areas in East Java will be developed, namely Regencies: Pacitan, Trenggalek, Tulungagung, Blitar, Malang, Lumajang, and Banyuwangi. Trenggalek Regency has several sub-districts that cultivate cocoa plantations, including the Suruh Sub-district. [9]. In 2021-2022 the growth value of cocoa production in Suruh Sub-district is the lowest compared to other sub-districts, which is -52%. The low growth value was caused by cocoa production which decreased by 76.7 tons [10]. Factors causing the decline in production are erratic climate change [11], high pest attack rate [12], and many cocoa flowers falling off and cocoa pods rotting on the tree [13].

district, which has the lowest production growth, has the third largest cocoa plantation area, namely 412 ha after Pule (591 ha) and Karangan (432 ha) Sub-districts [10]. This shows the potential to develop the cocoa crop in Suruh Sub-district to achieve more optimal production. The way to establish cocoa is by improving the quality of human resources, especially farmers as primary producers [14,6]. The center of cocoa production in Suruh Sub-district is Suruh Village, which is known as the "Cocoa Forest" in Trenggalek Regency and is the main supplier of cocoa beans to the Chocolate House Processing Unit owned by the Agriculture and Food Service of Trenggalek Regency.

Suruh Village has the third largest cocoa land area, which is 80.36 ha in the 2021-2022 period [10].

Many people in Suruh Village are involved in cocoa farming and have joined the "Tunggal Jaya" farmer group, which has been established since 1995. The "Tunggal Jaya" farmer group aims to encourage farmers to be consistent in developing cocoa farming with attention to soil fertility, community welfare, and better cocoa quality. In 2006, many farmers switched to the "Tunggal Jaya" farmer group because the previous group was considered no longer active, whereas the "Tunggal Jaya" farmer continued to actively organize activities, such as meetings, training, and discussions on cocoa farming, thus attracting farmers from other farmer groups.

It is expected that by joining a farmer group, farmers can participate in training, including cocoa fermentation practices to improve the quality of cocoa beans [15,16,17]. Cocoa fermentation processing can also provide better economic value with higher cocoa bean prices, with a price difference between Rp3,000/kg and Rp5,000/kg [18,19]. Farmer groups also act as a production unit that provides facilities and infrastructure that are easy to reach [14], increase the amount of production [20,21], and minimize the cost of cocoa farming [22,23]. Farmer groups also serve as a forum for cooperation that connects cocoa farmers with the government, extension workers, and traders [24,25,26].

Farmer households in Suruh Village are still highly dependent on cocoa farming to fulfill their daily needs. This is supported by the characteristics of the land in Suruh Village which is terraced, making it very suitable for cocoa farming. Farmer households in Suruh Village are still committed to cocoa cultivation, as there are farmer groups that actively mobilize farmers to continue producing cocoa, however, cocoa farmers still face various challenges, such as unpredictable weather changes [27,28,29] and frequent floods, droughts, and pest infestations [30]. Cocoa farming practices still use hereditary methods that result in less-than-optimal production [30,31,32]. The process of selling cocoa is still done traditionally [20], with products being marketed individually in limited quantities [33], with some farm households waiting for the middlemen to pick it up [34].

Household activities with living expenses are often a problem in managing income [35,36,37]. High-income levels of cocoa farming households provide a better ability to fulfill the needs of life and support various businesses, including cocoa farming as the main source of income [22,38]. One way to optimize cocoa farming is by playing an active role in farmer groups. Farmers who actively participate in farmer group activities may find it easier to solve farming problems so that the productivity obtained may be more optimal. Optimal cocoa productivity can increase farmers' household income. Based on the phenomenon and previous research, the correlation between farmer activeness in farmer groups with income in Trenggalek Regency.

II. METHODOLOGY

The methods used in the research are descriptive analytics and correlation. The data used in the form of primary data includes the number of farmers who are members of farmer

groups, the component value of the level of cocoa farmer activity in farmer groups, cocoa and non-cocoa production, cocoa and non-cocoa production prices, cocoa and non-cocoa farm processing costs, other jobs besides farming, and daily household expenditures, while secondary data is cocoa production data in Indonesia. The research was conducted in Suruh Village, Trenggalek Regency. Respondents used in the study, namely the entire population of cocoa farmer households who are members of the farmer group "Tunggal Jaya" in Suruh Village, Trenggalek Regency, totaling 111 respondents.

The level of activity of cocoa farmers in farmer groups in Trenggalek Regency was measured from five aspects, namely farmer attendance in farmer group activities, farmer involvement in farmer groups, farmer relationships with farmer group members, farmer networks with agricultural institutions, and partnerships made by farmers. The measurement of farmers' level of activity was analyzed using a Likert scale with the rubric in Table 1.

