RESEARCH
www.commprac.com
ISSN 1462 2815

# RUBBER PRODUCTIVITY IMPROVEMENT PROGRAM BASED ON THE SOCIOECONOMIC CHARACTERISTICS OF RUBBER SMALLHOLDERS IN BANYUASIN REGENCY, SOUTH SUMATRA PROVINCE

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**DOI: 10.5281/zenodo.12772366**

**Abstract**

The database of rubber smallholdings is indispensable to design programs related to increasing rubber production and productivity in rubber smallholdings. This study aims to obtain data on the socioeconomic characteristics of rubber smallholders in Banyuasin Regency, which can be used to design a program to increase rubber production and productivity in the district. The research was conducted using the survey method. The location was selected purposively considering that Banyuasin Regency is one of rubber plantation centers in South Sumatra. Sampling was carried out by combining purposive, stratified random sampling and random sampling methods with 160 respondents from 4 sub-districts: Sembawa District, Banyuasin III District, Suak Tapeh District and Betung District. Results of the study show that Banyuasin Regency has the characteristics of a progressive area. Taking these characteristics into account, the program to increase the production and productivity of rubber in Banyuasin Regency is to accelerate rubber replanting which can be carried out through: 1) improving planting material quality and introducing new recommended clones by establishing budwood garden of new recommended rubber clones such as IRR 112, IRR 118, IRR 220 and IRR 230; 2) providing funds and credit facilities for rubber replanting; and 3) providing technical guidance on rubber cultivation especially in controlling rubber diseases of pestalotiopsis leaf fall disease and white root disease. In addition, rubber farmers also need tapping schools to improve their skills in tapping techniques. Furthermore, group coaching is more directed to increase the establishment of cooperatives or rubber processing and marketing unit (UPPB).

**Keywords:** Rubber Smallholdings, Smallholders, Socioeconomic Characteristics, Productivity Improvement Program.

## INTRODUCTION

South Sumatra is the largest rubber-producing province in Indonesia. Rubber plantations in South Sumatra consists of smallholder plantations, private plantations, and state-owned plantations, with a total area of 885.70 thousand hectares and 783.3 thousand tons of dry rubber production in 2022. Most of rubber plantation areas are owned by rubber smallholdings, with an area of 859.9 thousand hectares or 97% of the total rubber area in South Sumatra. With the large area, smallholders' rubber plantations can produce the highest production, which is 757.3 thousand tons or 96.6% of the total rubber production in South Sumatra (Directorate of Food Crop Statistics, Horticulture, and Plantations, 2023).

Rubber plantations in South Sumatra are located in 17 districts/cities. One of the rubber center areas in South Sumatra is Banyuasin Regency, which has a total rubber area of 74.7 thousand hectares and rubber production of 54.8 thousand tons in 2021. Rubber plantations in Banyuasin have become a source of livelihood for more than 32 thousand farmers (Directorate General of Estate Crop, 2022).

The development of smallholder rubber plantations in Banyuasin is inseparable from the efforts made by the Indonesian Government through rubber development projects

that began in the five-year development program (Pelita) I period. Since the existence of these projects, the people in Banyuasin have begun to know superior rubber nurseries, which ultimately pushed Banyuasin Regency to become one of the largest rubber nursery centers in South Sumatra. In addition, the existence of the own-state rubber plantations and the private plantations, as well as the Indonesian Rubber Research Institute in Banyuasin, also influenced the farmer's mindset to adopt rubber cultivation technology. Banyuasin Regency has also begun to improve recommended rubber processing techniques and rubber marketing systems, as shown by the existence of the Processing and Marketing Unit of Raw Rubber Material (established in rubber-producing villages.

However, since 2012, rubber prices have continued to decline and are not currently remunerative for smallholders (Figure 1). This condition affected the income and behavior of rubber smallholders in cultivating rubber plantations. The impact of declining rubber prices has caused many rubber plantations to be abandoned because farmers' income is not able to be allocated for the maintenance of rubber plantations. In addition, the low income of farmers causes farmers to leave rubber plantations to look for other sources of livelihood, and even many farmers have converted rubber plants for other commodities (Syarifa, et al., 2015; Syarifa and Tistama, 2020).

