Productivity of PINUS SAP (Pinus Merkusii) in Uelincu Village, Pamona, Utara District, Poso District

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Abstract

Planting pine stands was originally aimed at accelerating the reforestation and rehabilitation of vacant land in forest areas; planting pine trees is appropriate because these plants can grow and survive on critical land. Pine trees produce sap that currently has high economic value, which can improve the welfare of the people around the pine forest. The factors that must be considered to increase the productivity of pine resin are the condition of the pine stands, the technique of tapping pine resin, and, no less importantly, the welfare of the tappers. This study aims to determine the productivity and income of sap tappers produced in Uelincu Village, North Pamona District, Poso Regency. This research was conducted for two months, starting from February to April 2022, in Uelincu Village, North Pamona District, Poso Regency. The method used in this study uses the descriptive analysis method, sampling is done by purposive sampling with the number of respondents obtained from the calculation of the Slovin formula (2007), $n = N/1 + Ne^2$ totaling 39 respondents, the use value of pine resin is estimated from the approach market prices, and productivity is measured by calculating the ratio (Output) output to input (Input). The results showed that pine resin production was influenced by tree density per hectare and tapping behavior. Pine resin productivity in Uelincu Village is 3,600 kg/Ha/month. The income of the people around the pine forest is largely determined by the production of the sap produced and the selling price of the pine sap.

Keywords: *Income; Pine Resin; Productivity; Rubber Tappers.*

Introduction

Planting pine in forest land aimed to accelerate the reforestation and rehabilitation of vacant land in forest areas(Wijayanto et al., 2021). Technically, this type of planting is appropriate because pine is a pioneer species that can grow and survive in critical land conditions and grows very fast (fast glowing species). Poso Regency has the potential for wide pine stands, the existing type of stand is Pinus merkusii. Based on the Decree of the Minister of Forestry Number: SK.869/Menhut-II/2014 dated 29 September 2014 concerning Forest Areas and Marine Conservation in Central Sulawesi, it is known that the location of the Pine Distribution

is in the UPT-managed area. The Sintuwu Maroso KPH is mostly located in the Limited Production Forest Area (HPT), and a small part is outside the Forest Area (APL). The area of the Pine Forest in the Pamona Utara District area is ± 1,271.67 hectares.

Pine's economic prospects are quite good because various industries always seek pine by various industries, and the demand is continuously increasing. Sap production can also be regulated continuously so that it can be a source of livelihood. Pinus merkusii is a multi-purpose tree species that is continuously developed and expanded in the future for timber production, sap production, and land conservation. Almost all tree parts can be used, including parts of the trunk that can be tapped to extract the sap. The sap is further processed into gondorukem and turpentine. Gondorukem can be used to make soap, resin, and paint. Turpentine is used for industrial purposes, perfumes, medicines, and disinfectants. The wood is used for construction, matches, pulp, and long fiber paper.(Mukhlisa, 2020; Santoso et al., 2022).

Internal and external factors influence rubber productivity. Internal factors in the form of tree biology factors. While the external factors are places to grow and forest maintenance actions that affect the production of sap directly or indirectly. One of the aspects that play a role in efforts to increase and expedite the production of pine resin is tappers(Al-Okaishi, 2020; Heinze et al., 2021). To increase the productivity of pine sap, several important factors must be considered, namely the condition of the pine stands tapping technique, the area of tapping, and no less important is the welfare of tappers. It is not yet known how much productivity and income the community has in sap tapping activities, especially in Uelincu Village, North Pamona District, Poso Regency became the basis for researching the productivity of pine resin in Uelincu Village, North Pamona District, Poso Regency.

Formulation of the problem

Based on the background that has been described, the formulation of the problem is how is the productivity of pine resin and the income of resin tappers generated in Uelincu Village, North Pamona District, Poso Regency.

Goals and usage

This study aims to determine the productivity of pine resin and the income of resin tappers produced in Uelincu Village, North Pamona District, Poso Regency. This research will provide information regarding the productivity of pine resin and the income of tappers for the resulting resin, which will later be used as a basis for planning for tapping pine resin in Uelincu Village, North Pamona District, Poso Regency.

RESEARCH MATERIALS AND METHODS

Place and time

This research was carried out from February to April 2022 in the UPT area. Sintuwu Maroso Forest Management Unit, Uelincu Village, South Pamona District, Poso Regency.

Materials and tools

The materials used in this study were a questionnaire to collect data and information needed to support the accuracy of data related to the productivity of pine resin (Pinus merkusii) in Uelincu Village, North Pamona District, Poso Regency. The tools used in this study were cameras used to retrieve research object documentation, stationery used to record respondent data and information, laptops and

calculators used to analyze data, and other equipment.

