Jurnal Pertanian Agros Vol.26 No.1, Januari 2024: 4348-4356

INCOME OPTIMIZATION OF SMALLHOLDER RUBBER FARMING

OPTIMASI PENDAPATAN USAHATANI KARET RAKYAT

[1]Widya Fitriana[1], Rudi Febriamansyah[2], Vonny Indah Mutiara[3], Ayu Rahmah Citra[4]
[1,2,3,4] Social Economic of Agriculture (Agribusiness), Universitas Andalas, Padang, Indonesia

ABSTRACT

South Sumatra Province is the largest rubber producer in Indonesia, with a production share of 29 percent of the total national rubber production. However, since 2018, rubber production has tended to decline. This condition has an impact on the low contribution of rubber to GDP and reduces the income of rubber farmers. This study aims to (1) analyze the production and income of smallholder rubber farmers and (2) analyze the optimal income of smallholder rubber farmers. The study was conducted in Musi Rawas Utara District by interviewing 100 samples of smallholder rubber farmers using a simple random method. The variables observed include the amount of rubber production, rubber prices, rubber farming costs, total revenues, and total farm income, and then analyzed with optimization models. The results showed that the average production of smallholder rubber farming was 1,651 kg / Ha, lower than the optimal production of 4,840 kg / Ha. The income received by rubber farmers is Rp 14,164,390.2 /Ha/year, lower than the income of smallholder rubber farmers in Paser, East Kalimantan, but already higher than the income of rubber farmers in Simalungun, Sumatera Utara. To achieve an optimal income of IDR 24,784,438 / Ha/year, farmers are advised to rejuvenate because the rubber plants production is over 20 years. Farmers must use high-yielding rubber varieties and efficiently use other production inputs. The quality of processed rubber must also be improved to get a high selling price.

Keywords : Rubber, Income, Optimization, Rubber, Smallholder farming,

INTISARI

Provinsi Sumatera Selatan merupakan produsen karet terbesar di Indonesia dengan pangsa produksi sebesar 29 persen dari total produksi karet nasional. Namun sejak tahun 2018, produksi karet cenderung menurun. Kondisi ini berdampak pada rendahnya kontribusi karet terhadap PDB dan menurunkan pendapatan petani karet. Penelitian ini bertujuan untuk (1) menganalisis produksi dan pendapatan petani karet rakyat dan (2) menganalisis pendapatan optimal petani karet rakyat. Penelitian dilakukan di Kabupaten Musi Rawas Utara dengan mewawancarai 100 sampel petani karet rakyat dengan menggunakan metode acak sederhana. Variabel yang diamati meliputi jumlah produksi karet, harga karet, biaya usahatani karet, total pendapatan, dan total pendapatan usahatani, kemudian dianalisis dengan model optimasi. Hasil penelitian menunjukkan bahwa rata-rata produksi usahatani karet rakyat sebesar 1.651 kg/Ha, lebih rendah dari produksi optimal sebesar 4.840 kg/Ha. Pendapatan yang diterima petani karet sebesar Rp 14.164.390,2 /Ha/tahun, lebih rendah dibandingkan pendapatan petani karet rakyat di Paser Kalimantan Timur, namun sudah lebih tinggi dibandingkan pendapatan petani karet di Simalungun, Sumatera Utara. Untuk mencapai pendapatan optimal sebesar Rp 24.784.438/Ha/tahun, petani disarankan melakukan peremajaan karena produksi tanaman karet sudah diatas 20 tahun. Petani harus menggunakan varietas karet yang mempunyai produktivitas tinggi dan menggunakan input produksi lainnya secara efisien. Kualitas karet olahan juga harus ditingkatkan agar mendapatkan harga jual yang tinggi.

Kata Kunci : Karet, Pendapatan, Optimasi, Karet, Usahatani Rakyat

INTRODUCTION

Agriculture, forestry, and fisheries are important in national economic. Its contribution to Gross Domestic Product (GDP) reached 13.7 percent in 2020, the second largest after the Processing Industry sector. During the pandemic in Indonesia, the agricultural sector emerged as a vital sector in

[1] Correspondence author: Widya Fitriana. E-mail: widyafitriana66@gmail.com/widyafitriana@agr.unand.ac.id

the face of economic shocks. It became one of the reliable sectors in the national economic recovery (BPS, 2021).