TABLE 1. RUBRIC FOR MEASURING THE LEVEL ACTIVITY OF COCOA FARMERS IN FARMER GROUP

No	Aspects	Description	Score
1	Farmer attendance at farmer group activities	a. Never attended	1
		b. Attend activities 1 time/year	2
		c. Attend activities 2 - 3 times/year	3
		d. Attend activities 4 - 5 times/year	4
		e. Attend activities > 6 times/year	5
2	Farmer activity in farmer groups	a. Inactive	1
		b. Active, but not involved in making group decisions	2
		c. Active, sometimes participate in making group decisions	3
		d. Active, often involved in making group decisions	4
		e. Active, always involved in making group decisions	5
3	Relationship between farmers and farmer group members	a. Never communicate	1
		b. Communicate once a month	2
		c. Communicate 2 times a month	3
		d. Communicate 3 times a month	4
		e. Communicate > 4 times a month	5
4	Farmer networks with agricultural institutions	a. No network	1
		b. Has 1 network	2
		c. Has 2 networks	3
		d. Has 3 networks	4
		e. Has > 4	5
5	Farmer partnerships	a. No partnerships	1
		b. Has 1 partnership	2
		c. Has 2 partnerships	3
		d. Has 3 partnerships	4
		e. Has > 4 partnerships	5

Source: [39]; [40]; and [41]

Each aspect was measured using a Likert scale with a score of 1-5. The results of the measurement were then transformed into an average score using Microsoft Excel software. The average score value is calculated and adjusted based on the score interval calculated using a formula. The average score value and score interval are calculated using the following method [42].

$$\text{Average Score} = \frac{\text{Total Score}}{\text{Total Respondents}}$$

Based on the calculation of the average score above, the category of the level of activeness of farmers based on the

interval score is obtained. The following is the score interval formula in this study.

$$\text{Score Interval} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{The desired number of interval groups}}$$

$$\text{Score Interval} = \frac{5 - 1}{5} = 0.8$$

Notes:

- 0.80 - 1.69 = Inactive
- 1.70 - 2.59 = Slightly Active
- 2.60 - 3.49 = Active Enough
- 3.50 - 4.29 = Active
- 4.30 - 5.00 = Very Active

Cocoa farm productivity is calculated using the following formula.

$$\text{Productivity} = \frac{\text{Total Cocoa Output (ton)}}{\text{Land Area (ha)}}$$

Decision-making criteria related to the level of productivity of cocoa farming in this study are using the following interval categories.

- 0.100 – 0.441 = Low
- 0.442 – 0.782 = Medium
- 0.783 – 1.125 = High

Cocoa farm income was analyzed using the following income model [30].

$$\pi = \text{TR} - \text{TC}$$

Keterangan:

- π = Income (Rp)
- TR = Total Revenue (Rp)
- TC = Total Cost (Rp)

The classification of cocoa farm income levels in Trenggalek Regency is as follows.

- Rp115,431 - Rp11,380,369 = Low
- Rp11,380,370 - Rp22,645,306 = Medium
- Rp22,645,307 - Rp33,910,244 = High

The correlation between farmer activeness in farmer groups with productivity and income of cocoa farming in Trenggalek Regency was analyzed using Pearson product-moment correlation with the following formula.

$$r_{xy} = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2} \sqrt{\sum y_i^2}}$$

Keterangan:

- x = Variable level of cocoa farmer activeness in farmer groups in Suruh Village, Trenggalek Regency

Y = Variable productivity or income of cocoa farming in Suruh Village, Trenggalek Regency

Kategori nilai koefisien korelasinya sebagai berikut.

- $0.00 \leq r_{xy} \leq 0.20$; very weak correlation
- $0.20 < r_{xy} \leq 0.40$; weak correlation
- $0.40 < r_{xy} \leq 0.60$; medium correlation
- $0.60 < r_{xy} \leq 0.80$; strong correlation
- $0.80 < r_{xy} \leq 1.00$; very strong correlation

Pearson product-moment correlation analysis was assisted by the IBM SPSS Statistics 20 application with the following hypothesis.

H_0 = There is no significant relationship between farmers' level of involvement in farmer groups and cocoa farming productivity and/or income

H_1 = There is a significant relationship between farmers' level of involvement in farmer groups and cocoa farming productivity and/or income

The decision-making criteria with a level of 0.05, namely:

- If significance > 0.05 then H_0 is accepted and H_1 is rejected
- If the significance ≤ 0.05 then H_0 is rejected and H_1 is accepted

III. RESULTS AND DISCUSSION

A. Activity Levels of Cocoa Farmers Groups

The level of activity of cocoa farmers in the "Tunggal Jaya" farmer group in Suruh Village, Trenggalek Regency was assessed based on five aspects consisting of farmer attendance in farmer group activities, farmer involvement in the farmer group, farmer relationships with farmer group members, farmer networks with agricultural institutions, and partnerships made by farmers. The five aspects were assessed using a Likert scale with a score of 1-5, in Table 2.

TABLE 2. LEVEL OF COCOA FARMER INVOLVEMENT IN FARMER GROUPS

No	Aspects	Average Score	Category
1	Farmer attendance at farmer group activities	3.72	Active
2	Farmer involvement in farmer groups	3.49	Active Enough
3	Relationship between farmers and farmer group members	3.68	Active
4	Farmer networks with agricultural institutions	3.55	Active Enough
5	Farmer partnerships	3.39	Active
Average Score		3.56	Active

Source: Primary data processed, 2023

Table II shows that the activeness of cocoa farmers in the farmer group "Tunggal Jaya" in Trenggalek Regency is in the active category with an overall average score of 3.56. The level of activeness of farmers in farmer groups in Trenggalek Regency is in line with research which states that the activeness of farmer group members in Rasau Jaya Dua Village is in the medium category with an average of 20.79 located in the interval 15- 20 [43]. This means that the activeness of farmer group members in Rasau Jaya Dua Village at planning meetings and

participation in extension activities has been carried out quite well.

