Income of loggers and pine tappers in Barakkae and Mattampawalie Villages, Bone District

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Abstract. The community-forest in Bone District is one of the economic resources that helps the community around the forest to meet their daily needs. The community uses wood and non-timber products that are available in the forest area. The wood-using such as building material, firewood, and raw material for the wood processing industry has been used as an opportunity for few people in Barakkae Village to maintain their jobs as woodcutter workers. Apart from wood, Pinus merkusii jungh et de vriese in Mattampawalie Village has also helped local communities increase their income by becoming pine tappers. This research is intended to determine the income of loggers and pine tappers through its cost of the wage system. The results of the research obtained from field observations, interviews, scientific literature, and related party reports within the scope of the research location. It shows that the average income received by pine tappers is IDR 835,600 per tapping, slightly lower than the average income of loggers at IDR 955,812 per one harvest. However, the amount of income can decrease and increase due to several factors such as the season and the frequency of harvest. This research is expected to be considered by loggers and pine tappers to increase income and reduce its costs during harvesting.

1. Introduction

Community forest in Bone Regency is one of the economic resources that helps the community around the forest to increase family income to meet their daily needs. The community using the wood for the material of building construction, firewood, and sells it in logs or sorting according to the buyer's request. This makes the woodcutter still very much needed to producing wood. It has been done by the people of Barakkae Village who choose to work as a woodcutter to increase their family income. The wood that is felled is located inside the village or outside the village. Apart from wood, Pinus merkusii jungh et de vriese in Mattampawalie Village has also helped local communities increase their income by becoming pine tappers. Based on research by Suwaji, et al (2017) [1] in Tangkulowi Village, Sigi District, the income obtained by pine tappers is quite large which is reaching IDR 3,082,004.54 per month, it means that it is greater than the Central Sulawesi Provincial Minimum Wage (UMP) in 2016 of IDR 1,670,000 per month.

The research conducted in Barakkae and Mattampawalie Villages, Bone District, will look at the number of income of wood harvesters and pine tappers through a wage system. Data related to wood harvesters is focused on Barakkae Village, while pine tapping is located in Mattampawalie Village. The purpose of this study was to determine the amount of income received by woodcutters in Barakkae Village and pine tappers in Mattampawalie Village.
2. Research methodology

2.1. Time and place
This research was conducted in August - September 2019 in Barakkae and Mattampawalie Villages, Bone District.

2.2. Data collection technique
The data collected in this study consisted of primary data and secondary data. Primary data were obtained through field observations and interviews, including the identity of fellers and tappers, harvesting patterns, supporting equipment, costs incurred in the harvesting process, and other farming businesses owned by loggers and tappers to meet family needs. Secondary data were obtained from scientific literature and related party reports within the scope of the research location.

2.3. Data analysis
The data in this study used two types of analysis which are descriptive and quantitative. Descriptive analysis was conducted to determine the costs incurred in harvesting activities and quantitative analysis was carried out to calculate the amount of income using a formula below:

2.3.1 Fixed Costs. Fixed costs consist of depreciation costs and capital interest costs. Depreciation cost formula [2]:

\[ D = \frac{M - R}{N \times t} \]

Where:
- \( D \) = depreciation value (IDR / hour)
- \( M \) = Capital / investment in equipment (Rp)
- \( R \) = The residual value at the end of the economy is 10% (9Rp)
- \( N \) = economic life (years)
- \( t \) = The working time of the tool in a year (hours / year)

Capital interest can be calculated using the formula [2]:

\[ B = \frac{[(M - R)(N + 1)] \times 0.0p}{N \times t} \]

Where:
- \( B \) = Interest on capital (Rp / hour)
- 0.0p = interest rate / year

2.3.2 Variable Costs. Variable costs consist of maintenance costs (Plh), repair costs (Prb), fuel costs (Bbk), lubricants / oil costs (Plm), transportation costs (T), and transportation costs (Ba). The amount of variable costs in units (Rp / hour) is calculated using a formula:

\[ BV = Plh + Prb + Bbk + Plm + T + Ba \]

