FEASIBILITY OF CACAO FARMING METHOD OF TOP GRAFTING IN WIJA AMERTA FARMING GROUP IN ANGKAH VILLAGE, SELEMADEG BARAT DISTRICT, TABANAN REGENCY

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ABSTRACT

Cocoa is one of the potential export commodities because processed cocoa products can be used as the main ingredient for the cocoa powder (chocolate) manufacturing industry. The objectives of conducting research are: 1. Describe the production process of cocoa top grafting in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency. 2. Analyzing costs, receipts and income of cocoa farming in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency. 3. Analyze the feasibility of cocoa in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat Subdistrict, Tabanan Regency. Research results show that cocoa farming with top grafting production techniques shows that the grafting process at the Wija Amerta Farmers Group in Angkah Village, Selemadeg Barat Sub-District, Tabanan Regency is carried out by grafting local cocoa with superior cocoa entries. Cocoa farming costs IDR 5,423,000, revenues IDR 20,025,000 and cocoa farming income IDR 14,602,000 in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat Sub-District, Tabanan Regency. The feasibility of cocoa in the Wija Amerta Farmer Group in Angkah Village, Selemadeg Barat District, Tabanan Regency is known to have an R/C ratio of 3.7.

Keyword: Cocoa, entries, feasibility

1. PRELIMINARY

Background

Cocoa is one of the potential export commodities because processed cocoa products can be used as the main ingredient for the cocoa powder (chocolate) manufacturing industry. Raw materials for the manufacture of food and beverages such as cakes, ice cream, snacks, milk, refreshing drinks, cosmetics and pharmaceuticals and have a sizable market opportunity. Indonesia is the third largest cocoa producer after Ivory Coast and Ghana (ICCO, 2015) with production reaching 779 thousand tonnes and an area of 1.44 million hectares, the largest in all provinces, (Director General of Plantations, 2015).

According to the Ministry of Agriculture (2018), in the period 2017 – 2018 the development of Indonesian cocoa consumption has continued to increase with an average growth of 1.17% per year. In 2017 cocoa consumption was 11.123 thousand tons, increasing to 11.256 thousand tons in 2018. This increase deserves to be the focus of all parties considering that the demand for cocoa and cocoa consumption in the world are increasing from year to year.

There is a high demand from importing countries for cocoa beans in Indonesia because they have special characteristics that cocoa in other countries does not

have. this is a big opportunity for Indonesia to increase cocoa competitiveness by continuously improving the quality of cocoa production.

To improve production to increase cocoa productivity, it is necessary to improve the cocoa marketing system as one of the infrastructures in increasing cocoa competitiveness (Hermawati, 2015).

The development of smallholder cocoa plants has fluctuated due to frequent changes in land area, production, productivity and market prices. The management of cocoa yields is not optimal, such as selling the harvest in the form of wet beans, even farmers often sell cocoa that is still being planted due to family financial needs so that the sales of cocoa received are low compared to market prices.

Table 1.1 Cocoa production in Bali Province by Regency/City (Tons)

City	Produksi kakao (ton)		
	2019	2020	2021
Jemberana	2.942	3.009	6.341
Tabanan	895	921	4.530
Badung	88	78	455
Gianyar	107	107	292
Klungkung	22	22	42
Bangli	76	62	228
Karangasem	172	169	727
Buleleng	649	628	1.261
Denpasar	0	0	0
Provinsi Bali	4.951	4.997	13.876

Source: Bali Provincial Agriculture and Food Security Office 2021

Based on Table 1.1, the district that has cocoa production has increased every year, namely Tabanan Regency. Tabanan Regency is one of the cocoa plantation commodity centers in Bali. One of the largest cocoa producing villages is Angkah Village, Selemadeg Barat District. (BPS Province of Bali, 2020) shows that the area of cocoa land in Selemadeg Barat District reaches 1,303.24 ha, which is the largest cocoa area in Tabanan Regency with production reaching 555.82 tons per year.