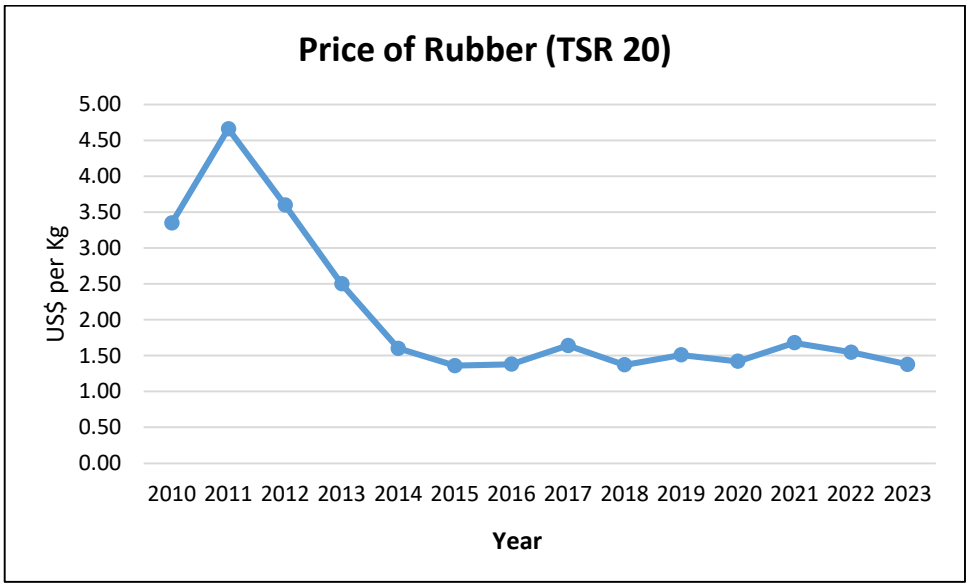


**Figure 1: Growth of Rubber Price, 2010-2023**

Source: SICOM

Projections of rubber prices by the World Bank (2023) and Smit (2016) stated that rubber prices will begin to improve in 2025. In 2025, rubber prices will be predicted to reach USD 1.50 per kg of rubber. Furthermore, Smit, (2016) projected that rubber prices will continue to increase to USD 2.50 per kg of rubber in 2027. Moreover, it is also predicted that there will be a deficit of rubber production in 2030. Therefore, the low rubber prices currently have to be a momentum for conducting rubber replanting programs in an effort to increase rubber production and productivity. Thus, Indonesian rubber plantations will not lose momentum due to the rising price in the future. Through the rubber replanting program, smallholders can use new planting material of superior clones from breeding and final selection (Agustina & Herlinawati, 2017). To increase rubber production and productivity, especially in Banyuasin, the first step that should

be taken is to obtain a database on the characteristics of rubber plantations in Banyuasin Regency. The database is indispensable for designing programs to increase production and productivity, especially for smallholder rubber plantations in the Banyuasin Regency. Therefore, this study aims to obtain a database on the socioeconomic characteristics of rubber smallholdings in Banyuasin Regency, which can be used to design a program to increase rubber production and productivity in the district. The characteristics of rubber smallholders show the characteristics of rubber smallholdings in this study.

## Research Methods

The research was conducted in Banyuasin Regency, South Sumatra Province. The location was selected purposively because Banyuasin Regency is one of the rubber plantation centers in South Sumatra. The research was conducted using a survey method to collect data on the socioeconomic characteristics of smallholder rubber plantations in the Banyuasin Regency. Sampling methods were done by combining purposive, stratified and simple random sampling methods. Then, about 4 sub-districts, namely Sembawa District, Banyuasin III District, Suek Tapeh District, and Betung District, were selected purposively considering that these 4 sub-districts are rubber centers areas in Banyuasin Regency. About 20 sampled villages were selected purposively from these sub-districts, considering these villages are rubber center areas in those 4 sub-districts. Furthermore, a random sample of farmers was taken in the selected villages. Data collection was carried out by interviewing 160 respondent of farmers (Table 1), in 20 selected villages, namely Rejodadi village, Lalang Sembawa Village, Pangkalan Panji Village, Kedondong Raye Village, Regan Agung Village, Plajau Ilir Village, Plajau Ulu village, Sukaraja Baru village, Galang tinggi village, Terentang village, Ujung Tanjung village, Air Senggeris village, Biyuku village, Lubuk Lancang village, Sukaraja village, Meranti village, Durian Daun village, Talang Ipuh village, Pulau Rajak village and Lubuk Karet village.

**Table 1: Number of respondents**

| Subdistrict | Number of respondents (Farmers) |
|---|---|
| Sembawa | 20 |
| Suak Tapeh | 71 |
| Betung | 52 |
| Betung | 17 |
| **Total** | 160 |

The data collected consisted of:

1) Primary data, which included the socioeconomic characteristics of farmers, and
2) Secondary data, which included statistical data from the Central Bureau of Statistics and the Ministry of Agriculture publications.

The data collected was processed by tabulation and analyzed descriptively.

## RESULTS AND DISCUSSION

According to Agunggunanto (2011), the characteristics of farmers included their demographic profile, status socioeconomic, and socio-culture of farmers. Farmer demographics can be related to the farmer's age and farming experience. Meanwhile, the socioeconomic profile of farmers includes land ownership/assets, income from rubber farming and non-rubber farming, and the level of adoption of rubber technology.

Furthermore, socio-cultural profiles included farmers' involvement in cooperatives or marketing groups and farmers' behavior towards farming decisions.

