

3. Farmer income analysis

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Farmer income analysis: Cocoa farming with side grafting technique (Case study in Mappesangka village, South Sulawesi, Indonesia)

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Abstract. The income analysis of side grafting cocoa farming aims to determine the income from side grafting cocoa farming received by farmers and to determine the R/C-ratio of side grafting cocoa farming. The research location was in Mappesangka village, Ponre district, Bone regency, South Sulawesi province. This research was conducted for three months, from March to May 2016. The analytical method used was income analysis to find out how much profit side grafting cocoa farming was, and R/C analysis to determine the level of efficiency in the use of cocoa farming costs. The results showed that the income obtained by respondent farmers in one growing season in side grafting cocoa farming was IDR 20.018.790,16/ha. The R/C in side grafting cacao farming in Mappesangka village was 2.95, this means that the R/C-Ratio value was greater than 1 so that it can be said to meet the criteria to be cultivated in side grafting cocoa farming in Mappesangka village.

1. Introduction

Based on data from Dukcapil Bone [1], Mappesangka village was located in Ponre district, Bone regency, South Sulawesi province, with the topography of the area being land. Mappesangka village has an area of 7.8 km² with the allocation for rice fields, settlements, and plantations of 83.33%, 7.18%, and 5.77%, respectively. The total population of Mappesangka village was 2,785 people, with the education level of the population being mostly elementary school graduates and those not graduating from elementary school are 650 people (38.57%) and junior high school graduates are 450 people (16.16%). This indicates that most of the residents of Mappesangka Village have a low level of education. The total population of productive age, namely 19-64 years, was more than 50%, which was dominated by the unemployed at 1,473 people (52.89%) and followed by farmers at 549 people (18.71%). Most of the livelihoods of farmers in Mappesangka village are cocoa farmers.

Agriculture is a sector that can survive in various conditions, one of which is during the global economic crisis. The agricultural sector plays an important role in economic recovery in Indonesia. The agricultural sector is also one of the main components of government programs and strategies to reduce poverty [2]. As one of the agricultural commodities in the plantation sub-sector, cocoa (*Theobroma cacao* Linn) plays an important role in the national economy. The cocoa industry serves the economy by providing employment, income, and foreign exchange. The role of the cocoa industry



in providing workers can be seen from the data on the cocoa industry workforce in 2010 as many as 1,693 people and growing to 7,540 people in 2014 [3].

The main areas of cocoa production are in eastern Indonesia, namely the province of South Sulawesi with production centers covering North Luwu, Mamuju, Bone, Polmas, Luwu, and Pinrang. Bone district's cocoa production in 2018, 2019, and 2020 were 10,692, 12,234, and 8,159 tons, respectively [3, 4]. The decline in cocoa production is due to the age of the plants, the absence of plant rejuvenation by farmers, pest and disease attacks, and low human resources [5]. Most farmers only get cocoa farming skills that are inherited from their predecessors and are still traditional. Improvement efforts need to be made immediately so that national cocoa production can be maintained and increased. One of the efforts to increase the productivity and quality of cocoa products can be done through rehabilitation through side grafting techniques. The side grafting technique is a vegetative plant propagation technique by combining parts of one plant with another of the same type so that it grows into a plant that has the same characteristics as its parent. The advantage of the cacao side grafting technique is that it is easier to implement so that the cocoa plantation area can be rehabilitated in a short time, and the cacao plant can produce faster. The side grafting technique has been proven to improve cocoa productivity and quality [6].

Based on the description above, it was necessary to calculate the amount of cocoa farming income received by farmers in Mappesangka village from the side grafting technique. Farming income is defined as the total net producer of farmers from cocoa production activities after deducting all costs [7]. The purpose of this study was to determine the income and efficiency level of side grafting cocoa farming in Mappesangka village.

2. Materials and methods

This research was conducted in Mappesangka village, using the purposive sampling method. The survey was conducted on 25 members of the Padaelo farmer group with the consideration that the farmer group received assistance from the Gernas (Gerakan Nasional Peningkatan Produksi dan Mutu) Cocoa Program. Gernas Cocoa or the National Movement for Increasing Cocoa Production and Quality is one of the efforts to accelerate the increase in crop productivity and the quality of national cocoa products by optimizing all potential stakeholders and existing resources [8].

