

# Optimization of Factors Affecting Rubber Farmer Revenue to Preserve Their Household Income

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**Abstract:** Rubber farming is the main activity of rubber farmers in Musi Banyuasin Regency. Generally, a rubber farmer cultivates quite an extensive rubber plantation area, but the production is not optimal, impacting their revenue. This study aimed to determine the factors affecting rubber farmer revenue and optimize them to preserve their rubber farming business. This research was conducted in Sukamaju Village, Musi Banyuasin Regency, from September – to October 2017. This study used multiple regression analysis with 30 respondents as the samples. The results showed that the average farmer's elementary school education was still in the productive age. The sources of income for farmers came from rubber farming, trading, and labor. At the same time, the factors influencing their revenue were the number of farmers' rubber stands (X2), the price of rubber farmers (X3), and the amount of rubber production (X4). The results of this study are essential to be determined because by knowing the factors affecting the farmer's revenue, farmers can optimize their revenue by increasing these factors. These factors include implementing the good agricultural practice, adopting recommended clones, and selling their product through an organized market.

**Keywords:** *Rubber Farmer, Revenue, Household Income, Sustainability*

## 1. Introduction

Rubber is one of the primary commodities in the agricultural sector in South Sumatra Province. The area of rubber plantations in South Sumatra is 838,749 ha. The area is categorized as smallholder plantations (791,187 ha), government plantations (11,334 ha), and private plantations (36,228 ha). At the same time, the absorption of labor in the rubber plantation sector is relatively high, namely 463,568 KK [1]. On the other hand, the productivity of the rubber plantation is still relatively low. It can be seen that the adoption of recommended clones only reached 59.2% [2]. Increasing awareness to use recommended clones is needed to increase rubber productivity. So that rubber is one of the essential commodities for improving the welfare of farmers in South Sumatera.

Musi Banyuasin is one of the districts with the largest rubber plantation area in South Sumatra (132,524 ha) [3], so the commodity is essential for the people of Musi Banyuasin as their livelihood. Although rubber gardening is

the main livelihood of the family, the revenue from rubber farming is still relatively low because the price of rubber has decreased in the last five years, which has had a significant impact on the revenue rate of rubber farmers. The revenue rate of rubber farmers is greatly influenced by the fluctuations of rubber prices themselves [4]. The level of revenue of farmers will affect farmers' expenditure to fulfill their household's needs.

In general, the higher the level of revenue, the more fulfilled farmers' daily needs. Hence, farmers' welfare is improved. So that the novelty of this study, besides determining the revenue of rubber farmers, also determines the factors affecting the revenue of farmers so that farmers know what factors can be optimized to increase farmers' revenue. Therefore, the purpose of this study was to 1) determine the characteristics of rubber farmers in Sukamaju Village, 2) determine the sources of revenue of rubber smallholder families, and 3) determine factors that affect the revenue of rubber farmers.

## 2. Methodology

### Location and Time of Research

The research was conducted in Sukamaju Village, Babat Supat Sub-district, Musi Banyuasin Regency, South Sumatra Province. Sukamaju Village was selected as the research site because most of the villager's family's main livelihood is rubber gardening. The research was conducted in September-October 2017.

### Research Population

The study population was 100 people. From this total population, 30 respondents were sampled. The selection of samples was conducted using purposive sampling by determining the criteria of farmers who have rubber gardens, experience in rubber gardening, and the accessibility of the pieces.

### Data Collection Methods

The study used primary and secondary data. Primary data is obtained by a structured interview method using questionnaires. At the same time, secondary data was obtained through literature studies [5].