### 1. Farmer Demographics

The farmer profiles of respondents were analyzed based on each subdistrict. The data in Table 2., shows that 160 respondents interviewed were, on average, 45 years old, ranging between 42 – 51 years old. Based on this, the age of farmers in Banyuasin is still classified as productive age. This is in line with the study of Susanti (2016), which stated that the productive age of farmers ranges between 30-59 years old. Farmers in productive age still have strong physical potential and are easily receptive to new innovations.

The survey results also stated that most farmers had experience establishing and cultivating their own rubber plantations. On average, the respondents had rubber farming experience of 21 years. With this experience, farmers are able to apply good rubber cultivation technology. Previous research has stated that farming experience for more than 20 years has a significant effect on productivity and farming income (Chuzaimah et al., 2016).

**Table 2: Demographic Profiles of Respondents**

| Subdistrict | Farming experience (years) | Family member (person) | Age (years) | Education (%) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Not finishing primary school | Primary school | Junior high school | Senior high school | Diploma/ Bachelor |
| Sembawa | 19 | 3 | 49 | 0 | 20 | 25 | 55 | 0 |
| Banyuasin III | 21 | 4 | 45 | 3 | 28 | 17 | 46 | 6 |
| Suak Tapeh | 22 | 4 | 46 | 2 | 38 | 25 | 33 | 2 |
| Betung | 23 | 4 | 46 | 0 | 41 | 12 | 35 | 12 |
| **Banyuasin** | **21** | **4** | **46** | **1** | **32** | **20** | **42** | **5** |

Source: Primary data

Smallholders' rubber in Banyuasin are classified in the education group of not completing elementary school and elementary school (33%); junior high school and senior high school (62%); and university (5%). Previous studies have stated that education can have a significant positive influence on the level of production efficiency of farms. With higher education, farmers will have better *skills* in accessing information and planning better farming (Poungchompu and Chantanop, 2015; Kittilertpaisan, et al., 2016).

### 2. Socioeconomic Profile of Farmers

As explained earlier, the socioeconomic profile of farmers includes land ownership/assets, income of respondent farmers, and the level of adoption of rubber technology.

#### *Asset Ownership*

According to Novianti et al. (2017), farmers' asset ownership includes land, capital, and land tenure status. Previous studies have stated that land area can have a positive influence on production and income generated from a farming (Andrias, et al., 2017; Mamondol, et al., 2016). Respondents in Banyuasin have an average of 1.73 hectares of land area per farmer (Table 3). Thus, rubber farmers in Banyuasin are no longer included in the category of small-scale (*gurem)* farmers. By having land rubber area of almost 2 hectares, it will make it easier for farmers to carry out rubber replanting

programs. Furthermore, the results of the study also showed that on average, 98% of the respondents owned their land. Owning land will be more profitable than renting land since owning land can provide cost efficiency and economic benefits from the increase of productivity produced by the land (Rondhi and Adi, 2018).

**Table 3: Ownership of Farmers' Assets**

| Subdistrict | Planting age (Years) | Land tenure (%) | Total Area (Ha) | Clonal planting material (%) | Number of Trees (Trees) |
|---|---|---|---|---|---|
| Sembawa | 16 | 100 | 1,4 | 100 | 886 |
| Banyuasin III | 16 | 97 | 2,0 | 90 | 1.015 |
| Suak Tapeh | 17 | 98 | 1,4 | 84 | 847 |
| Betung | 19 | 95 | 2,1 | 90 | 1.173 |
| **Average** | **17** | **98** | **1,73** | **91** | **980** |

Source: Primary data

The data in Table 3 shows that, on average, smallholders' rubber plants were at the peak production age of 17 years, which should be able to provide high rubber production supported by the use of clonal planting material (91%) and the high number of tree stands (980 trees). Based on the results of previous research, rubber plants will reach a peak production period between 15-18 years with good agronomic techniques (Kuswanhadi & Herlinawati, 2014).

Furthermore, plant age, rubber tapped area, and a number of rubber trees positively influence rubber production (Kittilertpaisan et al., 2016; Ofori-Bah and Asafu-Adjaye, 2011). However, in fact, with these conditions, the productivity produced by smallholders' rubber was still low, with an average of 1,273 Kg/ha/year (Table 4).

**Table 4: Rubber Production and Productivity of Respondent Farmers**

| Subdistrict | Rubber Production (Kg slab lump /year) | Land area (Ha) | Productivity (Dry rubber kg/ha/year) |
|---|---|---|---|
| Sembawa | 3.182 | 1,4 | 1.236 |
| Banyuasin III | 4.035 | 2,0 | 1.287 |
| Suak Tapeh | 3.400 | 1,4 | 1.211 |
| Betung | 4.368 | 2,1 | 1.360 |
| **Average** | **3.746** | **1,73** | **1.273** |

Source: Primary data

### *Revenue and Expenses*

The main livelihood of respondents (100%) as rubber farmers, showed that the selected villages are rubber centers in Banyuasin (Table 5). The average total income from rubber was about Rp 37.4 million per year or Rp 3.11 million per month. Farmers' income from rubber farming is still equivalent to the minimum wage of South Sumatra in 2022, which is Rp 3.14 million per month.