2.1. Data types and sources

The survey and observation methods were used in this research. The information gathered includes both primary and secondary data. Direct interviews and questionnaires were used to collect primary data from respondent farmers. Secondary data was obtained from research-related organizations or agencies.

2.2. Analysis methods

The data calculation of costs, income, and R/C ratio using the following formula:

Calculation of total costs (TC),

$$TC \text{ (IDR)} = VC \text{ (IDR)} + FC \text{ (IDR)} \quad (1)$$

where TC is the total costs, VC is the variable costs, and FC is the fixed costs.

Calculation of total revenue,

$$TR \text{ (IDR)} = Y \text{ (kg)} \times P_y \text{ (IDR/kg)} \quad (2)$$

where TR is the total revenue, Y is the total production, and P_y is the product price.

Calculation of income,

$$\pi \text{ (IDR)} = TR \text{ (IDR)} - TC \text{ (IDR)} \quad (3)$$

where π is the farming income.

The efficiency of cocoa farming is known by analysis of the R/C ratio which is the ratio between revenue and costs. It can be formulated as follows:

$$R/C \text{ ratio} = (TR/TC) \quad (4)$$

where R/C ratio is the revenue cost ratio, R/C ratio criteria are as follows: $R/C > 1$ indicates efficient side grafting cocoa farming, $R/C = 1$ indicates Break Even Point (BEP) cocoa farming, and $R/C < 1$ indicates inefficient side grafting cocoa farming.

3. Results and discussion

3.1. Characteristic of respondents

Respondent farmers in this study were farmers who did cacao farming in Mappesangka village. The characteristics of farmers in Table 1 are identified because they are a determining factor for the success of their farming.

Table 1. Characteristics of cocoa farmer respondents in Mappesangka village.

Characteristics	Number	Percentage (%)
Age (years old)		
25–40	10	40
41–56	10	40
57–72	5	20
Education level		
Completed/not completed elementary school	4	16
Completed junior high school	6	24
Completed senior high school	14	56
Graduated from college/university	1	4
Family members		
1–2	5	20
3–4	17	68
5–6	3	12
Farming experience (years)		
5–8	8	32
9–12	7	28
13–16	10	40
Land area (ha)		
0.20–0.63	11	44
0.64–1.07	11	44
1.08–1.51	3	12
Production (kg)		
250–1,400	17	64
1.401– 2.101	6	32
> 2.102	2	4

Young farmers have better physical abilities, and they are fast learning to accept technology [9]. The age of the farmers shows that the respondent farmers who cultivate cocoa were included in the productive age group (15–56 years old [10]) who can manage their farming well and have an impact on increasing production and income. In addition, the education level of the respondent farmers will affect managing their farms. Most of the education levels of respondent farmers who cultivate cocoa

are completed senior high schools. The higher the level of education of farmers, the easier the adoption process of innovations related to cultivation techniques and getting market information to increase the success of their farming. The education level of respondents will shape their character, way of thinking, and farming patterns which affect the improvement of farmers' living standards [11].

The number of dependent members of the farming family was a burden for the family to provide for their daily needs, but on the other hand, it was a source of a worker to help in farming activities, especially for productive family members. The number of family dependents on respondents who cultivate side-grafted cocoa in Mappesangka village was relatively low. Family dependents have the potential to be workers, so they can directly reduce the cost of labor and ultimately affect the level of income received [12].

Farmers' experience is useful in running their farming business because experience can be used in deciding actions and policies to anticipate failure. Farmers who have been working on cocoa plants for a long time are expected to be more skilled in mastering cocoa cultivation techniques. Respondent farmers in Mappesangka village are generally experienced. The farming experience causes farmers to be more careful in accepting and implementing a new type of technology that has the potential to cause failure [13].

The area of agricultural land affects business scale, cocoa production, and farmers' income [14]. Farmers who do not own land become dependent on other people as land owners. Respondent farmers who cultivate cocoa in Mappesangka village have an average land area of 0.75 ha. Production is the amount of product obtained by farmers as a harvest in one planting season and is expressed in kilograms. The production of side-grafted cocoa in Mappesangka village was classified as medium production with a total production of 1,401–2,101 kg.