One sub-sector that has considerable potential is the plantation sub-sector. The contribution of the plantation sub-sector to the national GDP reached around 3.63 percent in 2020, which is the first order in the Agriculture, Livestock, Hunting, and Agricultural Services sectors. The plantation sub-sector provides raw materials for the industrial sector, absorbs labor, and is the most significant contributor to foreign exchange.

Rubber is one of the plantation commodities that has a vital role in economic activities in Indonesia (Haryanto et al., 2019). Rubber is also one of Indonesia's export commodities that generates foreign exchange in addition to oil and gas (Perdana, 2020). Indonesia is the world's largest rubber producer and exporter (Purwaningrat et al., 2020). In addition to increasingly open export opportunities, the domestic rubber market is still relatively large. Potential markets that will absorb rubber marketing are the tire industry, automotive, asphalt, and others.

Rubber plantations in Indonesia are divided into state large plants (PBN), private large plants (PBS), and smallholder plantations (Satra Nugraha & Alamsyah, 2019). In 2018, the area of Indonesian rubber PBN reached 189.58 thousand hectares, decreasing 12.72 percent to 165.47 thousand hectares in 2019. In 2020, the area became 132.88 thousand hectares, a decrease of 19.69 percent. Meanwhile, the area of Indonesian rubber PBS in 2018 was recorded at 246.05 thousand hectares, decreasing 1.85 percent to 241.49 thousand hectares in 2019. In 2020, the area became 225.11 thousand hectares, or a decrease of 6.78 percent (Indonesian Rubber Statistics, 2020)

Large Plantations (PB) and Smallholder Plantations (PR) rubber are spread in most provinces on the islands of Sumatra and Kalimantan, West Java, Central Java, East Java, Banten, Central Sulawesi, South Sulawesi, Bali, and Maluku (Nasir, 2019). The largest PBN area in Indonesia is North Sumatra Province, which is 35.39 thousand hectares or 21.39 percent of Indonesia's total rubber PBN area in 2019. In 2020, it decreased to 33.49 thousand hectares or 25.20 percent of the total area of Indonesian rubber PBN (Hendarmin et al., 2019). The largest PBS area in Indonesia is North Sumatra province, which is 80 thousand hectares or 33.13 percent of Indonesia's total rubber PBS area in 2019—in 2020, it decreased to 58.13 thousand hectares or 25.82 percent of Indonesia's total PBS rubber area. The largest PR area in Indonesia is the province of South Sumatra, which is 817.83 thousand hectares (25.02%) in 2019 of the total PR rubber area in Indonesia and in 2020 of 845.82 thousand hectares (25.11%) of the national rubber PR area.

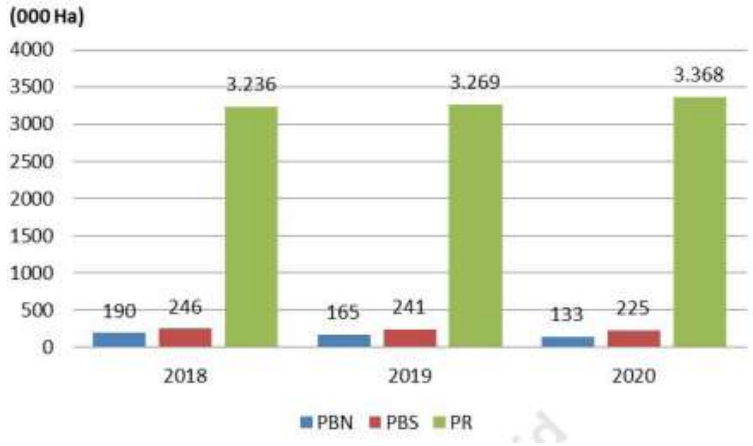

Figure 1. Development of Rubber Plantation Area by Plantation Status (000 Ha), 2019 – 2020

The most significant PR rubber production in 2020 came from South Sumatra Province, reaching 821.32 thousand tons or around 29.50 percent of the total national PR rubber production. The second largest rubber production comes from North Sumatra at 11 percent and Riau and Jambi at 10 percent each (Indonesian Rubber Statistics. 2020)

Musi Rawas Utara Regency is one of the five most significant smallholder rubber production centers in South Sumatra, with a production share of 11.49 percent. People's rubber productivity in this area tends to decline. This is due to the hereditary use of rubber seedlings, narrow land area, and lack of rejuvenation. This condition, of course, has an impact on the income of rubber farmers.

North Musi Rawas Regency is geographically located in the westernmost South Sumatra Province, bordering Bengkulu Province in the west, Jambi Province in the north, Musi Rawas Regency in the south, and Musi Banyuasin Regency in the east. Land in North Musi Rawas Regency is mainly used as non-rice field agricultural land, which reaches 48.45% of the total land area, 21.75% of which is plantation land, both owned and managed by the people and by companies.