Data Types and Sources

The types and sources of data used in this study consist of 2 (two) parts, namely:

Primary data

Primary data collection was carried out by direct observation in the field and interviews with the community (respondents) based on the guidelines that had been prepared (list of questions). This data includes information on the identity of the respondent, family dependents, age of the pine tree, age of the first pine tapping, area of tapping, number of pine trees per hectare, pine resin produced by tappers, income from pine tapping, costs incurred and price of pine resin.

Secondary Data

Secondary data is a research approach that uses existing data to support primary data. Secondary data was obtained from parties related to the research. The secondary data taken is the data needed to support this research, namely the general condition of the research location and related institutions.

Sampling technique

The selection/determination of respondents was carried out by purposive sampling, namely purposive sampling, with specific criteria. In this case, the selected respondents have managed land for tapping pine resin, and the land is considered to have the potential to produce resin. Sampling conducted in the field consisted of 2 (two) parts, namely:

Sample Respondents

The population of Uelincu Village consists of 414 people. From the existing population data, the number of residents participating in the pine forest management comprises 300 people. So that the sample to be taken in the study is 15% of the total population, namely 39 people. Sampling using the formula(Slovin, 2007)as follows :

$$n = \frac{N}{1+Ne^2} (/)\ n = = 39\ souls \frac{300}{1+300.(15\%)^2}$$

Information:

e (error) = Percentage error rate that can be tolerated (15%)

n = Number of samples (39 people)

N = Total Population (300 People)

Location Sample

The location sample was selected by purposive sampling, that is, the target sample. Respondents sampled were respondents who had pine resin tapping locations with an area of 1 Ha, and the tapped pine stands were 39 years old.

Data analysis

The method of data analysis used in this study is descriptive analysis. A sampling of data sources was carried out purposively to explore the production of pine resin.

The use value of pine resin is estimated from the market price approach with the following formula:

$$NG_{i=}M_i \times - CostHG_i$$

Where :

Ngi = Use a value of the i-th sap (Rp)

Mi = Amount of sap collected i (kg)

HGI = price of sap i (Rp/kg)

RESULTS AND DISCUSSION

Characteristics of Pine Sap Tapping Communities

Respondent characteristics are traits inherent in individual pine resin-tapping farmers. These characteristics will affect socioeconomic conditions and decision-making in the household. The characteristics of the pine resin tapping community are presented in the following table:

Table 1. Characteristics of Respondents

No	Description (Respondents)	Amount	(%)
1	Age (Years)		
	a. <30	15	38,46
	b. 30-40	12	30,77
	c. 40-65	12	30,77
	Total	39	100
2.	Education		
	a. SD	8	20,51
	b. JUNIOR HIGH SCHOOL	18	46,15
	c. SENIOR HIGH SCHOOL	13	33,34
	Total	39	100
3.	Family Dependents (Person)		
	a. 2	19	48,72
	b. 3	13	33,33
	c. 4	7	17.95
	Total	39	100

Source: Primary data after processing, 2022.

Based on Table 1, the highest age level of pine resin tappers in Uelincu Village was <30 years old, with 15 people with a percentage of 38.46%; in the 30-40 age class, there were 12 people with a percentage of 30.77% and aged 40-65 as many as 12 people with a percentage of 30.77%. According to Mantra (2000), based on the workforce, the age group of 15-50 years is the productive age, that is, the age range that belongs to the working age group. Thus the population of Uelincu Village is dominated by people of productive age (30.77%), who have the potential always to work to supplement household income.

The level of education of the people around the pine forest in Uelincu Village shows that the education of respondents in Uelincu Village is relatively low, with an elementary education level of 8 people with a percentage of 20.153%, a junior high school education level of 18 people with a percentage of 46.154%, a high school education level of 13 people with a percentage of 13.333 %. This level of education influences the choices and opportunities that can be achieved so that they can be creative and productive in participating in development in all fields, including the management of pine forests(Siti Ikramatoun et al., 2020). The level of education largely determines the quality of human resources. Education is seen as not only being able to increase knowledge but also being able to improve the skills of the workforce so that it will increase productivity.

Increased productivity can increase economic growth, income, and welfare, especially for people living around the forest. The most dependents in Uelincu Village are 2 people with a percentage of 48.72% for 19 people, 3 people with a percentage of 33.33% for 13 people, and 4 people with a percentage of 17.95% for 9 people. Families who have many family dependents will have a greater burden of living to bear, moreover, this is accompanied by limited access to resources.