Generally, to afford the basic needs, rubber farmers in Banyuasin have side livelihoods, including employees, laborers, fishermen, and traders. From side livelihoods (non-rubber farming), the farmers have an income of about Rp 20.9 million per year or Rp 1.74 million per month per household. Therefore, rubber farmers in Banyuasin earned a total income of Rp 58.3 million per year or Rp 4.86 million per month per household.

**Table 5: Livelihood and Income of Rubber Farmers**

| Subdistrict | Rubber livelihood (%) | Revenue per year (Rp) | | | Revenue per month (Rp) | |
|---|---|---|---|---|---|---|
| | | Rubber | Non-Rubber | Total | Rubber | Total revenue |
| Sembawa | 100 | 28.470.000 | 11.760.000 | 40.230.000 | 2.372.500 | 3.352.500 |
| Banyuasin III | 100 | 42.788.629 | 21.013.168 | 63.801.797 | 3.565.719 | 5.316.816 |
| Suak Tapeh | 100 | 38.572.623 | 31.148.823 | 69.721.445 | 3.214.385 | 5.810.120 |
| Betung | 100 | 39.641.905 | 19.722.857 | 59.364.762 | 3.303.492 | 4.947.063 |
| **Average** | **100** | **37.368.289** | **20.911.212** | **58.279.501** | **3.114.024** | **4.856.625** |

Source: Primary data

The total income earned by farmers was used to finance basic needs (54%). The rest was used to finance children's education (23%), savings (14%), social activities (6%), and maintenance of rubber plantations (3%). Table 6. showed that rubber farmers still have potential capital to conduct rubber replanting from the savings. However, the savings will usually be used to fund the unexpected basic needs of farmers. Meanwhile, the maintenance budget is usually used to purchase materials and wages for weeding and fertilizing. Furthermore, the expenses for social activities are generally allocated by farmers to donate feasts or other social activities.

**Table 6: Household Expenditure of Respondent**

| Subdistrict | Expenses (Rp/year) | | | | | Total Expenses (Rp/year) |
|---|---|---|---|---|---|---|
| | Basic Needs | Children's Education | Savings | Social Activities | Rubber plantation Maintenance | |
| Sembawa | 23.932.046 | 9.900.202 | 2.919.604 | 2.119.116 | 1.359.032 | 40.230.000 |
| Banyuasin III | 33.115.816 | 14.500.615 | 10.574.199 | 3.728.056 | 1.883.112 | 63.801.797 |
| Suak Tapeh | 36.625.385 | 15.910.855 | 9.928.795 | 4.732.180 | 2.524.231 | 69.721.445 |
| Betung | 31.510.668 | 13.612.238 | 8.832.077 | 3.903.146 | 1.506.632 | 59.364.762 |
| **Average (Rp)** | **31.295.979** | **13.480.977** | **8.063.669** | **3.620.624** | **1.818.252** | **58.279.501** |
| **Percentage (%)** | **54** | **23** | **14** | **6** | **3** | **100** |

Source: Primary data

### *Access to Extension Services*

The extension services access is a very important support in an effort to increase rubber production and productivity. Data shows that 66% of farmers in Banyuasin have received plantation extension services (Table 7). According to Rosnita et al., (2017), extension workers can play an important role in the process of education, dissemination, facilitation, monitoring, and evaluation in the development of self-subsistent farmers, which in turn can have a significant effect on the empowerment of farmers in increasing rubber productivity. In addition to extension access, farming courses have also been proven to have a significant impact on the production efficiency of farming (Fadzim, et.al., 2017). However, it is only 26% of respondent farmers in this study can get the opportunity to take a course on rubber cultivation technology.

**Table 7: Extension Services and Course Access**

| Subdistrict | Activities to Increase Farmers' Knowledge (%) | |
|---|---|---|
| | Extension visit | Course |
| Sembawa | 65 | 35 |
| Banyuasin III | 52 | 20 |
| Suak Tapeh | 100 | 43 |
| Betung | 47 | 6 |
| **Average** | **66** | **26** |

Source: Primary data

### *Adoption of Rubber Technology*

According to Latif et al. (2022), an agricultural extension can be considered successful if there is a significantly better change in farmers regarding knowledge, skills, and attitudes in adopting technology, which can increase farmers' welfare. This study shows the influence of extension on the adoption level of cultivation, harvesting (*tapping*), and rubber processing technology.

### 1) Rubber Cultivation Techniques

The data in Table 8 provide information that respondents in Banyuasin generally have a fairly good adoption level of rubber cultivation technology. The cultivation technology observed is planting material, planting technique, and maintenance of rubber plantations.