#### 1) Revenue Analysis

Data analysis was conducted qualitatively and quantitatively. Qualitative research was conducted descriptively. While the quantitative analysis was performed using Microsoft Excel and SPSS 16 analysis tools. Revenue was the multiplication between price (P) and quantity (Q) [6]. Mathematically, it can be written as follows:

$$TR = P \times Q$$

Where:

- TR : Total family revenues (IDR/month)  
 P : Prices of commodities that are tried (IDR / kg)  
 Q : The number of items produced (kg)

Household expenses were costs incurred to buy various types of households needs at a specific time. At the same time, the total household expenditure came from the sum of food and non-food prices. According to Amaliyah [7], household expenses calculation was mathematically written as follows:

$$TP = Pp + Pn$$

Where:

- TP : Total expenditure (IDR/month) Pp: Food expenditure (IDR/month)  
 Pn : Non-food expenditure (IDR/month)

## 2) Multiple Linear Regression

Regression analysis was conducted using the SPSS16 software to determine the factors affecting farmer revenue. The variables used to determine the factors affecting revenue are presented as follows:

$$Y: c + ax_1 + bx_2 + cx_3 + \dots + nx_n + \epsilon$$

- Where: Y : Revenue of rubber farmers (IDR/month)  
 C : Constant  
 X1 : Age of the farmer (year)  
 X2 : Number of rubber stands (tree/ha)  
 X3 : Price of rubber (IDR /kg)  
 X4 : Amount of production (kg/month)  
 X5 : Fertilizing the garden (apl/year)  
 X6 : Rubber system (apl/week)

A good regression analysis was a model that frees from multicollinearity, autocorrects, and heteroskedasticity properties. If the model was not free from these properties, it was necessary to review the variables used, taking one of the variables with a high correlation [8]. Parameter testing can be conducted using the F Test. The purpose of this test was to see if independent variables used simultaneously have a significant effect on non-dependent variables (Sudrajat, 1985). While the t-test aimed to find out the regression coefficient of each independent variable (X) used to have a significant effect on the dependent variable (Y) [9]. The alpha used in this analysis was 10%.

## 3. Result and Discussion

### Characterization of Rubber Farmers

Musi Banyuasin regency was a district with a wide area of rubber plantations. However, it was not supported by a high level of education. Based on Table 1, most rubber farmers' education level in the research site was an elementary school (56%). At the same time, the age rate of farmers was still productive, which is 25-40 years, reaching 56% and farmers over 58 years only 8%. This is in line with research conducted by Bola, E & Prihtanti [10], which states that the age of farmers, in general, enters a non-productive period. These conditions can be said that farmers can still build a more optimal rubber garden. The average experience of rubber gardening farmers 0-10 years was 44%. The length of knowledge of rubber gardening because farmers already know and did rubber cultivation well at 15 years.

**Table 1.** Characteristics of Rubber Farmers Respondents

No	Category	Description	Percentage
1	Education	Elementary School	56
		Junior High School	22
		Senior High School	22
2	Age	25-40	56
		41-55	36
		> 56	8
3	Rubber gardening experience	0-10	44
		11-20	36
		> 21	20

Source: Primary Data, 2017

**Source of Rubber Farmers' Revenue**

Farmers needed income to meet the needs of farmers' households. The higher the revenue, the family's needs will

be met. The gain of rubber farmers in Sukamaju Village of Musi Banyuasin Regency can be seen in Table 2.

**Table 2.** Revenue of Rubber Farmer Family

Type of Business	Family Revenue (IDR/month)	Percentage (%)
Rubber gardening	1.649.731	44
Laborer	1.008.889	27
Trade	1.097.727	29
Sum	3.756.347	100

Source: Processed Data, 2017

Based on the data above, it can be seen that the average farmer's revenue amounted to IDR 3,756,347,- per month. The income comes from rubber gardening activities, labor, and trade. Rubber gardening was an activity that contributed 44% to farmer revenue. This was in line with previous research, namely although the price of rubber has decreased, rubber gardening was still the primary source for the family economy [11;12]. Other activities that increase farmers' revenue are as workers and trade with contributions of activities of 27% and 29%, respectively. The income of rubber farmers was relatively lower compared to other types of agricultural business activities [13].