Rubber production in North Musi Rawas Regency tends to fluctuate yearly; this can be seen from data on land area and rubber production in North Musi Rawas Regency in 2019-2021. In 2019, smallholder rubber productivity in North Musi Rawas Regency reached 0.93 tons/Ha; in 2020, it fell to 0.87 tons/Ha (BPS North Musi Rawas Regency, 2022). A decrease in productivity will have an impact on decreasing farmers' income (Nicod et al., 2020).

Income optimization is essential to support the welfare of farmers (Jayathilake et al., 2023). Based on the description above, the objectives of this study are: (1). Analyze the level of production and income of smallholder rubber farmers in Musi Rawas Utara Regency, South Sumatra; (2). Analyze the optimal income that can be generated from smallholder rubber farming in Musi Rawas Utara Regency, South Sumatra.

METHODOLOGY

Research Location

This research was conducted in North Musi Rawas Regency, South Sumatra. The location was chosen deliberately because South Sumatra Province was the largest rubber production center in Indonesia in 2020, with a contribution of 28.56% to Indonesia's total production or an average production of 985.98 thousand tons (Center for Agricultural System Data and Information Secretariat-Ministry of Agriculture, 2020); And North Musi Rawas Regency is one of the largest production centers for people's rubber in South Sumatra.

Sampling Method

The population of this study is farmers who farm smallholder rubber plantations in Musi Rawas Utara District. Sampling was done using a simple random method, and the number of 100 farmers was determined using the Slovin formula.

Variable

The variables used in the study refer to a number of variables that affect the optimization of farm income based on the results of previous research conducted (Natalia S et al., 2013); (Elinur et al., 2019), and (Ali J et al., 2015).

Table 1. Research Variables and Measurement

Variable	Measurement
Production	The amount of rubber production produced from smallholder plantations (kg/ha)
Selling Price	The selling price of rubber at the farmer level (Rp/kg)
Farm Cost	All farming costs incurred to purchase inputs/production factors (Rp/ha/Year)
Revenue	Production multiplied by selling price (Rp/ha/Year)
Marginal revenue	The first derivative of rubber farming income (Rp/ha/Year)
Marginal Cost	The first derivative of rubber farming cost (Rp/Ha/Year)
Income	Total farm revenue is reduced by the total cost of rubber farming (Rp/ha/Year)

Data Analysis

Data analysis is carried out with an optimization approach with the following steps:

First, to find out the amount of costs incurred on a farm, can be done using the equation:

$$C = f(Q)$$

$$C = a + bQ + cQ^2$$

C = Cost; a = fixed cost coefficient /Constant (Rp); b,c = coefficient of non-fixed costs (Rp); Q = Production amount (Kg)

Second, the cost equation is transformed into a quadratic equation, i.e.,

$$C = a + bQ + cQ^2$$

So that:

$$C = na\ b\ \boldsymbol{\Sigma}\ Q\ c\ \boldsymbol{\Sigma} Q^2$$

$$CQ = a \sum Q + b \sum Q^2 + c \sum Q^2$$

$$\sum c\ Q^2 = a \sum Q^2 + b \sum Q^3 + c \sum Q^4$$

The values a, b, and c can be obtained using the determinant formula (Sudjana, 1998).

$$\begin{vmatrix} n & \sum Q & \sum Q^2 \\ \sum Q & \sum Q^2 & \sum Q^3 \\ \sum Q^2 & \sum Q^3 & \sum Q^4 \end{vmatrix} \cdot \begin{vmatrix} a \\ b \\ c \end{vmatrix} = \begin{vmatrix} \sum Q \\ \sum Q \\ \sum Q^2 \end{vmatrix}$$

Third. Calculate total revenue with the following formula $TR = aQ + bQ^2$

The values a, and b can be obtained using the determinant formula

$$a = \frac{\sum P \sum Q^2 - \sum Q \sum PQ}{n \sum Q^2 - (\sum Q)^2}$$

$$b = \frac{n \sum PQ - \sum P \sum Q}{n \sum Q^2 - (\sum Q)^2}$$

Fourth, to determine the optimal level of production, marginal costs are equal to marginal revenues, provided that

$$MC = \frac{dC}{dQ} = 0$$

$$MR = \frac{dR}{dQ} dR = 0$$

Fifth, Maximum income on optimal production is achieved if: I max = TR – TC

RESULTS AND DISCUSSION

Overview of Research Areas

North Musi Rawas Regency is a division of Musi Rawas Regency in South Sumatra Province. This area is the westernmost in South Sumatra Province, with the capital city Rupit. This regency is bordered by Jambi Province in the north, Musi Rawas Regency in the south, Bengkulu Province in the west, and Musi Banyu Asin Regency in the east.