**Table 8: Adoption of Rubber Cultivation Technology in Banyuasin Regency**

| Sub-district | Planting Material (%) | | Planting Technique (%) | | Maintenance Technique (%) | |
|---|---|---|---|---|---|---|
| | Budding Skills | Rubber Clone | Planting Distance | Planting Hole | Fertilization | Disease control |
| Sembawa | 95 | 100 | 100 | 90 | 95 | 35 |
| Banyuasin III | 30 | 90 | 100 | 30 | 43 | 14 |
| Suak Tapeh | 71 | 84 | 100 | 69 | 61 | 12 |
| Betung | 65 | 90 | 100 | 71 | 53 | 24 |
| **Average** | **65** | **91** | **100** | **65** | **63** | **21** |

Source: Primary data

The adoption of planting material technology can be analyzed from the farmer's budding skills and clone of rubber planting material used. Most respondent farmers (65%) already know and have adopted budding techniques for rubber propagation. Farmers' knowledge of rubber clones also supports this skill. Hence, farmers' adoption of rubber clones is also high (91%). Successful rubber development projects and state-owned and private rubber plantations in Banyuasin Regency also influence farmers' knowledge of budding techniques and types of rubber clones. Thus, Banyuasin Regency has become one of Indonesia's superior rubber nursery centers. In addition, the Indonesian Rubber Research Institute contributes to providing rubber technology counseling for rubber farmers in the Banyuasin Regency.

Furthermore, planting technologies included planting distance and planting hole techniques. The measured planting spacing with a certain distance size is an important rubber cultivation technique. From the survey results, all respondents have adopted the recommended planting spacing with varying planting distances: 4 m x 5 m, 5 m x 3 m, and 6 m x 3 m. Hereafter, as many as 65% of respondents have adopted recommended planting holes, and about 35% of respondents still have not implemented recommended planting holes.

Subsequently, the maintenance of rubber plants included fertilization and disease control. In this study, only 63% of farmers have applied fertilization. However, the fertilizer applied still not uses the recommended dosage. Most of the farmer's difficulties in fertilizing are caused by the limited farmer’s capital and the scarcity of fertilizer in the market. Furthermore, the adoption level of farmers for disease control was still very low, at only 21%. The low adoption of disease control was influenced by lack of farmer’s knowledge on types of diseases, as well as controlling and handling rubber diseases.

### 2) Rubber Tapping Techniques

Tapping is a harvesting activity to obtain rubber production by injuring the bark of rubber stems. Rubber tapping technology includes tapping frequency, direction and tilt, and tapping opening height. Rubber plants can be harvested if about 60% of rubber plants have a girth of ≥ 45 cm. Meanwhile, the recommended tapping system is the S/2 (half spiral) which is carried out every two days (d2). Furthermore, farmers are encouraged applying tapping direction from the top left to the bottom right with the recommended inclination angle of ranging from $30^0$ to $40^0$ to the flat plane. In addition, farmers are encouraged to apply a height of tapping opening of about 130 cm from the ground (Kuswanhadi, and Herlinawati, 2012).

The study results show that only about 64% of farmers adopted the S/2 d2 tapping system. Respondents with more than 1 hectare rubber fields can adopt the S/2 d2 tapping system; hence, the tapping activity can be alternated. On the other hand, the respondents with only 1 hectare of rubber plants conducted rubber tapping every day with a frequency of 6 days per week. This not recommended tapping system has an impact on the waste of the economic life of rubber plants. From now on, about 83% of farmers adopted the recommended tapping direction and slope, but only 49% applied the height of tapping opening of 130 cm. Most farmers applied the height of tapping opening ranging from 150-160 cm (Table 9).

**Table 9: Farmers' Adoption Level of Rubber Tapping Technology**

| Subdistrict | Tapping (%) | | |
|---|---|---|---|
| | S/2 d2 tapping system | Tapping Direction and Slope of $30^0$-$40^0$ | Height of Tapping opening (130 cm) |
| Sembawa | 100 | 100 | 100 |
| Banyuasin III | 47 | 80 | 24 |
| Suak Tapeh | 51 | 63 | 24 |
| Betung | 59 | 88 | 47 |
| **Total** | **64** | **83** | **49** |

Source: Primary Data

### 3) Rubber Processing Techniques

Pengawasan Mutu Bahan Olah Komoditi Ekspor Standard Indonesian Rubber

In general, the quality of raw rubber materials produced by farmers in Indonesia is still relatively low since the rubber processing at the farmer's level did not meet the standard requirement. In addition, most of raw rubber material was marketed through a traditional marketing system with a long marketing chain through middlemen. Therefore, one of the Government's efforts to improve the quality of smallholders' raw rubber material is to issue Regulation of the Minister of Agriculture No. 38/Permentan/OT. 140/8/2008 concerning Guidelines for Processing and Marketing of Raw Rubber Materials and Regulation of the Minister of Trade No. 53/M-DAG/PER/10/2009 concerning Quality Supervision of Export Commodity Raw Material of Standard Indonesian Rubber based on SNI No. 06-2047-2002. One of these policy implementations is establishing a Rubber Processing and Marketing Unit (UPPB) in rubber centers in Indonesia. Farmers who are members of UPPB must comply with the rubber processing rules set by UPPB. Hence, the quality of the rubber can meet the standard requirement. Through this UPPB, the farmer's group can market raw rubber material directly to rubber factories. It implies that farmers can receive a higher farmer's share.