Factors Affecting Pine Sap Productivity

Several factors cause sap production to be not constant every year; these factors include seasonal changes that affect pine resin production and community activity patterns. During the rainy season, the high frequency of rain causes tappers to be reluctant to enter the forest to renew the wound and then collect sap. Wet ground conditions usually cause tappers difficulty reaching the tapping area, especially if the land for managing tapping is on a certain

slope. According to(Azhar et al., 2022), tappers generally collect the sap only after 6-8 times wound renewal during the rainy season because the sap coming out in the rainy season is relatively slow. Whereas during the dry season, tappers collect the sap after 4-6 times of renewal of new wounds because the sap discharge in that season is quite smooth.

According to(Kerebungu et al., 2022), the average daily sap production during the rainy season is 0.90 kg/day with 300 trees. Meanwhile, tappers can produce 2.05 kg of sap per day with 500 trees during the dry season. Summer will provide high production of sap, but continuous summer causes the sap to dry quickly, and the sap flow can stop. Cold weather will slow the sap flow and affect the quantity and quality.

During the growing season, which falls in the rainy season, the tappers with rice fields will work on their fields. This also affects the reduced activity of tappers, so the yield of sap obtained is low. Apart from tapping pine resin, the people living around the forest have a side job as farmers. When the wound renewal and harvesting activities have been completed, the community returns to taking their time to farm or farm. However, the results obtained are often smaller than tapping pine resin. Low tree density is one of the causes of low production. The density of trees per hectare will affect the production of sap, where the higher the density, the more trees are tapped, so it will affect the production of sap. Based on observations and interviews in the field, the production of pine resin is influenced by the number of trees used for tapping. Pine sap tappers who get high sap production are tappers with 500-700 trees in a tapping location.

According to(Hidayanti et al., 2022), The factors that affect the productivity of pine sap are related to the diameter of the tree, with the growth of the volume of sapwood greater. Therefore the greater the volume of sapwood, the more sap channels contained in the pine tree, and the production of pine sap will increase. Based on this description, it is known that the main factors influencing sap production are the number of trees in the tapping area and the tappers' behavior. The production of sap obtained by tappers depends on the frequency of work in the field.

Pine Forest Management in Uelincu Village

The pine forest area in the village of Uelincu, North Pamona District, Poso Regency, Central Sulawesi Province, is a forest area under the auspices of the UPT. Sintuwu Maroso Forest Management Unit (KPH).

Poso Regency has the potential for wide pine tree stands, and the existing stand type is Pinus merkusii. Based on the Decree of the Minister of Forestry Number: SK.869/Menhut-II/2014 dated 29 September 2014, concerning the Central Sulawesi Forest and Marine Conservation Area, it is known that the location of the Pine Distribution is in the UPT-managed area. The Sintuwu Maroso KPH is mostly located in the Limited Production Forest Area (HPT), and a small part is outside the Forest Area (APL). The area of the Pine Forest in the North Pamona District is ± 1,271.67 Ha.

Pine Plants in the Working Area of KPH Sintuwu Marosoplanted in 1979 through a reforestation project and began to be tapped in 2004 through the Individual Licensing system. According to data on pine resin production in the Sintuwu Maroso KPH area in 2016, it was 3,037 tons. This pine sap is marketed to Central Java and East Java, as well as China and India, for the international market. The reforestation program of the Government of the Central Sulawesi Provincial Forestry Service, which

was implemented in 1979, was beneficial for the community, especially the people around the forest because it could improve the economy and people's welfare and preserve the environment. In addition, considering the condition of the area, which is prone to various natural disaster threats, pine plants can also grow and survive in critical land conditions.

In 2004 when the pine tree plantations began to be tapped, the people around the forest were quite skeptical about the pine forest. This can be seen from their need for more awareness of the value produced from pine resin. At that time, there was still a shortage of sap tappers, and those who had managed areas for extensive sap tapping were those who had started tapping from obtaining permits from the forestry department to manage pine forest areas by extracting the sap. Further developments show that the prospect of tapping pine resin can provide a relatively high income, even though tapping pine resin is only a part-time job. This condition indicates that there has been a shift in perception of the benefits obtained from pine forests.