The production of plantation commodities at the village or banjar level is accommodated in a farmer group institution, which is known as "Subak". One of the farmer groups engaged in cocoa production is the Wija Amerta farmer group, which is located in Angkah Village, Selemadeg Barat District, Tabanan Regency.

Based on the above background, a feasibility study on cocoa farming was carried out in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency.
The objectives of conducting research are:

1. Describe the production process of cocoa top grafting in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency?
2. Analyzing costs, receipts and income of cocoa farming in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency?
3. Analyze the feasibility of cocoa in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat Subdistrict, Tabanan Regency.

2. LITERATURE REVIEW

Cocoa Plants

Cocoa is a plantation crop that is very suitable for planting in tropical areas such as Indonesia. Cocoa plants are best planted in areas that are at 10º North Latitude and 10º South Latitude with rainfall of 1100-3000 mm / year.

Cacao cultivation is done by seed by means of seed deder, to get a sturdy stem then 3 months later transferred to the garden, 6 months in the garden the first pruning is done by growing branches ¾ (pruning shape). In the next 6 months (1 year – 1.5 years) the form of production pruning is the worm branch, the base branch. The pruning process is carried out twice a year, pruning and maintenance through shoot grafting with a productive period of 30 years.

System ; Tall plants are difficult to maintain.
Modification of the plants from the beginning: after 3 months, they are connected to the production branch which already has cocoa plants, sorting is carried out which are resistant to pests and fungi and is grafted on to new seedlings. After the connection age of 2-3 months, it just goes down to the ground.

Cocoa plants are annual crops that start producing at the age of 3-4 years. Cacao plants produce seeds that can be processed into cocoa powder (Tjitrosoepomo, 1998). Cocoa beans that have undergone processing can be used as a consumable or mixed ingredient in food. Cocoa beans contain 50-60% fat by weight of the seeds.

There are theobromine and caffeine which function to prevent premature aging and provide a wakeful effect for consumers (Suwarto, et al, 2010). Post-harvest technology Processing of cocoa beans by farmers includes fermentation, non-fermentation, washing, drying and marketing activities. Processing of non-fermented cocoa is processing by soaking the beans in water to remove the pulp and followed by drying in the sun, thus the beans are ready for sale regardless of quality. This step was taken by farmers to get fast sales results because if it goes through fermentation it takes a long time so farmers have to wait to get profits from sales.

Cocoa Cultivation Techniques
a. Fertilization

Fertilization is done by making grooves as deep as 10 cm around the trunk of the cocoa plant. The distance between the main stem and the furrow is half the diameter of the petiole. Then the fertilizer is placed along the groove and immediately covered with soil. Fertilization is done twice a year, namely at the beginning of the rainy season and at the end of the rainy season (Karmawati, 2010).

b. Pruning

Pruning is the activity of reducing some leaves, twigs and branches that are parasitic and detrimental to plants. Pruning aims for good aeration, facilitating harvesting and controlling pests and diseases (Asrul, 2013).

c. spraying

Spraying was carried out after the connection cover was opened having 2-3 young leaves, spraying was carried out once a week after the connection cover was opened and repeated 8 times. The steps in preparing to spray POCL Biota are preparing POCL Biota with a predetermined concentration/dose and mixing it with water then spraying it using a handsprayer to evenly distribute parts of the plant, stems and roots.

a. Harvest

Cocoa harvesting is carried out after the fruit is ripe which is marked by a change in the color of the fruit skin. Young fruit is green when ripe it will be yellow whereas, fruit that is red when young, when ripe will turn orange. Fertilization until the fruit is ready for harvest takes an average of 6 months. Cocoa pod picking is done by cutting the pods using a sharp knife so that the pods attached to the stem/branches are not peeled off or damaged. The fruit that is picked should be ripe fruit because underripe fruit contains less sugar in the pulp, resulting in poor yields of cocoa bean fermentation. The fruit that has been picked is then collected to be broken and separated between the seeds and the skin of the fruit. Seeds resulting from separation with fruit skins can then be processed further and then dried in the hot

sun to dry with a moisture content of approximately 12% and then stored in a storage warehouse.