Meanwhile, when viewed from the distribution of the revenue of farmers' families can be said to start from IDR

500,000 - IDR4,500,000, - per month. One of the impacts with the low price of rubber affected the number of farmers' family revenues, where there are still those whose revenues are below IDR 1,000,000, - per month by 3%, in addition to revenues with a distribution of IDR 1,000,000 - IDR 1,500,000, - per month by 18%. While the majority of the distribution of family revenues is spread at the revenue rate of IDR 2,500,001 - IDR 3,000,000, IDR 3,000,001 - IDR 3,500,000, IDR 3,500,001 - IDR 4,000,000 and IDR 4,000,001 - IDR4,500,000,- per month - each amounting to 16%. The distribution of revenues of rubber farming families can be seen in Table 3.

**Table 3.** Distribution of Farmer Revenue

Farmer's Revenue	Sum	Percentage (%)
500.000 - 1.000.000	1	3
1.000.001 - 1.500.000	6	18
1.500.001 - 2.000.000	3	9
2.000.001 - 2.500.000	2	6
2.500.001 - 3.000.000	5	16
3.000.001 - 3.500.000	5	16
3.500.001 - 4.000.000	5	16
4.000.001 - 4.500.000	5	16

**Source:** Primary Data, 2017

With the revenues generated by the farming family was utilized to meet the needs of his family, such as the need for food (side dishes, vegetables, rice) and non-food such as education level, savings in the form of "arisan", garden maintenance such as for fertilization and weed weeding.

Meanwhile, social and other needs include "gotong royong" activities and death donations as well as additional costs such as installments to buy household furniture and so on. The details of a farmer's household expenditure can be seen in Table 4.

**Table 4.** Details of Farmers' Household Expenses

Types of Expenses	Amount of Expenditure (IDR/month)	Percentage (%)
Food	1.340.625	50
Children's education	434.815	16
Savings	183.000	7
Garden maintenance	201.667	8
Social	104.470	4
others	364.778	15
Total	2.629.355	100

**Source:** Processed Data, 2017

Based on Table 4, it can be seen that the household expenditure of respondent farmers reached IDR2,629,355, - per month. The most extensive distribution of price is to meet the family's food needs, which is 50%. This is in line with previous research conducted by Muhammad et al., [14], which states that spending on food needs amounted to 50% more than total household expenditure. As for the other, the most considerable market was for children's education by 16%. For different needs such as garden maintenance, savings in arisan, social activities below 10%.

#### **Factors Affecting Farmer Revenue**

Six variables were significant to affect the revenue of rubber farmers. The selection was conducted based on observations in the field led by farmers in rubber farming activities and previous research [15]. These variables can affect the increase in farmer revenue [16; 17]. Based on the results of multiple regression analysis of the six variables, information is obtained that shows that all variables affect revenue. The results of the data analysis can be seen in Table 5.

**Table 5. Analysis Results (Test F)**

Model	R	R2	Adj R2	Sig.. F Change	Durbin- Watson
1	0,94	0,88	0,86	0,0000	1,63

Source: Processed Data, 2017

Table 5 shows that all variables can explain an effect on revenue of 88%, while 12% was explained outside the specified variables. In addition, the variable is free from the nature of autocorrelation. It can be seen from the Durbin-Watson value of 1.63. The results of ANOVA analysis show

that the model obtained as a whole has a significant effect on the revenue of farmers independently. This can be seen at a significance value smaller than the actual level set at 10%. The results of Anova's analysis can be seen in Table 6.

**Table 6. ANOVA Analysis Results**

Model	Sum of Sq	Mean Sq	F	Sig..
<b>Regression</b>	1.492	1.866	41.45	.000 <sup>a</sup>
<b>Residual</b>	1.845	4.500		
<b>Total</b>	1.677			

Source: Processed Data, 2017

Based on the test analysis results, three variables have a natural effect on farmers' revenue at a fundamental

level of 10%. The results of the t-test analysis can be seen in Table 7.