The aspect of cocoa farmer activeness in farmer groups in Suruh Village, Trenggalek Regency that has the lowest average score is the aspect of partnerships made by cocoa farmers with an average score of 3.39 which is in the medium active category. The low value of partnerships made by cocoa farmers is because in conducting farming, farmers still use the GAP of organic cocoa farming so they do not establish many partnerships with institutions that mostly conduct non-organic farming [44]. Cocoa farmers in Suruh Village, Trenggalek Regency have an average of 2 partners to support organic farming, such as farmer groups that produce organic fertilizer and processing units as a place of sale.

The aspect of cocoa farmer involvement in farmer groups in Suruh Village, Trenggalek Regency has an average score of 3.49 which is in the medium active category, because farmers sometimes participate in making farmer group decisions. The aspect of cocoa farmers' network with agricultural institutions has an average score of 3.55 which is in the active category, because cocoa farmers on average have a lot of relationships, both communication, cooperation, and regarding farm business development to several agricultural institutions, such as other farmer groups, village officials, agricultural extension workers, cooperatives, and collective traders. The aspect of cocoa farmer relationships with farmer group members has an average score of 3.68 which is in the active category because many cocoa farmers who are members of the "Tunggal Jaya" farmer group actively hold meetings so that communication is carried out with farmer group members more than 4 times a month. Based on research related to cocoa farming practices, it is stated that farmers consider farmer group meetings to be quite effective in increasing the productivity of cocoa farming [45].

The aspect of cocoa farmer activeness in farmer groups in Suruh Village, Trenggalek Regency that has the highest average score is the aspect of farmer attendance in farmer group activities with an average score of 3.72 which is in the active category. The high value of attendance is because cocoa farmers are actively present to participate in activities that are also actively organized by the farmer group "Tunggal Jaya". Farmers who are members of the "Tunggal Jaya" farmer group get a better understanding of cocoa farming, starting from cocoa cultivation practices according to GAP, making natural fertilizers and pesticides, to post-harvest processing in the form of fermented cocoa beans. Based on the activities of the "Tunggal Jaya" farmer group, farmers who actively participate in farmer group activities have conducted cocoa farming correctly with the use of production factors that can be technically efficient.

Based on the scores of five aspects of cocoa farmer activeness in farmer groups, it shows that cocoa farmers in Suruh Village, Trenggalek Regency are active in group activities. However, there needs to be a slight increase in some aspects by improving the relationship between farmers and farmer partners to obtain information in developing more effective and efficient cocoa farming [46], starting from the correct way of maintaining cocoa plants, post-harvest treatment

techniques to increase the added value of cocoa beans, market price information, and how to multiply partners in selling cocoa beans [47,48].

B. Cocoa Farm Productivity

The productivity analyzed in this study is the productivity of cocoa harvest during the year 2023 including intermediate harvest or harvest conducted by respondent cocoa farmers once a month. The level of productivity of cocoa farming in Farmer Group "Tunggal Jaya" in Trenggalek Regency can be seen in Table 3.

TABLE 3. PRODUCTIVITY LEVEL OF COCOA FARMING

No.	Productivity Level (tons/ha/year)	Category	Number of Farmers (person)	Percentage (%)
1	0.100 – 0.441	Low	46	41.44
2	0.442 – 0.782	Medium	44	39.64
3	0.783 – 1.125	High	21	18.92
Total			111	100.00
Average = 0.54 tons/ha/year				

Source: Primary data processed, 2023

Table III above shows the productivity level of cocoa farming divided into three categories, namely low, medium, and high. Based on cocoa production/ha/year, the number of cocoa farmers in Suruh Village, Trenggalek Regency who have low productivity level (0.100 – 0.441) is 46 people or 41.44% of the total number of farmers sampled, medium productivity (0.442 – 0.782) is 44 people or 39.64%, and high productivity (0.783 – 1.125) is 21 people or 18.92%. The average productivity of cocoa farming in Suruh Village, Trenggalek Regency is 0.54 tons/ha/year which means it is in the medium category.

The level of cocoa farming productivity in Suruh Village, Trenggalek Regency which is in the medium category is due to the large number of cocoa farmers who have joined a farmer group, one of which is the "Tunggal Jaya" farmer group. The "Tunggal Jaya" farmer group is a farmer group that aims to mobilize farmers to be serious about carrying out sustainable cocoa farming so that farmers who join are considered to have complied with the correct cocoa cultivation method. However, not all farmers are active in farmer group activities, so the benefits obtained from farmer groups are not optimally applied in cocoa farming practices [49]. Likewise, the condition of cocoa plants of farmers in Suruh Village is 28-29 years old so the level of productivity is reduced. The results of this study are in line with research stating that cocoa less than fifteen years old has better productivity when compared to cocoa entering the unproductive age of more than equal to fifteen years. The average productivity of productive age cocoa is 744.20 kg/ha while the average productivity of unproductive age cocoa is 588.41 kg/ha [50].

C. Cocoa Farm Income

Cocoa farming is one of the sources of household income for cocoa farmers in Trenggalek Regency. Cocoa farm income can be determined by calculating the difference between farmers' revenue and total costs incurred during cocoa farming. Farmer revenue can be seen from total cocoa production multiplied by the selling price of cocoa, while total costs are the sum of variable costs and fixed costs. Based on 111 respondents, cocoa farmers

in Trenggalek Regency have been farming for 28-29 years. Analysis of cocoa farm income in Trenggalek Regency can be seen in Table 4.