Post Harvest

Post-harvest is defined as the action given to agricultural products after harvest until the commodity is in the hands of consumers. Post-harvest handling aims to ensure that crop yields are in good condition and suitable/appropriate for consumption or for processing raw materials.

3. RESEARCH METHODOLOGY

Location and Time of Research

The research was conducted at the *Wija Amerta* Farmer's Group, Angkah Village, Selemadeg Barat District, Tabanan Regency. Determining the location of this research was done deliberately (purposive sampling) with the following considerations: *Wija Amerta* Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency which is one of the largest cocoa producers in Tabanan Regency with an intercropping system. International scale marketing distribution in Angkah Village. The only cocoa farmer group that functions as a P4S (Independent Rural Agriculture Training Center) in cocoa commodities in Tabanan Regency

The time of the research on Cocoa Marketing Efficiency in the *Wija Amerta* Farmer Group in Angkah Village, Selemadeg Barat Sub-District, Tabanan Regency was carried out for 3 months, from August – October 2022.

Data Types and Sources

The type of data used in the research is qualitative data and quantitative data, which are in the form of explanations related to the object of research.

1. Quantitative data in this study include production costs, cocoa revenues and cocoa income
2. Qualitative data includes the characteristics of respondents, cocoa production management,
3. Data sources

The data obtained in this study include primary data and secondary data.

1. The primary data in this study includes farmer identity, farmer income, and questions related to cocoa marketing efficiency in the Wija Amerta Farmer Group, Angkah Village.
2. Secondary data were obtained from agricultural books, the internet, the Central Statistics Agency for Bali Province, the Central Statistics Agency for Tabanan Regency and the library.

Determination of population and Respondents

The population in this study were all cocoa farmers in the Wija Amerta Farmer Group, consisting of 14 farmers. Thus the sample in this study were 14 cocoa farmers in the Wija Amerta Group, Angkah Village, Selemadeg Barat District, Tabanan Regency.

Data Collection Methods

This research data collection was carried out using the following methods:

1. The observation method is the collection of data obtained from direct observation of the activities of cocoa farmers.

2. The in-depth interview method is the process of obtaining information by means of question and answer while face-to-face between the interviewer and the sample farmers which is guided by a list of questions or questionnaires that have been prepared in advance covering the identity of the farmer, land area, related to marketing efficiency of cocoa farming in the *Wija Amerta* Farmer Group Mekar, Angkah Village, Selemadeg Barat District, Tabanan Regency.
3. Literature study, data collection in the field, literature study is needed where literature related to the feasibility of cocoa farming is used in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency
4. Documentation of Cocoa in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency.

Variabel Penelitian

Variabel penelitian adalah suatu variabel yang mencakup semua unsur yang menjadi ciri utama variabel itu sendiri. Variabel penelitian dilihat pada tabel dibawah ini.

Tabel 3.1 Cocoa Efficiency Research Variables

No	Variable	Indicator	Parameter	Measurement
1.	Production Cost	Labors cost Tools Cost Fertilizer cost	1. Number of worker in the production process 2. Number of tools required 3. The amount of fertilizer used	 Rp Rp
2.	acceptance of cocoa farming	1. Cocoa Price 2. Amount of cocoa production	1. Cocoa Price 2. Amount of cocoa production	Rp Rp
3.	Cocoa Income	1. Acceptance of cocoa farming 2. Production cost	1. Cocoa Price 2. Number of cocoa production cost	Rp Rp
4.	Feasibility of cocoa farming	1. Revenue 2. Cost		%

GENERAL DESCRIPTION OF THE RESEARCH LOCATION

Geographical Conditions of Research Locations

Topographical Geographical Conditions, Angkah Village, Selemadeg Barat District, Tabanan Regency, is a mountainous area with an altitude of 0 to 700 m above sea level, relatively a lot of rainfall with administrative area boundaries as follows:
To the north: pupuan district
To the east: Selemadeg district
To the south: the Indonesian sea
To the west: jemberana district