In Banyuasin Regency, many Rubber Processing and Marketing Units (UPPB) have been established. Most of the respondents in this study have already joined UPPB. The survey results show that in UPPB, as many as 40% of the respondents have used the recommended rubber coagulant, formic acid. However, most of respondents have still used sulfuric acid as a rubber coagulant due to its price cheaper than formic acid's price. The current condition is still better since the respondents have no longer used rubber coagulants as fertilizer (Table 10).

**Table 10: Weight of slab lump and Rubber Coagulant Applied by Respondents**

| Subdistrict | Weight of Rubber per Slab Lump (kg) | | Rubber Coagulant | |
|---|---|---|---|---|
| | Average | Range | Sulfuric acid | Formic acid |
| Sembawa | 75 | 42-120 | 0 | 100 |
| Banyuasin III | 90 | 34-120 | 78 | 22 |
| Suak Tapeh | 74 | 25-130 | 67 | 33 |
| Betung | 200 | 50-300 | 94 | 6 |
| **Average** | **110** | | **60** | **40** |

Source: Primary Data

All respondents molded rubber in plastic boxes and stored it in a dry place for 5-6 days. Most respondents have produced clean rubber with dry rubber content (*DRC*) ranging from 52-54% for 5-6 days (Table 11).

**Table 11: Rubber Coagulation, Storage, and Cleanliness of Raw Rubber Materials**

| Subdistrict | Places of rubber moulding | Storage | Long storage | Rubber cleanliness | Dry rubber content (DRC) |
|---|---|---|---|---|---|
| | | | (Days) | | (%) |
| Sembawa | 100% plastic box | 100% non-soaked | 5 | 100% Clean | 54% |
| Banyuasin III | 100% plastic box | 100% non-soaked | 6 | 100% Clean | 52% |
| Suak Tapeh | 100% plastic box | 100% non-soaked | 6 | 100% Clean | 52% |
| Betung | 100% plastic box | 100% non-soaked | 6 | 100% Clean | 54% |

Source: Primary data

### 3. Socio-Cultural Profile

The socio-cultural profile of the respondents' farmers is shown by the involvement of farmers in the UPPB marketing group, which has a good impact on farmers' behavior in rubber farming. Through this organization, respondents receive guidance on the recommended processing of raw rubber material technology. The guidance received by respondents included extension (33% of farmers), training (31% of farmers), assistance (14% of farmers) and provision of rubber coagulant (43% of farmers) (Table 12).

**Table 12: Coaching from Farmer Organizations**

| Subdistrict | Rubber processing coaching received by respondents (%) | | | |
|---|---|---|---|---|
| | Extension | Training | Assistance | Provision of Rubber Coagulant |
| Sembawa | 50 | 55 | 20 | 100 |
| Banyuasin III | 32 | 25 | 15 | 35 |
| Suak Tapeh | 23 | 23 | 12 | 21 |
| Betung | 26 | 22 | 10 | 16 |
| **Average** | **33** | **31** | **14** | **43** |

Source: Primary data

## 4. Strategy to Increase Rubber Production and Productivity

From the previous research, characteristics of rubber smallholdings in Indonesia are distinguished by the type of progressive and unprogressive areas. Generally, progressive areas have extension facilities, are near to state-owned and private plantations, have successful rubber development projects, and are sources of superior rubber nurseries. In progressive areas, the farmers have a higher knowledge and adoption of rubber technology. Meanwhile, unprogressive areas have the opposite characteristics of progressive areas (Supriadi, et al., 1999).

The previous discussions show that Banyuasin Regency has the characteristics of a progressive area due to it has the conditions that this regency is near to state-owned and private plantations, successful rubber development projects, and the Indonesian Rubber Research Institute so that extension facilities related to rubber technology are adequately available for rubber smallholders. Furthermore, Banyuasin Regency also has the characteristics of farmers with an adequate level of education and a fairly good level of knowledge and adoption of rubber technology. In addition to rubber income, the respondents also have side jobs income to fund basic needs and rubber plantations investment costs. Most of respondents have also been involved in joint marketing organizations that have given benefits in improving the quality of raw rubber materials and farmer's share.