Table 2. Cocoa farmer income analysis in Mappesangka village

No	Description	Value
1	Total Revenue (TR = Y x Py) (IDR)	30,285,204
	Product (Y) (kg)	1,408.61
	Product Price (Py) (IDR/kg)	21,500
2.	Total Cost (TC = VC + FC) (IDR)	10,266,413.65
	a. Variable Cost (VC) (IDR)	10,007,742.17
	Urea (fertilizer)	595,767.20
	NPK Phonska (fertilizer)	780,264.55
	SP-36 (fertilizer)	495,540.00
	Duta Tani (fertilizer)	446,560.86
	Nordoks (fungicide)	354,074.07
	Polaris (herbicide)	409,523.80
	Tombak (fertilizer)	976,000.00
	Radus (fertilizer)	547,354.49
	Maintenance	1,299,835.98
	Harvest wages	3,050,540.22
	Transportation cost	1,052,281.00
	b. Fixed cost (FC) (IDR)	258,671.48
	Land tax	103,000.00
	Depreciation	155,671.48
3.	Income ($\pi = TR - TC$) (IDR)	20,018,790.16
4.	R/C ratio = TR/TC	2.95

3.2. Farming cost analysis

Farming cost analysis is dependent on the type of production facilities used as well as farm management costs, which include variable and fixed costs. Variable costs are expenses incurred by farmers during production activities that have a direct impact on output. Variable costs consist of the purchase of production facilities such as fertilizers, pesticides, and labor. Fixed costs, including land rent, taxes, and production equipment costs, have no direct impact on output [15]. Table 2 shows the costs incurred by respondent farmers.

Table 2 shows that the fixed cost spent by respondents in side grafting cocoa farming in Mappesangka village was IDR 258,671.48/ha, while the variable cost was IDR 10,007,742.17/ha, so the total cost was IDR 10,266,413.65/ha. This value was close to the total cost incurred by side grafting cocoa farmers in Central Sulawesi, which was IDR 10,373,000/ha, while farmers who do not do side grafting were IDR 6,807,600/ha [16]. Research in West Sidole, Parigi Moutong, Central Sulawesi by Fahrudin [17] stated that the total cost of side grafting farming was IDR 16,292,588.24/ha smaller than the total cost of top grafting farming IDR 16,483,261.65/ha. The number of costs incurred by respondents is influenced by processing, planting, fertilizing, maintaining, and harvesting. The efficiency of farmers' income, is determined by farming capital goods in the form of fertilizers, seeds, agricultural tools (hoes, plows, etc.), unsold harvests, plants in the fields, and others [14].

The farmer's welfare level was influenced by the amount of income received from farming [18]. Farmers' income was determined by the amount of revenue obtained from the value of production minus the total cost. The production value is calculated by multiplying the quantity and the price of the product, while the total costs of fixed costs are added to variable costs. The income of respondent farmers in side grafting cocoa farming was IDR 20,018,790.16/ha. The income of Central Sulawesi cocoa farmers who perform side grafting was IDR 15,327,200/ha, while farmers who do not do side grafting were IDR 7,693,200/ha [16]. The income of cocoa farmers in West Sidole, Parigi Moutong, Central Sulawesi who perform side grafting was IDR 40,591,016.27/ha, while top grafting farming generates an income of IDR 20,556,827.13/ha [17].

Efficiency is the study of how a person allocates available resources effectively and efficiently to maximize profits at a given time [19]. According to an analysis of the efficiency level (R/C ratio) of side grafting cocoa farming in Mappesangka village, the R/C ratio value was 2.95, which means that every IDR 1.00 spent will result in an income of IDR 2.95. This value corresponded to the findings of an analysis of the R/C ratio in side grafting farming in Central Sulawesi, which was 2.48 [16]. The R/C ratio value was greater than 1, so it can be said that side grafting cocoa farming in Mappesangka village was efficient and profitable.

4. Conclusion

The study concluded that the respondents' income from side grafting cocoa farming was IDR 20,018,790.16/ha. In side grafting cocoa farming in Mappesangka village, Ponre sub-district, the R/C ratio was 2.95. This means that the farmer will receive IDR 2.95 for every IDR 1.00 spent. Because the R/C ratio value was greater than one, farming in Mappesangka village was efficient and profitable. According to the findings of this study, the government should assist farmers through side grafting cocoa farming rehabilitation and more optimal cocoa farmer development. The future research is to identify the cocoa side grafting technique implementation problems in the Mappesangka village and obtain solutions for these problems.

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