Figure 4.1 Map of the area of Angkah Village, Selemadeg Barat District, Tabanan Regency

Demographic Conditions of Angkah Village

Based on the registration by village officials in 2022, there will be 2,112 people, consisting of 1,058 men and 1,054 women, with details of the distribution of the population presented in the table**.**

Table 4.1 Total Population of Angkah Village

No (Person)	Population Condition	Total Population
1.	Inhabitans male	1.058
2.	Inhabitans female	1.054
Total		2.112

4. RESULTS AND DISCUSSION

Characteristics of Respondents

The characteristics of the research respondents are described in the discussion below. All respondents used in this study were 14 cocoa farmers who were in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency. All respondents are divided into several characteristics which are explained based on age, education and experience. As for the characteristics of the respondents can be described as follows:

Characteristics of Respondents by Age

Age is one of the assets in cultivating the land, because age is very synonymous with the power possessed by someone in carrying out activities, especially in agriculture. Therefore, the older you are, the less energy you have.

The results showed that most of the 56-65 year olds, as many as 6 people, were classified as productive age. This can lead to optimal cocoa production and higher farming productivity.

Characteristics of Respondents Based on Education

The level of education of the respondents also greatly determines the mindset. The level of education and skills possessed by a person shows knowledge in the field of work.

The results showed that the level of education attained by the respondent farmers was more at the high school level, namely 14 people (100%). The higher the farmer's education, the more the farmer is willing to take risks and be innovative in cocoa production.

Characteristics of Respondents Based on Cocoa Land Area

Land area is a factor of production in running a farm. The area of land used by farmers in farming affects the quantity of production.

The results showed that the largest percentage of cocoa land area was 50% with 7 farmers. This shows that with a large enough land area, the potential for cocoa production will be more and more, and will produce more product value. Farmers' cultivated land shows that most of the cocoa farmers in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat District, Tabanan Regency own their own land (100.00%).

Production Top Connecting Techniques

Top grafting is the merging of two individual clones of different cocoa plants into one unit and grows into a new plant. This shoot grafting uses cacao seedlings as rootstocks which are connected with superior cacao shoots as scions. Rootstock seedlings are ready to be grafted at the age of 2.5-3 months. Cocoa plants in Tabanan showed that each cocoa seedling group had an average of 70% grafted seedlings, 20% side grafted seedlings, and 10% seed-based seedlings.

According to Wisahya (2011), to obtain good growth quality in cocoa seedlings with the top grafting technique, of course there is a process that is carried out, namely in the form of stages in carrying out top grafting on cocoa plants.

For the process that is carried out, of course there are materials that are needed must be prepared such as scissors, ice plastic, connecting knife, and straps. The steps in the cocoa grafting process are: (1) prepare seeds that are about 3 months old as base stems, buds as grafting shoots, and other materials, (2) cut cocoa shoots using scissors, (3) split the middle of the cocoa stem as deep as 1.5 cm, (4) tores entres like ramps with a thin 1.5 cm long, (5) enter the entres into the middle of the split cocoa stem (6) tie it tightly using the rope that has been prepared, (7) use ice plastic for the cocoa lid that has been connected to stimulate growth by the evaporation process and protect young shoots that grow from pests and diseases, (8) place in shady place, keep doing maintenance and observe its growth. After 14 days of the grafting process, shoot growth can be seen and the ice plastic will be opened because if it takes too long it can abort the growing shoots. After 2 months of opening the lid and taking care of the seeds

Cocoa with top grafting technique can already be planted on land that already has shade trees.