To increase rubber production and productivity in Banyuasin, government support is needed to provide fertilizer and pesticide at affordable prices. Besides, it is also required to conduct rubber replanting using high yielding rubber clones which is resistant to rubber diseases. In line with the research of Supriadi, et al., (1999), through considering the characteristics of smallholder's rubber plantations in Banyuasin at this time, the acceleration of rubber replanting can be carried out through: 1) improving the quality of rubber planting material and introducing new recommended clones by establishing budwood garden of new recommended rubber clones. The Indonesian Rubber Research Institute has released new recommended rubber clones that have high yield and are resistant to rubber diseases, namely IRR 112, IRR 118, IRR 220, and IRR 230 clones; 2) providing fund and credit facilities for rubber replanting. In efforts to carry out rubber replanting, the farmers have the potential for internal funds such as family labor and income from the sales of rubber wood and intercropping products. In addition, farmers also have the potential of external funds such as CSR assistance from rubber wood processing companies, crumb rubber factories, and oil companies; partial assistance from the governments and bank loans for rubber replanting; and 3) providing technical guidance and group coaching. Currently, the farmers in Banyuasin need technical guidance to control leaf fall disease of pestalotiopsis and white root disease, as well as tapping schools to adopt tapping technique skills in order to obtain optimal rubber production. Meanwhile, farmer organizations such as joint rubber marketing groups, cooperatives, and the Rubber Processing and Marketing Unit (UPPB) have developed in Banyuasin and provided benefits to increase rubber quality and farmer's share. Nonetheless, it is only about 8% of rubber sales conducted through UPPB. On the other hand, most farmers' rubber sales are carried out by middlemen. Therefore, the farmer's group coaching is more directed to increase the establishment of cooperatives or UPPB.

## CONCLUSIONS AND SUGGESTIONS

1. Results of the study show that Banyuasin Regency has the characteristics of a progressive area. This characteristics were supported by conditions that this area is near to own-state and private rubber plantations, successful rubber development projects, and also the Indonesian Rubber Research Institute which can provide adequately extension facilities on rubber technology for rubber farmers. Rubber farmers in Banyuasin have an adequate level of education and fairly good knowledge and adoption of rubber technology. In addition, farmers also have income to fund basic needs and rubber investment costs. The progressive mindset of respondents can be shown by their involvement in the joint marketing organization which has given positive impact on improving the quality of rubber and farmer's share.
2. Taking into account the characteristics of smallholder plantations in Banyuasin, which can be categorized as progressive areas, the program to increase rubber production and productivity is to accelerate rubber replanting which can be conducted through: 1) improving the quality of planting material and introducing new recommended clones, by establishing budwood garden of new recommended rubber clones such as IRR 112, IRR 118, IRR 220 and IRR 230; 2) providing funds and credit facilities for rubber replanting; and 3) providing technical guidance on rubber cultivation, especially in controlling rubber diseases of pestalotiopsis leaf fall disease and white root disease. In addition, rubber farmers also need to improve skills of recommended tapping technique through tapping school. Furthermore, group coaching is more directed to increase the establishment of cooperatives or rubber processing and marketing unit (UPPB).

**Bibliography**

1) Agunggunanto EY. (2011). Analisis kemiskinan dan pendapatan keluarga nelayan kasus di Subdistrict Wedung Kabupaten Demak, Jawa Tengah, Indonesia. Jurnal Dinamika Ekonomi Pembangunan 1(1):50-58

2) Agustina, D.S dan E. Herlinawati. (2017). Komparasi kelayakan investasi klon karet GT 1 dan PB 260 pada berbagai tingkat harga dan umur ekonomis. *Jurnal Penelitian Karet*, 35 (1) : 83-92. DOI: 10.22302/ppk.jpk.v1i1.362.

3) Andrias, A.A., Y. Darusman, dan M. Ramdan. (2017). Pengaruh Luas Lahan Terhadap Produksi dan Pendapatan Ushatani Padi Sawah (Suatu kasus di Desa Jelat Subdistrict Baregbeg Kabupaten Ciamis). Jurnal Ilmiah Mahasiswa Agroinfo Galuh, 4 (1): 521-529

4) Chuzaimah, Noprianto, E. Lastinawati, dan A. Febriyansyah. (2016). Faktor-Faktor yang Mempengaruhi Pendapatan Usahatani Padi Lebak di Desa Pemulutan Ulu Kabupaten Ogan Ilir The Factors that affect to Swamp Rice Farming Income in Pemulutan Ulu Village, Ogan Ilir District. *Jurnal Lahan Suboptimal*, Vol. 5, No.1: 27-34. ISSN: 2252-6188 (Print), ISSN: 2302-3015 (Online, www.jlsuboptimal.unsri.ac.id).

5) Directorate of Food Crop Statistics, Horticulture, and Plantations (Direktorat Statistik Tanaman Pangan, Hortikultura, dan Perkebunan). (2023). Statistik Karet Indonesia 2022. Volume 16, 2023. Badan Pusat Statistik. Indonesia. ISSN. 1978-9920.