The main livelihood of residents in North Musi Rawas Regency is farming both as owner farmers, sharecroppers, and agricultural laborers, and the rest are engaged in non-agricultural fields such as private (traders and handypersons), civil servants (teachers and agency employees) and retirees. In addition, non-agricultural household businesses have also developed a lot, such as handicrafts, snacks, and so on.

Overview of Smallholder Rubber Farming in North Musi Rawas Regency

Musi Rawas Utara Regency is one of the districts in South Sumatra where there are many rubber farmers; until 2023, more than 1000 people were trying to farm rubber, but every year, this figure is decreasing due to declining rubber production because rubber

prices that never rise make rubber farmers switch to planting oil palm.

The rubber production process by local farmers is still traditional, using simple tools. The tools used in conventional management include rubber sap tapping knives, wire rigs & rubber sap tapping bowls, rubber freezer tubs, machetes, plastic buckets as containers when harvesting the rubber sap, and others (Figure 2). Fertilizing rubber plants is done by sprinkling fertilizer on the bottom of rubber trees; this is done so that the roots of rubber plants can absorb fertilizer. Fertilization is carried out two times a year to obtain maximum results in the management of rubber farming. The number of days farmers tap rubber plants averages from 3 to 5 days a week. The harvest brought by rubber farmers will be frozen first before being sold to traders.

Figure 2. Tapping knife, latex holding bowl and latex freezer tub

Based on production factors, some farmers still need to fertilize regularly as recommended. Rubber plantations owned by farmers look neatly arranged (Figure 3), and the appropriate way of planting between rubber tree distances makes it easier for farmers to care for and manage their rubber plants.

Figure 2. The condition of smallholder rubber plantations in Musi Rawas Utara Regency

Based on the results of the study, it was found that the average production of people's rubber in the North Musi Rawas district reached 1.65 tons / Ha/year. The productivity of rubber produced by smallholder plantations in South Sumatra is relatively higher than the national rubber productivity of 1.08 tons / Ha/year but lower than rubber productivity in

other countries such as Thailand, 1.8 tons / Ha/year, and Malaysia, 1.5 tons / Ha/year (Junaidi, 2020). The low productivity of smallholder rubber farming is thought to be caused by rubber trees in community gardens being generally old and needing rejuvenation. Smallholders' ability to manage their rubber plantations still needs to be improved. The average farmer's rubber plant life is more than 20 years. If replanting is carried out, according to farmers, it costs around 25 million / Ha, and this, of course, is very burdensome for farmers.

In addition to low productivity, the quality of processed rubber ("bokar") produced by farmers is also standard, so the competitiveness of rubber made by Indonesia tends to be low compared to the competitiveness of rubber made by other producing countries—the low quality of "bokar" results in relatively low prices received by farmers. The results showed that farmers sold their rubber in the form of rubber chips to collecting traders. The selling price received by farmers is around Rp 6,347 / kg.

Smallholder rubber plantations in North Musi Rawas Regency generally use something other than superior seeds. The results showed that only 23% of farmers used high-yielding seeds. The high-yielding rubber varieties farmers grow are IRR 112, IRR 118, and PB 260. Meanwhile, the non-high-yielding variety planted is natural rubber (Brazilian rubber). Natural rubber comes from production trees in their gardens and has been around since Dutch times, so it needs to be clarified, and quality is not guaranteed.

The area of rubber land owned by the majority of farmers ranges from 1.51-2.50 hectares. Rubber farmers in North Musi Rawas Regency cultivate rubber plants in monoculture by applying a planting distance of 3 x 7 meters. Fertilizers used in people's rubber plants in North Musi Rawas Regency are Urea, TSP, and KCL. In addition to planting rubber, farmers usually also grow other commodities such as oil palm. The results showed that 65% of the land owned by farmers was used for rubber plantations, while the rest was planted with oil palm (Table 2). Farmers began to switch to planting oil palm because of the fluctuating tendency of rubber prices, while palm oil prices, according to them, were relatively stable. However, in terms of the area of land planted with rubber, it is still more significant than the area of land planted with oil palm.