Where:
- \( BV \) = Variable Costs (IDR / hour)
- \( Plh \) = Maintenance Fee (Rp / Hour)
- \( Prb \) = Repair Cost (Rp / hour)
- \( Bbk \) = Fuel Cost (Rp / hour)
- \( Plm \) = Cost of Lubricants (Rp / Hour)
- \( T \) = Transportation costs
- \( Ba \) = Transportation costs
2.3.3 Total Production Costs. B iaya is the overall total production costs incurred in the process of harvesting.

\[ TC = BT + BV \]

Where:
- TC = Total cost of production (IDR / hour)
- BT = B fixed rate (Rp / hour)
- BV = Variable costs (IDR / hour)

2.3.4 Reception. Labor Wages [2]:

\[ UP = G : (H \times W) \]

Where:
- UP = Labor wages (Rp / hour)
- H = average working days per month
- G = Salary (IDR / month)
- W = Hours of work per day (hours / days)

2.3.5 Income

\[ F = P - TC \]

Where:
- F = net income (IDR / hour)
- P = Receipt (Rp / quantity)
- TC = Total production costs

3. Results and discussion

3.1. Loggers' income

3.1.1. Costs issued. Costs incurred are grouped into fixed costs and variable costs. Fixed costs consist of depreciation costs for tools (chainsaw, rope, and two-wheeled vehicles used by respondents to reach the felling site) and capital interest costs. Variable costs consist of fuel costs, lubricant costs, maintenance and repair costs (round files, triangular files, and chains), as well as transportation costs to the felling site.

The average costs incurred for one felling (based on the results of field interviews) can be seen in Table 1.

| No. | Respondents | Fixed Costs (Rp / m\(^3\)) | Variable Cost (Rp / m\(^3\)) | Total Cost (Rp / m\(^3\)) |
|-----|-------------|----------------------------|-----------------------------|--------------------------|
| 1   | Ahmadi      | 58,615                     | 60,223                      | 118,838                  |
| 2   | Amire       | 100,413                    | 99,938                      | 200,351                  |
| 3   | Mukhtar     | 81,711                     | 77,315                      | 159,026                  |
| 4   | Tahir       | 33,072                     | 47,454                      | 80,526                   |
| 5   | The Word    | 39,466                     | 68,035                      | 107,501                  |
|     | Average     | 62,655                     | 70,593                      | 133,248                  |

The average logger costs IDR 133,248 / m\(^3\), with the lowest expenditure of IDR 80,526 / m\(^3\) and the highest was IDR 200,351 / m\(^3\). There are various factors that affect the loggers' expenditure which
are the quality of the chainsaw used by loggers (all loggers use chainsaw Stihl MS 070), the volume of felled timber, use of fuel, and the availability of private fellers’ vehicles. Barus (2019) [3], in his research, argues that the increase in costs is also due to differences in the actual time used and the effective time.

It was also explained that the costs incurred during the actual working time are greater than the cost-effective working time because it takes longer to cut it down.

3.1.2. Acceptance. The revenue or gross income in this study is the wages the logger gets after cutting wood. The amount of logger acceptance is shown in Table 2.

The wage referred to is the wage of the logger as a laborer in charge of cutting down trees, dividing the trunk, and making sorting as requested by the wood owner. The types of sortimens produced are beams and bearings. In Table 2, it can be seen that the two loggers did not produce blocks due to the higher cutting difficulty level and the longer working time of making bearings. In addition, the demand for blocks has also decreased as the use of wood as the main material for building houses on stilts has decreased. Most of the logs harvested in this study are used as raw materials for the wood industry in the village and outside the village.

The average logger's revenue for making blocks is IDR 490,139 / felling, slightly higher than the revenue for bearing, at IDR 415,025 / felling. Referring to Irawanti’s (2015) [4] research results, revenue is influenced by wood type, wood designation (woodworking is more expensive than pulpwood), as well as cubication and wood quality. This has a direct effect on the number of felling wages and the acceptance of fellers. In this study, the demand for bearing production provides more advantages to loggers because it is relatively easier to manufacture and the wage per meter offered is greater than that of making blocks.