**Table 7. Test Analysis Results t**

Model	Unstandardized Coefficients (B)	T	Sig..	VIF
C	-5735790	-4,91	0,000	
X1	-10516,91	-0,69	0,492	1,09
X2	871,79	1,79	0,079	1,15
1 X3	594,31	4,11	0,000	2,60
X4	2083,44	2,85	0,006	3,24
X5	33944,42	0,20	0,837	1,22
X6	110214,29	0,56	0,577	1,20

Source: Processed Data, 2017

The variables that had a noticeable effect were the number of rubber tree stands(X2), the price of rubber (X3), and the amount of rubber production (X4). At the same time, those that do not affect revenue were the age of farmers (X1), fertilization (X5), and tapping systems (X6). The number of rubber tree stands of farmers(X2) had a significant effect on revenue. It can be seen that the value of significance was smaller than the alpha (10%). The number of stands arranged by a farmer has applied recommended plant spacing (6 m x 3 m) [18]. The number of rubber trees stands by the recommendations will be able to facilitate disease control because the distance between trees is not too tight so that the disease does not spread

quickly [19; 20].

The price of rubber farmers (X3) was a variable affecting the revenue of rubber farmers [16; 21]. The cost of farmers' rubber had an impact on farmers' income. If the price were high, then the revenue would also increase, but vice versa if the price were low, farmers' revenue would also be below. To keep the cost of rubber stable when the price of rubber decreases, prioritizing good raw rubber material quality, namely by using a formic acid coagulant and selling rubber in groups through organized marketing could be conducted [22; 23; 24]. At the same time, the not recommended processing activities were the application of alum, sulphatic acid, alum, and fertilizer [25]. However, the

price of rubber farmers will increase with the participation of farmers in organized marketing. The amount of farmer rubber production (X4) was a variable that significantly affected farmers' revenue [26; 27].

Production can be increased because farmers already use recommended planting materials. The influence of planting materials on the increase in productivity of rubber plants was relatively strong, about 60% and the other 40% is influenced by environmental factors and garden management [28]. The farmer's age variable (X1) has an insignificant effect on farmers' revenue. This result was in line with previous research. Farmers could increase revenue if they have the creativity to look for other activities so that the income of farmers increases [29]. Harwati et al., [30] stated that the age variable for horticultural commodities has a significant effect because the more productive the age of farmers, the more activities will be done to increase farmers' revenue. At the same time, variables X5 and X6 have an insignificant impact on the income because based on conditions in the field, farmers tend to have the same behavior that is tapping rubber every day or not following the recommendations that use a day-to-day system and in general rubber farmers do not cultivate rubber crops.

### ***Sustainable Farmer Rubber Farming***

The source of livelihood with rubber gardening in Sukamaju Village has been conducted for a long time. Furthermore, some farmers still have to increase their household income by implementing Good Agriculture Practices related to technical recommendations of rubber gardening. The need for strategies to develop people's plantations at this research site becomes essential to be followed up through programs based on institutional approaches and stakeholder collaboration.

Ideal farmer characteristics development will be the primary capital for the competitiveness of rubber farmers. It can be implemented through intensive assistance related to the cultivation and transfer of upstream-downstream technology of natural rubber. Structured supervision activities by related institutions in processing and farmers' organized marketing can certainly also provide additional value on the price and revenue of farmers' households. In addition, the involvement of farmers in the planning and achievement of institutional strengthening programs at the rubber community level in the countryside also helps encourage the collective participation of farmers to be active in rubber farming activities by the direction and recommendations of rubber policies, utilization of natural rubber. Of course, the sustainability of rubber farming in Sukamaju Village will be sustainable if farmers were not only optimizing supporting factors but also be assured about the certainty of stable rubber prices and opportunities to

downstream products based on the region's potential to support the growth of new economic centers in the countryside.

## **4. Conclusion**

Based on the discussion, it can be concluded that the majority of education levels of rubber farmers were only in elementary school, still in a productive age condition, and have relatively long experience of rubber gardening. The primary sources of revenue are rubber gardening, trade, and labor. While the factors that had a significant influence on the increase in revenue were the number of rubber stands of farmers (X2), the price of rubber (X3), and the amount of rubber production (X4). Such revenue could be increased if farmers could optimize factors increasing that revenue.

The increase in farmers' income will be determined mainly by the readiness of farmers' resources to achieve the welfare of rubber farmers' households' welfare by rubber gardening. Rubber farmers must be motivated to be trained in rubber cultivation technology. Furthermore, innovative technology and participation in organized raw rubber material marketing should be conducted to obtain a high price share.

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