Table 2. Characteristics of Sample farmers

Farmer Characteristics		Percentage
Farmer age (years)	30-40 years	6
	41-50 years	46
	51-60 years	42
	>60 years	6
Gender	Male	68
	Female	32
Length of rubber farming (years)	15-16 years	40
	17-18 years	33
	19-20 years	27
Formal education	Elementry School	32
	Junior High School	24
	Senior High School	43
	University	1
Rubber land area (ha)	Less than 1.5 ha	11
	1.51 – 2.5 ha	64
	2.51 – 3.5 ha	19
	More than 3.51 ha	6
Commodities cultivated	Rubber only	24
	rubber and palm oil	76

Analysis of Income Optimization

The optimization of smallholder rubber farming income is analyzed by determining the cost function first. Farm costs incurred consist of fixed costs and variable costs. Fixed costs are a component of farm costs not affected by the amount of rubber production. There are two components of fixed costs: depreciation and land tax.

Depreciation costs are incurred for loss of asset value in the form of used farm equipment such as machetes, hoes, bowls, tapping knives, freezers, and other garden equipment. The total depreciation cost incurred by rubber farmers reaches Rp 786,870 / Ha/year. And land tax fee of Rp 35,000/ha/year. So the total fixed costs incurred reached Rp 821,870 / Ha/year

The variable costs incurred are (1) seed costs, (2) labor costs, (3) fertilizer costs, (4) herbicide costs, and (5) rubber gum vinegar costs. The total cost of seeds reached Rp 508,500//Ha, while labor cost reached Rp 3,291,705/Ha/year. In this study, farmers used several fertilizers, such as Urea, KCl, and TSP, costing Rp 1,194,555 / ha/year. The cost of purchasing herbicides is Rp 39,739/Ha/year. While the cost of vinegar to process rubber is Rp 79,676 / Ha / Year. So toal variable costs incurred Rp 5,114,175/Ha/year (Table 3)

Table 3. Cost of Smallholder Rubber Farming

No	Cost component	Fix Xost	Variable Cost	Total Cost
1	Depreciation Cost (Rp/Ha)	786.870		
2	Land Tax (Rp/Ha)	35.000		
3	Cost of seedlings (Rp/Ha)		508.500	
4	Cost of labour (Rp/Ha)		3.291.705	
5	Cost of fertilizer (Rp/Ha)		1.194.555	
6	Cost of pesticides (Rp/Ha)		39.739	
7	rubber vinegar cost (Rp)		79.676	
	Total Cost (Rp/Ha/tahun)			5.936.045

Farm cost data is then formulated in the cost function equation so that the following function is obtained: TC = 5,568,934 +1,752,653Q - $2.40Q^2$. Rubber farming revenue comes from the value of rubber sold. The average production of people's rubber reaches 1,651.698 kg / Ha, lower than optimal production of 4,840 Kg/Ha. Average of rubber selling price of Rp 6,347 / Kg at the farmer level. Income received by rubber farmer is Rp 14,164,390,2 / Ha / Year. The total revenue received by smallholder rubber farmers in North Musi Rawas Regency is relatively lower than the income of smallholder rubber farmers in Paser, East Kalimantan, which reached Rp 14,192,037.23 Ha/year (Mursidah, 2019). However, it is still higher when compared to the revenue of people's rubber farming in Simalungun, Sumatera Utara (Natalia S et al., 2013b)

The low income of farmers is thought to be caused by low rubber productivity. In addition, the rubber produced by farmers is of poor quality, so agricultural revenue is relatively low. To achieve optimal income at Rp 24,784,438 Ha/year, farmers are expected to increase production productivity by using superior seeds and production inputs per the recommendations. The rejuvenation factor of rubber plants also needs to be considered by farmers because old plants tend to decrease production.

CONCLUSION AND RECOMMENDATION

Conclusion

1. Rubber production produced from smallholder plantations in North Musi Rawas Regency has yet to reach optimal production. The productivity of rubber made is relatively low due to

old plants and the use of production inputs such as fertilizers that are still not by recommendations
2. Farming income from smallholder rubber plantations in North Musi Rawas Regency could have been more optimal. It is due to the low productivity of rubber; the selling price received by farmers also causes it to be relatively cheap. It is allegedly because the quality of processed rubber produced by farmers tends to be different from the expected quality, so traders buy at low prices.