Cocoa Production Costs

Total cost is the sum of fixed costs and variable costs. Using this formula, the total production costs of cocoa top grafting systems in farmer groups are as follows:

Fixed cost

Costs whose magnitude does not depend on the amount of production produced. The fixed cost in this study is the cost of depreciation of equipment in the cocoa top grafting system. The depreciation value can be seen in the following table:

No	Tools	Price	Amounts	Tool economic life	Usage	Tool price (Rp)	Capacity Kg	Cost/ Kg	Cost per cyclus	Production Cost (Rp)
1	Fermentations Box	50.000	30	5	60	3.000.000	50	60.000	2.000	30.000
2	Drying Mat	75.000	50	5	60	4.500.000	20	225.000	7.500	112.500
3	Drying Floor	10.000.000	1	10	120	1.200.000.000	1.000	1.200.000	40.000	600.000
4	Scales	150.000	1	15	180	27.000.000	300	90.000	3.000	45.000
5	Counter mechine	15.000.000	1	10	120	1.800.000.000	1.500	1.200.000	40.000	600.000
6	Walla	50.000	10	2	24	1.200.000	10	120.000	4.000	60.000
7	Box	35.000	20	1	12	420.000	20	21.000	700	10.500
8	Shake	100.000	2	5	60	6.000.000	2	3.000.000	100.000	1.500.000
9	Artco	150.000	2	10	120	18.000.000	200	90.000	3.000	45.000
10	greenhouse	15.000.000	1	10	120	1.800.000.000	1.000	1.800.000	60.000	900.000
	Total	40.610.000	118	73	376	4.860.120.000	4.102	7.806.000	260.200	3.903.000

Variable Cost

Variable costs increase or decrease depending on changes in farming activities. Variable costs used in the cocoa top grafting system consist of manure and labor**.**

Table 5.5 Results of cocoa variable costs in the Farmer Groups of Angkah Village, Selemadeg Barat District, Tabanan Regency.

Component	Amount	Value (Rp)	Total Costs
Manure	3	6.000	1.200.000
Worker Labours	4	80.000	320.000

Total	1.520.000

Total Cost

The total cost is the total fixed costs incurred by cocoa farmers

Table 5.6 Results of the total cost of cocoa production

No	Component	Value (Rp)
1	Fix Cost	3.903.000
2	Variabel cost	1.520.000
3	Total Cost	5.423.000

Acceptance of cocoa farming in the Wija Amerta Farmer Group

Acceptance is the amount of product produced which can be measured in physical form or in the form of money. Physical output in the form of weight, amount and content that can be used to compare businesses, other products or value, output in the form of money is used to calculate the value of an income. The income from cocoa farming with the Top grafting System in the Amerta wija farmer group in Angkah Village, Selemadeg Barat District, Tabanan Regency is IDR 2,025 kg x IDR 10,000 = 20,025,000 in one harvest period.

Income

According to Umar (2013) Revenue is the difference between the company's total receipts and total expenses. To analyze income, there are two main information, namely the condition of receipts and expenditures within a certain period of time. The results showed that the income of cocoa from the top grafting system in the Wija Amerta farmer group in Angkah Village, Selemadeg Barat District, Tabanan Regency was IDR 14,602,000

R/C Ratio

According to Suratiyah, (2015). R/C (Revenue Cost Ratio) is a comparison between total revenue and total costs. Using this formula, the R/C ratio with the top grafting system in the Wija Amerta farmer group in Angkah Village, Selemadeg Barat District, Tabanan Regency is as follows: IDR 20,025,000 divided by IDR 5,423,000 = 3.7

CONCLUSION

Based on the results of the discussion, it shows that cocoa farming with top grafting production techniques shows that

1. The grafting process at the Wija Amerta Farmers Group in Angkah Village, Selemadeg Barat Sub-District, Tabanan Regency is carried out by grafting local cocoa with superior cocoa entries
2. Cocoa farming costs IDR 5,423,000, revenues IDR 20,025,000 and cocoa farming income IDR 14,602,000 in the Wija Amerta Farmer Group, Angkah Village, Selemadeg Barat Sub-District, Tabanan Regency
3. The feasibility of cocoa in the Wija Amerta Farmer Group in Angkah Village, Selemadeg Barat District, Tabanan Regency is known to have an R/C ratio of 3.7.

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