6) Directorate General of Estate Crop. (2022). Statistik Perkebunan Unggulan Nasional. 2021-2023. Kementerian Pertanian. Indonesia.

7) Fadzim, W.R., Aziz, M.I.A, and Jalil, A.Z.A. (2017). Determinant of technical efficiency of cocoa farmers in Malaysia. International Journal of Supply and Chain Management, 6(1): 254-258.

8) Kittilertpaisan, J., Kittilertpaisan, K., and Khatiwat, P. (2016). Technical efficiency of rubber farmers' in Changwat Sakon Nakhon: Stochastic frontier analysis. International Journal of Nakhon Economics and Financial Issues, 6(56): 138-141.

9) Kuswanhadi, dan Herlinawati, E. (2012). Penyadapan. Dalam M. Lasminingsih, H. Suryaningtyas, C. Nancy, dan A. Vachlepi (Eds.), Sapta Bina Usaha Tani Karet Rakyat, (pp. 93-101). Pusat Penelitian Karet: Balai Penelitian Sembawa.

10) Latif, A., Ilsan, M., Rosada, I. (2022). Hubungan Peran Penyuluh Pertanian terhadap Produktivitas Petani Padi. Wiratani: Jurnal Ilmiah Agribisnis, Vol 5 No. 1: Juni 2022, pp 11-21.

11) Mamondol. M. R., dan F. Sabe. (2016). Pengaruh Luas Lahan Terhadap Penerimaan, Biaya Produksi, dan Pendapatan Usahatani Padi Sawah di Desa Toinasa Subdistrict Pamona Barat. Jurnal Envira 1 (2): 48-59.

12) Novianti, Zakiah, dan Romano. (2017). Pengaruh Kepemilikan Assets Terhadap Tingkat Pendapatan Petani Padi di Subdistrict Kuta Baro Kabupaten Aceh Besar. Jurnal Ilmiah Mahasiswa Pertanian Unsyiah, 2(1); 47-56.

13) Ofori-Bah, A., and Ashafu-Adjaye, J. (2011). Analysis of scope economies and technical efficiency of cocoa agroforestry system in Ghana. Journal of Ecological Economics, 70: 1508-1518.

14) Poungchompu, S., and Chantanop, S. (2015). Factor affecting technical efficiency of smallholder rubber farming in Northeast Thailand. American Journal of Agricultural and Biological Sciences, 10(2): 83-90.

15) Rondhi, M., dan A.H. Adi. (2018). Pengaruh Pola Pemilikan Lahan Terhadap Produksi, Alokasi Tenaga Kerja, dan Efisiensi Usahatani Padi. AGRARIS: Journal of Agribusiness and Rural Develpoment Research, 4(2): 101-110. DOI: http://dx.doi.org/10.18196/agr.4265

16) Rosnita, E. Sayamar, S.S. Sianturi, R. Yulid, dan E.K.P. Simanjuntak. (2017). Analisis Penyuluhan dan Keberdayaan Petani Karet Pola Swadayadi Kabupaten Rokan Hilir, Provinsi Riau. Jurnal Penyuluhan, Vol. 13 No. 2: 231-243.

17) Singapore Exchange (SGX). Sicom TSR 20 Rubber Futures. Diakses dari: https://www.sgx.com pada 25 Oktober 2023, pukul 08.30 WIB.

18) Smit, H. (2016). *The Outlook for Rubber Prices and the Need for Appropriate Action*. Makalah dipresentasikan pada Global Rubber Conference 2016, 11-13 Oktober 2016, Krabi, Thailand.

19) Susanti.D, N.H Listiana, T. Widayat. (2016). Pengaruh Umur Petani, Tingkat Pendidikan dan Luas lahan terhadap Hasil Produksi Tanaman Sembung, Jurnal Tumbuhan Obat Indonesia, 9(2): 75-82.

20) Supriadi, M., C. Nancy, dan G. Wibawa. (1999). Percepatan Peremajaan Karet Rakyat Melalui Penerapan Teknologi dan Pemberdayaan Masyarakat Perkebunan.Prosiding Lokakarya dan Ekspose Teknologi Perkebunan, Palembang, 26-28 Oktober 1999. Hal.45-69.

21) Syarifa, L.F. dan Tistama, R. (2020). Analisis Kinerja dan Prospek Komoditas Karet dalam Analisis dan Opini Perkebunan. *RADAR dePlantation, Vol. 1 No. 2, Oktober 2020*.

22) Syarifa, L.F., Agustina, D.S., Nancy, C., Supriadi, M. (2015). *Socioeconomic condition as affected by fall of natural rubber price: case study in South Sumatra. International Rubber Conference* 2-6 November 2015, Ho Chi Minh, Vietnam.

23) World Bank. (2023). *Commodity Markets Outlook under the Shadow of Geopolitical Risks*. *A World Bank Report*, October 2023.