TABLE 4. COCOA FARM INCOME ANALYSIS IN 2023

Description	Average (Rp)
Average Cocoa Production (kg/year)	198
Average Land Area (ha)	0.13
Price (Rp/kg)	Rp 40,000
Average Revenue	Rp 7,920,000
Average Farm Costs	
a. Land Tax Cost	Rp 158,869
b. Toll Depreciation Cost	Rp 458,884
A. Total Fixed Cost	Rp 617,753
a. Fertilizer Cost	Rp 944,396
b. Labor Cost	Rp 148,649
c. Transportation Costs	Rp 192,640
B. Total Variable Cost	Rp 1,285,685
Average Total Cost (A+B)	Rp 1,903,438
Average Income/ Year	Rp 6,016,562

Source: Primary data processed, 2023

Based on Table III, the details of the average results of cocoa farm income analysis in Suruh Village, Trenggalek Regency are as follows.

1. Income

Cocoa farm revenue is seen from the average cocoa production yield and the average cocoa price per kg. Table III shows that the average cocoa production in Trenggalek Regency in a year is 198 kg with an average land area of 0.13 ha owned by cocoa farmers. The average cocoa price is Rp40,000/kg. Total revenue from cocoa farming amounted to Rp7,920,000/year in 2023. The price given to farmers is adjusted to the harvest season.

2. Fixed Cost

Fixed costs are costs incurred during farming activities without being influenced by the amount of production. Fixed costs in cocoa farming in Trenggalek Regency consist of tool depreciation and land tax. The tools used in cocoa farming are hoe, sickle, scissors, sack, bucket, arco, ganco, ladder, crowbar, saw, shoes, caping, gloves, and mask. Based on Table III, it can be seen that the average cost of land tax is Rp158,869/year and the average cost of tool depreciation is Rp458,884/year, resulting in a total fixed cost of Rp617,753/year.

3. Variable Cost

Variable costs are costs incurred during farming activities and are influenced by the amount of production. Variable costs in cocoa farming in Trenggalek Regency consist of fertilizer costs, labor costs, and transportation costs. Based on Table III, it is known that the average fertilizer cost incurred is Rp944,396/year, the average labor cost is Rp148,649/year, and the average transportation cost is Rp192,640/year. Total average variable costs incurred by cocoa farmers amounted to Rp1,285,685/year.

4. Total Farm Costs

Total farming costs are the result of the sum of fixed and variable costs. Based on Table III, it is known that the average fixed cost is Rp617,753/year and the average variable cost is Rp1,285,68/year. Total cocoa farming costs amounted to Rp1,903,438/year.

5. Cocoa Farm Income

The income generated from cocoa farming is the difference between the average revenue and the average total cost of cocoa farming. Based on Table III, the average cocoa farm income in Suruh Village, Trenggalek Regency is Rp7,920,000/year and the average total cost of cocoa farming is Rp1,903,438/year, so the average cocoa farm income is Rp6,016,562/year.

The income level of cocoa farming in Suruh Village, Trenggalek Regency can be seen in Table IV below.

TABLE 4. COCOA FARM INCOME LEVEL

No.	Income Level (Rp/year)	Category	Number of Farmers (person)	Percentage (%)
1	Rp115,431 – Rp11,380,369	Low	102	91.89
2	Rp11,380,370 – Rp22,645,306	Medium	6	5.41
3	Rp22,645,307 – Rp33,910,244	High	3	2.70
Total			111	100.00
Average = Rp6,016,562/year				

Source: Primary data processed, 2023

Based on Table 4, the average income of cocoa farmers in Suruh Village, Trenggalek Regency is Rp6,016,562/year which is in the low category. The results state that 91.89% of cocoa farmers have an annual income of Rp115,431 - Rp11,380,369/year which is in the low category with an average price of Rp40,000/kg. The selling price of cocoa depends on the quality of the cocoa beans, the more the beans are fermented, the higher the income received by farmers [51, 52]but the majority of farmers in Suruh Village do not do fermentation. Cocoa sales by farmers also still use the traditional method, namely by being marketed individually in small quantities and some farmers wait to be taken by middlemen. The results of this study align with research which states that the average income of farmers from cocoa farming is Rp5,510,000 [53].

D. Correlatin Beetween Farmer Activity in Farmer Groups and Cocoa Farm Productivity and Income

The correlation between farmer involvement in farmer groups with productivity and income of cocoa farming in Suruh Village, Trenggalek Regency was analyzed using Pearson product-moment correlation. The analysis results obtained with the help of the IBM SPSS Statistics 20 application can be seen in Table 5.