3.1.3. Income. The income in this study is the net income (profit) obtained by the fellers. Income is divided into two tables, namely Table 3 which contains the income per m3 obtained by the loggers by reducing the amount of revenue based on the number of wages per m3 with the number of costs incurred, and Table 4 which contains the logger's income in one felling which is obtained by multiplying the income per m3 by the volume of the sort in one felling.
Table 3. Income of woodcutter respondents.

| Respondents | Total Cost (IDR / m³) | Revenue (IDR / m³) | Income (IDR / m³) |
|-------------|-----------------------|--------------------|------------------|
| Ahmadi      | 118,838               | 125,000            | 6,162            |
| Amire       | 200,351               | 541,667            | 341,316          |
| Mukhtar     | 159,026               | 541,667            | 382,641          |
| Tahir       | 80,526                | 125,000            | 44,474           |
| The Word    | 107,501               | 541,667            | 434,166          |
| **Average** | **133,248**           | **375,000**        | **241,752**      |

Table 3 shows that three out of five respondents had an income below the average logger’s income, namely IDR 241,752 / m³. The difference in income is due to the costs incurred during the logging process which also varies according to the needs of each logger. In the table above, it can be seen that in order to maximize income, loggers must minimize costs incurred and increase the volume of felled so that the logger’s income (feller’s wage / m³) is higher. Below is a table of loggers’ income for one felling as shown in Table 4.

Table 4. Income respondents’ loggers to logging.

| Respondents | Sortimen Volume (m³ / pbg) | Income (IDR / m³) | Income (IDR / pbg) |
|-------------|-----------------------------|-------------------|-------------------|
| Ahmadi      | 4,712                       | 6,162             | 29,035            |
| Amire       | 4,515                       | 341,316           | 1,541,040         |
| Mukhtar     | 3,012                       | 382,641           | 1,152,514         |
| Tahir       | 4,067                       | 44,474            | 180,876           |
| The Word    | 4,320                       | 434,166           | 1,875,596         |
| **Average** | **4,125**                   | **241,752**       | **955,812**       |

Table 4 shows that the loggers in Barakkae Village have varying incomes for one felling. The average income was Rp. 955,812 / logging, with the highest income of Rp. 1,875,956 by Mr. Firman. According to Soenarno (2018) [5], proper felling and distribution of stems can maximize the sale of wood from the felled trees, lower harvest costs, and increase timber yield.

3.2. Pine Tappers Income

3.2.1. Costs Issued. The costs incurred are the total costs spent during tapping the pine sap. In this study, costs are grouped into fixed costs and variable costs. Fixed costs consist of depreciation costs for two-wheeled vehicles used by the respondent. Variable costs consist of transportation costs to and out of the tapping location as well as the cost of transporting sap. The difference in the number of costs incurred by tappers is influenced by the distance between the felling locations and the availability of tapping infrastructure. The following is a table of the average costs incurred in tapping pine sap.

Table 5. Recapitulation of costs incurred by respondents of pine sap tappers.

| Respondents | Types of Trees | Fixed Costs (Rp / Kg) | Variable Cost (Rp / Kg) | Total Cost (Rp / Kg) |
|-------------|----------------|----------------------|------------------------|---------------------|
| Salma       | *Mercury Pine* | 712                  | 250                    | 962                 |
| Civil       | *Mercury Pine* | 0                    | 10                     | 10                  |
| Beautiful   | *Mercury Pine* | 1,425                 | 500                    | 1,925               |
3.2.2. Acceptance. The revenue or gross income in this study is the amount of money that the pine sap tappers get according to the weight of the sap tapped in one month. The tapped sap is valued at IDR 5,000 / kg. The amount of revenue is obtained by multiplying the weight of the sap produced/tapped by the sap per kg. The amount of acceptance of pine sap tappers in one month (one tapping) is presented in Table 6.