The distribution of land area for tapping pine resin covering ± 1,271.67 Ha around the forest in Uelincu Village totaled 300 people. The distribution is carried out by the community around the forest itself since a permit has been obtained from the forestry department to manage the pine land by extracting the sap from it. Initially, the community was not interested in managing pine land because, at the time, pine tapping was started, and the price was still very low; road access was still not supportive for sap tapping locations. As time went on, the price of pine began to rise, and sap tappers began to realize the value produced from pine sap. The community itself carries out the formation of each plot. Tapper communities have a tapping permit from the forestry department to manage pine forests.

Pine Sap Tapping Working Mechanism

The sap collection method used by tappers is the quare method. The quare method is a wounding process on the wound's surface, which begins with initial tapping with a maximum width of 6 cm, a height of 10 cm, and a depth of 1.5 cm.

Based on the results of interviews and observations in the field, the tools used by tappers when tapping include shells, gutters, kadukul, plastic buckets, scrapers to remove sap that sticks to canals, and whetstones for sharpening kadukul. The tapper does not use a quare depth gauge because the tapping mall ruler is less practical and takes more time when carrying out wound renewal. The tapping process begins with open tapping, which starts with making an initial quare as high as 20 cm from the ground. Quare1.5cm depth excluding skin. The results of observations in the field showed that only some tappers complied with the implementation guidelines, which stated that the depth of the quare should be at most 1.5 cm. Even in some plots, in one tree, there can be more than 3 (three) quares, plus the distance between the quares is relatively very close.

Based on the Decree of the Board of Directors of Perum Perhutani Number 792/KPTS/DIR/2005, the number of quares allowed:

a) Circumference 65-124 cm as much as 1 quare.

b) Circumference 125-175 cm as much as 2 quare.

c) The maximum circumference of 176-Up is 4 quares.

Productivity and Income of Pine Sap Tappers in Uelincu Village

Production and productivity are very closely related, and this term is usually used to designate the number of results or targets obtained from the harvest. In agriculture, productivity is defined as the result of a unit area or one piece of land harvested from the entire area of harvested land. At the same time, production is the result of the whole or the total amount of land harvested.

Productivity is a measurement in which production uses resources to get the maximum possible results. Sap production increases with the number of trees in the tapping area. The higher the density of tapped trees, the more sap is produced. An increase followed the increase in tree density in sap yield and income for each tapper. The results showed that the average sap production obtained by each tapper was 300 kg/month with an average number of trees tapped of 465 trees. Compared with the results of research conducted by(Purwandari, 2002)in KPH Bogor, local tappers in KPH Bogor can produce an average of 328.95 kg of sap/month with 500 trees tapped. The sap production in Uelincu Village is relatively the same as in BPKH Bogor. To increase productivity of pine resin, adding the number of trees to 600-700 per hectare can increase the productivity of pine. Apart from that, improvements to the koakan method can also be made to increase the productivity of pine resin. The koakan method used by pine resin tappers in Uelincu Village violates many tapping rules. It is better if the koakan is added if the koakan no longer produces sap. If the koakan is made directly around the tree, the sap production from each koakan is relatively small. (Audina et al., 2021).

The sap yield obtained by tappers also depends on the frequency of work in the field. The tappers who produce tall sap generally have only one means of livelihood besides tapping. The tapper's working time usually starts from 06.00 to 17.00. The activities carried out by tappers in the field are more routine, even almost every day, so it greatly affects the sap yield obtained.

The average productivity of the sap produced by each tapper is 300 kg/Ha/month using 1 HOK in 10 working days. To determine the productivity for one year, the average monthly productivity is 300 kg multiplied by 12 months. Productivity pine resin in Uelincu Village for 1 year of 3,600 kg/Ha/year. The production of pine resin and the selling price of pine resin largely determine the income of the people around the pine forest. To find out the amount of income, first, find out the costs used for tapping pine resin. The cost incurred for tapping costs is the equipment depreciation fee of IDR 48,333 per month. Tappers in Uelincu Village of 100,000 per day for 10 working days. The total cost incurred for tapping pine resin is IDR 1,043,333 per month. To determine the income of pine sap tappers in Uelincu Village, each tapper's average production is 300 kg per month multiplied by the selling price of Rp.

CONCLUSION

Based on the results of the research conducted, the following conclusions can be drawn:

1. The density of trees in the tapping area and the tappers' behavior strongly influence the development of pine resin productivity. Pine resin productivity in the UPT area. The Sintuwu Maroso Forest Management Unit in Uelincu Village is 3,600 kg/ha/year.

2. The productivity of the sap and the selling price of the pine sap largely determines the income of the people around the pine forest. The income of each pine resin tapper in the UPT Managed area. The Forest Management Unit in Uelincu Village is 1,651,667 per month.

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