TABLE 5. RESULTS OF CORRELATION ANALYSIS OF FARMER INVOLVEMENT IN FARMER GROUPS WITH COCOA FARMING PRODUCTIVITY AND INCOME

		Farmer Engagement	Productivity	Income
Farmer Engagement	Pearson Correlation	1	0.865**	0.760**
	Sig. (2-tailed)		0.000	0.000
	N	111	111	111
Productivity	Pearson Correlation	0.865**	1	0.868**
	Sig. (2-tailed)	0.000		0.000
	N	111	111	111
Income	Pearson Correlation	0.760**	0.868**	1
	Sig. (2-tailed)	0.000	0.000	
	N	111	111	111

Notes: **) Significant at $\alpha = 0.01$ level (2-tailed)

Source: Primary data processed, 2023

Table V shows that the Pearson product-moment correlation coefficient between farmer involvement in farmer groups and cocoa farming productivity in Suruh Village, Trenggalek Regency, is 0.865, which means it has a very strong correlation. The positive correlation value indicates that the higher the activity of cocoa farmers in farmer groups, the higher the productivity value of cocoa farming will be followed, and vice versa. Sig. (2-tailed) value of 0.000, meaning that the value is smaller than the real level of 0.05 ($0.000 < 0.05$) so that H_0 is rejected and H_1 is accepted, it can be concluded that there is a significant relationship at the significance level of 0.01 between the activeness of farmers in farmer groups with cocoa farming productivity in Suruh Village, Trenggalek Regency. This study's results align with research stating that the knowledge and skills of cocoa farmers obtained from field schools are new farming methods, creativity in solving farming problems, and managerial skills. Participation in field schools has a positive impact on the productivity and per capita income of cocoa farmers [54].

The correlation between farmer activity in farmer groups and cocoa farming income in Suruh Village, Trenggalek Regency is 0.760 which means it has a strong correlation. This positive correlation value indicates that the more active cocoa farmers are in farmer groups, the higher cocoa farm income will be, and vice versa. Sig. (2-tailed) of 0.000 is smaller than the significance level of 0.05 ($0.000 < 0.05$), so H_0 is rejected and H_1 is accepted. This shows that there is a significant relationship at the 0.01 significance level between farmer activeness in farmer groups and cocoa farming income in Suruh Village, Trenggalek Regency. This study supports the results of previous research which states that the recapitulation of social capital elements consisting of trust, networks, and reciprocity of cocoa farmers is in the high category with cocoa farmer income in the high category. The relationship between cocoa farmers' income and social capital has a strong coefficient value [55].

Productivity and cocoa farm income in Suruh Village, Trenggalek Regency have a very strong correlation of 0.868. The positive correlation value indicates that the higher the productivity of cocoa farming, the higher the income value, and vice versa. Sig. (2-tailed) is 0.000, meaning that the value is smaller than the real level of 0.05 ($0.000 < 0.05$) so H_0 is rejected and H_1 is accepted, it can be concluded that there is a significant relationship at the significance level of 0.01 between productivity and cocoa farm income in Suruh Village,

Trenggalek Regency. The results of this study are in line with research which states that productivity variables significantly affect the level of cocoa farm income. [56].

Actively participating in farmer group activities provides many benefits for farmers in overcoming various agricultural problems [57]. For example, in cocoa farmers' participation in the "Tunggal Jaya" Farmers Group, farmers are taught to make rorak and worm palaces to deal with climate change which helps maintain soil moisture and increase fertility. To deal with pests and diseases, farmers are taught how to build ant houses and cocoa scavenging. Cocoa plant rejuvenation efforts are also carried out in farmer groups by learning side-grafting and milk-grafting techniques to improve plant quality and productivity. Apart from that, farmers are also trained to make vegetable pesticides and organic fertilizers. Making environmentally friendly agricultural inputs is a strategy to prioritize safety standards in cocoa farming practices so that they remain sustainable [58]. All these practices not only help to optimize cocoa productivity but also ensure higher production and thus higher income for farmers.

IV. CONCLUSIONS

The activeness of cocoa farmers in farmer groups in Suruh Village, Trenggalek Regency is in the active category with an overall average score of 3.56. The attendance aspect has a score of 3.72, the relationship aspect has a score of 3.68, and the network aspect has a score of 3.55, all three aspects of activeness are in the active category. The other two aspects, namely involvement and partnership, are in the medium active category with scores of 3.49 and 3.39, respectively. The average productivity of cocoa farming is in the medium category at 0.54 tons/ha/year. The average cocoa farm income is Rp7,920,000/year and the average total cost of cocoa farming is Rp1,903,438/year, so the average cocoa farm income is Rp6,016,562/year.

The correlation between farmer involvement in farmer groups and cocoa farming productivity has a correlation value of 0.865 which is in the very strong category. The correlation between farmer involvement in farmer groups and cocoa farming income has a correlation value of 0.760 which is in the strong category. The correlation between productivity and cocoa farm income has a correlation value of 0.868 which is in the very strong category. The direction of the three correlations is positive and both have a significance value of $0.000 < 0.05$ which means significant.

ACKNOWLEDGMENTS

The authors would like to thank the "Cocoa Innovations and Developments" Research Group for their assistance in writing this article.

REFERENCES

- [1] Badan Pusat Statistik, Statistik kakao Indonesia 2022. Jakarta: Badan Pusat Statistik Indonesia, 2023.
- [2] Muhandi et al., "Sustainability of cocoa production in Indonesia," *Aust. J. Crop Sci.*, vol. 14, no. 6, pp. 997–1003, 2020, doi: 10.21475/ajcs.20.14.06.p2510.
- [3] C. Maney, M. Sassen, and S. L. L. Hill, "Modelling biodiversity responses to land use in areas of cocoa cultivation," *Agric. Ecosyst. Environ.*, vol.