Table 6. Acceptance of each respondent in one tapping.

| No. | Respondents | Production Yield (kg) | Wages (IDR / kg) | Revenue (IDR) |
|-----|-------------|-----------------------|-----------------|--------------|
| 1   | Salma       | 200                   | 5,000           | 1,000,000    |
| 2   | Sipila      | 240                   | 5,000           | 1,200,000    |
| 3   | Asri        | 100                   | 5,000           | 500,000      |
| 4   | Nandang     | 200                   | 5,000           | 1,000,000    |
| 5   | Jume        | 250                   | 5,000           | 1,250,000    |
|     | Average     | 198                   | 5,000           | 990,000      |

Based on table 6, it is known that the acceptance of pine sap tappers in one harvest varies based on the weight of the sap tapped with an average income of Rp.990,000 per month. Suwaji, et al (2017) [1] argue that the high and low income of tappers is very much influenced by the price and the amount of pine sap produced. According to Lateka, et al. (2019) [7] pine sap production is influenced by three factors, namely internal factors (such as pine tree species, sapwood percentages, etc.), external factors caused by the tree's external environment (climate, height, age, and area to grow), and human treatment factors (such as shape and direction of leads, stimulant administration, etc.).

The results of the field research indicated that the area of land managed by tappers varied from 0.3 ha to 1 ha, according to the capacity agreed upon by the tappers and the head of the farmer group responsible for tapping pine sap, but this did not affect tapping acceptance. It can be seen that one respondent who manages 1 ha of land can only produce 200 kg of sap per month, while other tappers with an area of 0.5 ha of tapped land can produce 250 kg of sap. This is clearly different from the results of research conducted by Lateka et al (2019) [7], where the land area has an important effect because the larger the land area, the greater the sap production. So that in this study, the main factor affecting the amount of tappers' acceptance was the amount of pine sap production in a month [8]. The experience of tappers also plays an important role in increasing the production of sap.

3.2.3. Income. The income referred to in this study is the amount of net income received by pine sap tappers based on the wages earned minus costs during renewal and tapping, as shown in Table 7.
Table 7. Average income earned by respondents for pine sap tappers per 1 kg of sap.

| No. | Respondents | Cost (Rp / kg) | Wages (Rp / kg) | Revenue (Rp / kg) |
|-----|-------------|---------------|----------------|------------------|
| 1   | Salma       | 962           | 5,000          | 4,038            |
| 2   | Sipila      | 10            | 5,000          | 4,990            |
| 3   | Asri        | 1,925         | 5,000          | 3,075            |
| 4   | Nandang     | 963           | 5,000          | 4,038            |
| 5   | Jume        | 769           | 5,000          | 4,231            |
|     | **Average** | **926**       | **5,000**      | **4,074**        |

Table 7. Shows the income earned by tappers per 1 kg of sap, with an average income of Rp. 4,074 / kg. The acceptance of tappers in one time can be seen in table 8.

Table 8. Average income of pine sap tappers.

| No. | Respondents | Revenue (Rp / Kg) | Number of Leads (Kg / pdp) | Revenue (Rp / pdp) |
|-----|-------------|------------------|--------------------------|-------------------|
| 1   | Salma       | 4,038            | 200                      | 807,692           |
| 2   | Sipila      | 4,990            | 240                      | 1,197,500         |
| 3   | Asri        | 3,075            | 100                      | 307,500           |
| 4   | Nandang     | 4,038            | 200                      | 807,500           |
| 5   | Jume        | 4,231            | 250                      | 1,057,808         |
|     | **Average** | **4,074**        | **198**                  | **835,600**       |

Table 8 shows the average monthly income of pine sap tappers with an average of IDR 835,600 / tapping. The difference in tappers’ income is influenced by the amount of sap produced as described in the revenue. According to Zulkifkar (2020) [6], the quantity of latex production will vary according to the season and weather. In the rainy season, the sap produced by pine trees will decrease in quantity, thus affecting the income of tappers. The research area in Mattampawalie Village is at an altitude of 124 masl and temperatures in the rainy season can reach <20°C, making the sap production less than optimal. As stated by Lateka, et al. (2019) [7], to optimize sap production, pine trees require an average rainfall of less than 2000 / mm / yr, temperatures between 22-28, and elevations of 400-700 m above sea level.

3.3. Difference in income from wood harvesting and pine sap tapping

The difference in income referred to in this study is the difference in the average amount of income received by woodcutters and pine sap tapping. The magnitude of the differences in acceptance of woodcutters and pine sap tappers is shown in Table 9.