Recommendation

To achieve optimization of people's rubber farming income, it is recommended to farmers to:

1. Increase productivity through the use of superior seeds, plant rejuvenation, use of production inputs as recommended, and improve farm management
2. Improve the quality of processed rubber products produced by paying attention to rubber quality indicators to the demand of the processing industry

REFERENCES

Ali J, Delis. A, & Hodijah. S. (2015). Analisis Produksi dan Pendapatan Petani Karet di Kabupaten Bungo. *Jurnal Persepktif Pembiayaan Dan Pembangunan Daerah*.

Elinur, E., Heriyanto, H., & Saputra, J. (2019). Optimasi Produksi Usahatani Karet di Kecamatan Tapung Hulu Kabupaten Kampar. *Unri Conference Series: Agriculture and Food Security*, *1*, 15–25. https://doi.org/10.31258/unricsagr.1a3

Haryanto, H., Sunariyo, S., & Abdul Mukti. (2019). Analisis Faktor-Faktor yang Mempengaruhi Produksi dan Permintaan Karet Alam di Indonesia. *Journal Socio Ecpnpmics Agricultural*, *14*(1), 11–22. https://doi.org/10.52850/jsea.v14i1.467

Hendarmin, R. R., Sayadi, M. H., Pebriani, R. A., Veronica, M., & Jenahar, T. J. (2019). Analisis Meningkatkan Pendapatan Rumah Tangga Petani Karet di Indonesia. *Jurnal Ecoment Global*, *4*(1), 90–100. https://doi.org/10.35908/jeg.v4i1.575

Jayathilake, H. M., de la Porte, C., Chang, J. W. J., Edwards, D. P., & Carrasco, L. R. (2023). Transnational evidence for socio-economic factors affecting income and plantation expansion into natural habitats in smallholder rubber. *Resources, Conservation & Recycling Advances*, *18*, 200161. https://doi.org/10.1016/J.RCRADV.2023.200161

Junaidi. (2020). Peningkatan Produktivitas Karet Nasional Melalui Percepatan Adopsi Inovasi di Tingkat Petani. *Perspektif*, *19*(1), 17–28.

Nasir, M. A. (2019). Kinerja Ekspor Komoditas Standard Indonesian Rubber 20 (SIR 20). *Agritech: Jurnal Fakultas Pertanian Universitas Muhammadiyah Purwokerto*, *20* (2), 19. https://doi.org/10.30595/agritech.v20i2.3978

Natalia S, Kesuma, Salmiah, & Indra S. (2013a). Analisis Komparasi Tingkat Pendapatan Usaha Tani Karet Rakyat dengan USAha Tani Kelapa Sawit Rakyat di Desa Buntu Bayu Kecamatan Hatonduhan Kabupaten Simalungun. *Journal of Agriculture and Agribusiness Socioeconomics*.

Natalia S, Kesuma, Salmiah, & Indra S. (2013b). Analisis Komparasi Tingkat Pendapatan Usaha Tani Karet Rakyat dengan Usaha Tani Kelapa Sawit Rakyat di Desa Buntu Bayu Kecamatan Hatonduhan Kabupaten Simalungun. *Journal of Agriculture and Agribusiness Socioeconomics*.

Nicod, T., Bathfield, B., Bosc, P. M., Promkhambut, A., Duangta, K., & Chambon, B. (2020). Households' livelihood strategies facing market uncertainties: How did Thai farmers adapt to a rubber price drop? *Agricultural Systems*, *182*, 102846.

https://doi.org/10.1016/J.AGSY.2020.102846

Perdana, R. P. (2020). Kinerja Ekonomi Karet dan Strategi Pengembangan Hilirisasinya di Indonesia. *Forum Penelitian Agro Ekonomi*, *37*(1), 25. https://doi.org/10.21082/fae.v37n1.2019.25-39

Purwaningrat, L., Novianti, T., & Dermoredjo, S. K. (2020). Dampak Penerapan Agreed Export Tonnage Scheme (AETS) Terhadap Kesejahteraa Petani Karet Indonesia. *Jurnal Penelitian Karet*, 127–138. https://doi.org/10.22302/ppk.jpk.v37i2.641

Satra Nugraha, I., & Alamsyah, A. (2019). Factors Affecting Income Level of Rubber Farmers in Village of Sako Suban, Districts of Batang Hari Leko, South Sumatra. *Jurnal Ilmu Pertanian Indonesia*, *24*(2), 93–100. https://doi.org/10.18343/jipi.24.2.93

Sudjana. (1998). *Tekhnik Analisis Regresi dan Korelasi Bagi Para Peneliti*. Tarsito.