- 324, no. September 2021, p. 107712, 2022, doi: 10.1016/j.agee.2021.107712.
- [4] P. R. Mulyo and Y. Hariyati, "Dinamika perkembangan perkebunan kakao rakyat di Indonesia," *Agriekonomika*, vol. 9, no. 1, pp. 48–60, 2020.
- [5] D. S. Arsyad et al., "A one health exploration of the reasons for low cocoa productivity in West Sulawesi," *One Heal.*, vol. 8, no. October, p. 100107, 2019, doi: 10.1016/j.onehlt.2019.100107.
- [6] C. A. Wongnaa, F. Jelilu, I. A. Apike, J. G. Djokoto, and D. Awunyo-Vitor, "Effect of hybrid cocoa seedlings adoption on profit efficiency in Ghana," *Sustain. Futur.*, vol. 4, no. March, p. 100074, 2022, doi: 10.1016/j.sfr.2022.100074.
- [7] Dinas Kominfo Jawa Timur, "Produksi Kakao Jatim Tahun ini Bisa Capai 46 Ribu Ton," 2023. .
- [8] A. O. Acheampong et al., "The gender differential analysis : knowledge, attitude, practices, and aspirations of pesticide use among cocoa farmers in Asamankese Cocoa District, Ghana," vol. 04, no. 04, pp. 41–50, 2023.
- [9] Badan Pusat Statistik, Kabupaten Trenggalek dalam angka 2023. Trenggalek: Badan Pusat Statistik Trenggalek, 2023.
- [10] Badan Pusat Statistik, Kecamatan Suruh dalam angka 2022. Trenggalek: Badan Pusat Statistik Kabupaten Trenggalek, 2022.
- [11] P. M. Chimi et al., "Climate change perception and local adaptation of natural resource management in a farming community of Cameroon: A case study," *Environ. Challenges*, vol. 8, no. December 2021, p. 100539, 2022, doi 10.1016/j.envc.2022.100539.
- [12] M. K. Miyittah, R. K. Kosivi, S. K. Tulashie, M. N. Addi, and J. Y. Tawiah, "The need for alternative pest management methods to mitigate risks among cocoa farmers in the Volta region, Ghana," *Heliyon*, vol. 8, no. 12, 2022, doi: 10.1016/j.heliyon.2022.e12591.
- [13] R. Y. Rahman and Y. Hariyati, "Pendugaan efisiensi dan inefisiensi teknis pada usahatani kakao rakyat di Kabupaten Banyuwangi," *Media Agribisnis*, vol. 7, no. 1, pp. 98–106, 2023.
- [14] E. K. Tham-Agyekum, G. A. Abourden, J. E. A. Bakang, and B. Juantoa, "Cocoa farmers' perspective on the quality of public and private agricultural extension delivery in Southern Ghana," *Heliyon*, vol. 10, no. 9, p. e30797, 2024, doi: 10.1016/j.heliyon.2024.e30797.
- [15] Y. Hariyati, I. Ibanah, R. Yunita, D. Suharijadi, H. Firmanto, and U. Jember, "Nilai tambah dan keengganan petani melakukan fermentasi biji kakao rakyat Desa Jambewangi Kecamatan Sempu," *J. Agribest*, vol. 7, no. 1, pp. 8–20, 2023.
- [16] E. K. Tham-Agyekum et al., "Impact of children's appropriate work participation in cocoa farms on household welfare: Evidence from Ghana," *J. Agric. Food Res.*, vol. 14, no. May 2023, doi: 10.1016/j.jafr.2023.100901.
- [17] M. M. Oliveira, B. V. Cerqueira, S. Barbon, and D. F. Barbin, "Classification of fermented cocoa beans (cut test) using computer vision," *J. Food Compos. Anal.*, vol. 97, no. July 2020, 2021, doi: 10.1016/j.jfca.2020.103771.
- [18] K. A. Foster, L. M. Suarez-Guzman, D. C. Meza-Sepulveda, D. Baributsa, and C. A. Zurita, "Effects of alternative hermetic bag storage on fermented and dried cocoa bean (*Theobroma cacao* L.)," *J. Stored Prod. Res.*, vol. 107, no. May, p. 102351, 2024, doi: 10.1016/j.jspr.2024.102351.
- [19] Y. Hariyati, R. Y. Rahman, A. U. Hasanah, and A. N. Putri, "Farming group institutions in cocoa business analysis of the role and their effect on productivity and income in Banyuwangi District," *IJCIRAS*, vol. 5, no. 6, pp. 24–36, 2022.
- [20] O. V. Salazar, S. Latorre, M. Z. Godoy, and M. A. Quelal-Vásconez, "The challenges of a sustainable cocoa value chain: A study of traditional and 'fine or flavor' cocoa produced by the kick was in the Ecuadorian Amazon region," *J. Rural Stud.*, vol. 98, pp. 92–100, 2023.
- [21] U. Lestari and M. Idris, "Peran kelompok tani dalam kegiatan usahatani kakao di Desa Ketulungan Kecamatan Sukamaju Kabupaten Luwu Utara," *J. Agribisnis Indones.*, vol. 7, no. 2, pp. 92–101, 2019, doi: 10.29244/jai.2019.7.2.92-101.
- [22] S. G. Attipoe, J.-M. Cao, Y. Opoku-Kwanowaa, and F. Ohene-Sefa, "Assessing the impact of non-governmental organization's extension programs on sustainable cocoa production and household income in Ghana," *J. Integr. Agric.*, vol. 20, no. 10, pp. 2820–2836, 2021.