Table 9. The income differences of wood harvesting and pine sap tapping.

| No. | Harvest type | Harvest result | Wage (IDR) | Income average (IDR) |
|-----|--------------|----------------|------------|----------------------|
| 1   | Woodcutter   | Bearing        | 5,000/m³  | 955,812              |
|     |              | Beam           | 2,500/m³  |                      |
| 2   | Pine tapper  | Sap            | 5,000/kg  | 835,600              |

Table 9. above shows the average income earned by loggers and tappers in one harvesting process. Loggers who produce blocks and bearings earn an income of Rp. 955,812 / felling, higher than the income of tappers, which is Rp. 835,600 / tapping. The income earned by pine sap tappers is calculated for only one harvest per month, while woodcutters can cut several times a month. The logger’s income can change based on the amount of felled done.
Another difference in income when viewed from a seasonal perspective, pine sap tappers have their own advantages, which are during the rainy season, the sap produced by pine trees decreases in terms of quantity but does not stop the tapping process and the community will still have their monthly income as tappers. This is different from loggers who have to stop the felling process in the rainy season because it does not support the felling process and will hamper the extraction and transportation of wood. According to Wulan, et al. (2020) [9], harvesting results in the summer can be optimized, while in the rainy season it will decrease and even not be done, considering the dangers that may occur in slippery logging areas and the difficulty in determining the felling direction of trees. This condition requires loggers to switch to other jobs to finance their economic needs. An alternative that loggers can do is to become rice farmers or focus on raising livestock.

4. Conclusion
The average income received by pine sap tappers is IDR 835,600, slightly lower than the average income of a woodcutter of IDR 955,812, counting one harvest. However, pine sap tapping is carried out once a month while a woodcutter has the possibility of cutting 2 or 3 times a month so that the income can increase according to the number of logs carried out.

References

[1] Suwaji S, Lamusa A and Howara D 2017 Analisis Pendapatan Petani Penyadap Getah Pinus Di Desa Tangkulowi Kecamatan Kulawi Kabupaten Sigi Sulawesi Tengah Agrotekbis E-Jurnal Ilmu Pertan. 5 127–33
[2] Sitohang W R M, Muhdi M and Afifuddin Y 2016 Analisis biaya dan produktivitas produksi kayu pada Hutan Tanaman Industri (Studi Kasus: PT. Sumatera Riang Lestari-Blok I Sei Kebaro, Kabupaten Labuhanbatu Selatan dan Kabupaten Padang Lawas Utara) Peronema For. Sci. J. 5 192–203
[3] Indarwan B I 2019 Analisis Biaya dan Produktivitas Penebangan Kayu di HTI Pt. Toba Pulp Lestari, Tbk. Sektor Aek Nauli, Sumatera Utara (Universitas Sumatera Utara Medan)
[4] Irawanti S, Maryani R, Effendi R, Hakim I and Dwiprabowo H 2008 Kebijakan penetapan harga dasar penjualan kayu Hutan Tanaman Rakyat dalam rangka pengembangan Hutan Tanaman Rakyat J. Anal. Kebijak. Kehutan. 5
[5] Soenarno S and Yuniawati Y 2019 Pengaruh Perbaikan Metode Pembagian Batang Terhadap Waktu Kerja dan Produktivitas Penebangan Hutan Alam Produksi: Studi Kasus Di PT. Dwimajaya Utama J. Penelit. Has. Hutan 37 13–32
[6] Zulfikar A R 2020 Analisis Pendapatan Petani Penyadap Getah Pinus di Blok Pemanfatan Hutan Lindung Kecamatan Tobomojo Kabupaten Gowa (Universitas Muhammadiyah Makassar, Makassar)
[7] Lateka J A, Manurung T and Prang J D 2019 Analisis Faktor–Faktor yang Mempengaruhi Produksi Getah Pinus di Kabupaten Poso d’Cartesian 8 127–33
[8] Dalya N and Mujetahid A 2019 Infrastructure Role of Harvesting System In Community Forest IOP Conference Series: Earth and Environmental Science vol 270 (IOP Publishing) p 12010
[9] Wulan D R, Itta D and Rezekiah A A 2020 Analisis Waktu Efektif Penebangan Jenis Akasia (Acacia mangium) di Areal IUPHHK-HT PT INHUTANI II Pulau Laut Kalimantan Selatan J. Sylva Sci. 3 104–11