- [23] A. Wijaya, P. Glasbergen, P. Leroy, and A. Darmastuti, "Governance challenges of cocoa partnership projects in Indonesia: seeking synergy in multi-stakeholder arrangements for sustainable agriculture," *Environ. Dev. Sustain.*, vol. 20, pp. 129–153, 2018.
- [24] C. I. Prihantini and D. M. Onuigbo, "Participation of local farmer's organizations in supporting the cocoa plant revitalization program," *Indig. Agric.*, vol. 1, no. 2, pp. 79–90, 2023.
- [25] E. Donkor, E. Dela Amegbe, T. Ratering, and J. Hejkrlik, "The effect of producer groups on the productivity and technical efficiency of smallholder cocoa farmers in Ghana," *PLoS One*, vol. 18, no. 12 December, pp. 1–20, 2023, doi: 10.1371/journal.pone.0294716.
- [26] E. A. Kosoe and A. Ahmed, "Climate change adaptation strategies of cocoa farmers in the Wassa East District: Implications for climate services in Ghana," *Clim. Serv.*, vol. 26, no. March, p. 100289, 2022, doi: 10.1016/j.cliser.2022.100289.
- [27] R. Obeng Agyei, K. Amankwah, E. K. Tham-Agyekum, E. Narh, J. Quaye, and J.-E. A. Bakang, "Unveiling the nexus: how extension delivery methods drive the adoption of improved agronomic practices among cocoa farmers in the Bono Region," *Int. J. Food, Agric. Nat. Resour.*, vol. 4, no. 4, pp. 51–61, 2023, doi: 10.46676/ij-fanres.v4i4.189.
- [28] I. Owusu, "The impact of climate change on cocoa production and adaptation strategies adopted by cocoa farmers in Amansie West District, Ghana," *Norwegian University of Life Sciences, Ås*, 2022.
- [29] I. Fitriyah and Y. Hariyati, "The excellence of cocoa-goat integrated farming in the implementation of zero waste concept," *SEAS (Sustainable Environ. Agric. Sci.)*, vol. 4, no. 2, pp. 162–167, 2020.
- [30] Y. Hariyati, *Ekonomi kakao. Jember: UPT Percetakan & Penerbitan Universitas Jember*, 2018.
- [31] L. Haruna et al., "Effect of partial pulp removal and fermentation duration on drying behavior, nib acidification, fermentation quality, and flavor attributes of Ghanaian cocoa beans," *J. Agric. Food Res.*, vol. 17, no. April, p. 101211, 2024, doi: 10.1016/j.jafr.2024.101211.
- [32] M. Jibat and S. Alo, "Integrated management of black pod (*Phytophthora palmivora*) disease of cocoa through fungicides and cultural practices in Southwestern Ethiopia," *Int. J. Food, Agric. Nat. Resour.*, vol. 4, no. 3, pp. 43–45, 2023, doi: 10.46676/ij-fanres.v4i3.150.
- [33] L. L. Nkouedjo, S. Mathe, D. E. Fon, M. Geitzenauer, and A. A. Manga, "Cocoa marketing chain in developing countries: How do formal-informal linkages ensure its sustainability in Cameroon?," *Geoforum*, vol. 117, pp. 61–70, 2020.
- [34] E. Purnawan, G. Brunori, and N. G. Molina, "Market Function through Small Family Farms-Middleman Interaction, and Its Relation to Food Security: Evidence from Indonesia," *Int. ABEC*, pp. 143–148, 2021.
- [35] T. Penne and T. Goedemé, "Can low-income households afford a healthy diet? Insufficient income as a driver of food insecurity in Europe," *Food Policy*, vol. 99, p. 101978, 2021.
- [36] C. Rozynek, S. Schwerdtfeger, and M. Lanzendorf, "The influence of limited financial resources on daily travel practices. A case study of low-income households with children in the Hanover Region (Germany)," *J. Transp. Geogr.*, vol. 100, no. June 2021, p. 103329, 2022, doi 10.1016/j.jtrangeo.2022.103329.
- [37] C. Rozynek, "Imagine the financial barrier to public transport use disappears. The impact of the 9-Euro-Ticket on the mobility and social participation of low-income households with children," *Transp. Policy*, vol. 149, no. July 2023, pp. 80–90, 2024, doi: 10.1016/j.tranpol.2024.02.003.
- [38] J. A. van Vliet, M. A. Slingerland, Y. R. Waarts, and K. E. Giller, "A living income for cocoa producers in Côte d'Ivoire and Ghana?," *Front. Sustain. Food Syst.*, vol. 5, p. 732831, 2021.
- [39] M. Moran, A. Wright, P. Renehan, A. Szava, N. Beard, and E. Rich, "The transformation of assets for sustainable livelihoods in a remote aboriginal settlement," *Alice Springs*, 2007.
- [40] K. L. W. Saputra, W. P. Wijayanti, and D. Dinanti, "Kajian penghidupan berkelanjutan (sustainable livelihood) di Kecamatan Dayeuhkolot, Kabupaten Bandung," *Plan. Urban Reg. Environ.*, vol. 8, no. 3, pp. 265–274, 2019.

- [41] I. Prazeres, M. R. Lucas, A. Marta-Costa, and P. D. Henriques, "Organic cocoa farmer's strategies and sustainability," *Bio-based Appl. Econ.*, vol. 12, no. 1, pp. 37–52, 2023.
- [42] A. Salsabila and E. Wulandari, "Persepsi petani kentang terhadap kemitraan di Kecamatan Pangalengan, Kabupaten Bandung," *Mimb. Agribisnis J. Pemikir. Easy. Ilm. Berwawasan Agribisnis*, vol. 7, no. 1, p. 499, 2021, doi: 10.25157/ma.v7i1.4714.
- [43] S. Y. Rianti and J. Sudrajat, "Tani dan manfaat yang diperoleh petani (studi kasus : Desa Rasau Jaya Dua , Kecamatan Rasau Jaya , Kabupaten Kubu Raya)," 2019.
- [44] J. Blockeel et al., "Do organic farming initiatives in Sub-Saharan Africa improve the sustainability of smallholder farmers? Evidence from five case studies in Ghana and Kenya," *J. Rural Stud.*, vol. 98, pp. 34–58, 2023.
- [45] R. O. Agyei, K. Amankwah, E. K. Tham-Agyekum, E. Narh, J. Quaye, and J.-E. A. Bakang, "Unveiling the nexus: how extension delivery methods drive the adoption of improved agronomic practices among cocoa farmers in the Bono Region," *Int. J. Food, Agric. Nat. Resour.*, vol. 4, no. 4, pp. 51–61, 2023.
- [46] R. Glavee-Geo, U. Burki, and A. Buvik, "Building trustworthy relationships with smallholder (small-scale) agro-commodity suppliers: Insights from the Ghana cocoa industry," *J. Macromarketing*, vol. 40, no. 1, pp. 110–127, 2020.
- [47] T. Manyise and D. Dentoni, "Value chain partnerships and farmer entrepreneurship as balancing ecosystem services: Implications for agri-food systems resilience," *Ecosyst. Serv.*, vol. 49, p. 101279, 2021.
- [48] A. MOININA, R. LAHLALI, and M. BOULIF, "Management practices to improve the cocoa bean value chain in Sierra Leone," *Moroccan J. Agric. Sci.*, vol. 4, no. 2, pp. 45–52, 2023.
- [49] Y. Hariyati, R. Yunita, A. U. Hasanah, and A. N. Putri, "Farming group institutions in cocoa business analysis of the role and their effect on productivity and income in Banyuwangi District," *Int. J. All Res. Writings*, vol. 5, no. 6, pp. 24–36, 2022.
- [50] W. A. Saputro and O. Helbawanti, "Produktivitas tanaman kakao berdasarkan umur di Taman Teknologi Pertanian Nglanggeran," *Paradig. Agribisnis*, vol. 3, no. 1, pp. 7–15, 2020.
- [51] A. H. Villacis, J. R. Alwang, V. Barrera, and J. Dominguez, "Prices, specialty varieties, and postharvest practices: Insights from cacao value chains in Ecuador," *Agribusiness*, vol. 38, no. 2, pp. 426–458, 2022.
- [52] J. K. Gyan and B. Bajan, "Market analysis on cocoa beans export: The case of Ghana and Cote d'ivoire in West Africa," *J. Agribus. Rural Dev.*, vol. 66, no. 4, pp. 375–384, 2022.
- [53] A. W. Juliatmaja and Helviani, "Kontribusi usahatani kakao terhadap pendapatan rumah tangga petani di Desa Watumelewe Kecamatan Iwoimendaa Kabupaten Kolaka," *J. Food Syst. Agribus.*, vol. 6, no. 2, pp. 167–171, 2022, [Online]. Available: <http://dx.doi.org/10.25181/jofsa.v6i2.2375>.
- [54] R. K. Bannor, H. Oppong-Kyeremeh, B. Amfo, L. Hope, and S. K. C. Kyire, "The nexus between cocoa farmers' business schools participation and impact to support livelihood improvement strategies in Ghana," *SAGE Open*, vol. 12, no. 2, 2022, doi: 10.1177/21582440221108170.
- [55] Heliawaty, D. Rukmana, Y. Lumoindong, A. Sulili, N. Lanuhu, and I. Natsir, "Social capital and income of cocoa farmers in Peta village, Sendana District, Palopo City, South Sulawesi Province," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 807, no. 3, 2021, doi: 10.1088/1755-1315/807/3/032074.
- [56] R. Y. Rahman and Y. Hariyati, "Farmers household economic analysis on smallholders cocoa farming in Blitar," *J. Sos. Ekon. Pertan.*, vol. 12, no. 1, pp. 70–79, 2019.
- [57] F. Sugden et al., "Experiments in farmers' collectives in Eastern India and Nepal: Process, benefits, and challenges," *J. Agrar. Chang.*, vol. 21, no. 1, pp. 90–121, 2021.
- [58] W. Hyde-Cooper, E. K. Tham-Agyekum, J.-E. A. Bakang, S. Ntem, F. Ankuyi, and R. Mohammed, "Cocoa farmer's use of approved pesticides and compliance with safety standards in Obuasi Municipality, Ghana," *Int. J. Food, Agric. Nat. Resour.*, vol. 5, no. 2, pp. 83–94, 2024.