The teak harvesting technique in community forest during the Covid-19

A Mujetahid, I Gautama and N Dalya
Faculty of Forestry, Universitas Hasanuddin, Jl. Perintis Kemerdekaan Km.10 Tamalanrea Makassar, South Sulawesi, Indonesia 90245
E-mail : nurdindalya@unhas.ac.id

Abstract. Changes in teak harvesting techniques due to the Covid-19 outbreak was investigated at research locations in community teak forests. This research aims to identify the techniques that used in harvesting community teak forests. The techniques used in each harvesting process, including felling, skidding, and timber transportation processes were analyzed using qualitative descriptive analysis. The results showed that the technique used in the wood harvesting process was a semi-mechanical technique that combined the use of manual and mechanical equipment. Manual equipment is widely used in the felling and skidding process, while mechanical equipment is used in the felling and transportation processes. The felling is carried out to cut down the tree, which is then carried out by dividing the stems into parts that are suitable for skidding. Mechanical equipment in felling using chainsaws in the felling process and for the stems. Furthermore, in the branch cleaning process using manual equipment in the form of machetes. Felling is carried out by one operator by observing four basic steps in felling including determining the direction of felling, making the felling notch and the back cut. Furthermore, the pilgrimage process is carried out using manual equipment by means of a shoulder, using an ARTCO cart, horse, and dompeng. The method used in the skidding process at the research location is still manual with several considerations including; field conditions, such as unavailability of road access to the felling site and scattered locations, volume of timber to be skidded, and relatively low cost. In the final process of harvesting, the transport of skidded wood to the industry is carried out by mechanical engineering using a rented truck based on the number of trips with a maximum load volume of four m³ per trip.

1. Introduction
Harvesting forest products is all activities or work related to the preparation of standing trees or logs so that they can be taken out of the forest area, either in the form of whole wood or in the form of pieces of wood [1]. Harvesting of forest products is the last and key activity that determines the success or failure of an objective of forest exploitation in the form of wood or non-timber. Harvesting of forest products, which is one of the forest management activities in utilizing wood by converting standing trees into wood sorts. Utilization in the form of sorting is for various purposes such as meeting the raw material needs of the wood processing industry [2].

In general, this harvesting activity includes logging, distribution of stems, skidding and transportation [3]. Tree felling is the first step in the forest product harvesting process system. When a tree is still standing and still in the forest, usually the tree does not have a real value or selling value, so the tree
must be cut down and then removed from the forest and then brought to the industry and processed into goods of high value and can be used for humans.

The need for wood as an industrial raw material always increases every year, while the ability of wood production continues to decline, so it is not surprising that the price of wood continues to increase, one of which is teak, which is considered luxurious wood and is considered expensive in the market. This can trigger the community to develop teak plants, including in Liliriaja District, which is one of the teakwood development sites, which can then be used and processed by the wood processing industry.

The Indonesian wood processing industry is currently still dominated by the plywood, sawmill, pulp paper and also industries blockboard. The structure of the Indonesian wood processing industry is certain to change as a result of limited forest resources as a timber producer, increasingly expensive timber prices, increasingly fierce competition and consumer demands for environmentally friendly (green products). The wood processing industry should have the awareness to encourage people to plant and develop community forests [4]. This is because wood from community forests is proven to be able to support the supply of raw materials. When the supply of wood raw materials from natural forests has decreased, it has been proven that wood from community forests is reliable [5]. Some people in Pattojo Village, Liliriaja District, Soppeng Regency harvest teak wood from community forests, which has the potential to reach 28,928.16 m$^3$ with an area of 4,070.58 ha in Soppeng Regency, and in Liliriaja District it has the potential to reach 4,922.07 m$^3$ with an area of 721 ha.

The wood is harvested and then sold to both traders and the wood processing industry. However, at the time of the Covid-19 pandemic, several changes in logging techniques were found at the location. This is what underlies the need to conduct research in an effort to pay attention to the changes in harvesting techniques related to the teak processing industry which will ultimately lead to the achievement of maximum productivity. The usefulness of this research is expected to provide information about harvesting systems that are applied to various types of teak wood raw materials needed by the teak wood processing industry during the Covid-19 pandemic.

2. Research methods

The population in this study were traders who harvested wood from community forests and the wood processing industry. The respondents who were interviewed were determined by quota sampling as many as twelve harvesting actors consisting of one trader, two loggers, four dividers, five transporters and from the wood processing industry.

Primary data were obtained by conducting observations, measurements and direct interviews in the field both with community forest timber harvesting traders and wood processing industry entrepreneurs in Liliriaja District. Direct observations in the field are carried out with the aim of obtaining information about:

a. Is the felling technique used as low as possible or not during the pandemic?
b. The place for distributing the stems, is it at the felling site or on the side of the road?
c. The skidding technique used, is it human, tool or animal labor during the pandemic?
d. The transportation technique used by community forest teak harvesters!
e. The size of the timber harvested and transported in the community forest teak harvesting!
f. What raw materials are needed for the teak wood processing industry, whether in the form of logs, sorting, bearings, blocks or boards?

Meanwhile, for the wood processing industry, the data collected includes the types of wood needed, the size of the raw materials needed, how to obtain and order the raw materials.

3. Results

3.1. Logging techniques used during the Covid-19 Pandemic

In carrying out logging, the operators still pay attention to cutting techniques even in pandemic conditions with the aim of improving the quality of the logs being cut so that the wood supply for the wood processing industry does not decrease. In Liliriaja District, the felling operator pays attention to
the lowest possible felling technique with an average stump height of below 20 cm, i.e. reducing the height of the felling and notching back and paying attention to the felling direction of the trees so that the logs felled do not break and produce good quality wood for industrial use wood processing. The labor force used is two people, the provision of equipment and infrastructure is all borne by the timber entrepreneur. The number of workers involved in logging is relatively small so that it is not a problem in pandemic conditions that limit crowds to carry out an economic activity.

The dividing of stems is carried out at the felling site, and transportation is carried out by truck. The labor system applied, i.e. wholesale, from logging to transportation and the provision of equipment, facilities and infrastructure, all of this is borne by the timber entrepreneur. The costs incurred are IDR 120,000 for transportation activities and IDR 110,000 per m³ for felling and dividing stalks, using the formula:

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\text{Production Cost} = \frac{6000 \times \text{Total Sortiment Length}}{\text{Total Volume Sortiment}}
\]

The size of the wood produced is 3 x 6 cm, ± 1-2 m long in the form of board, and ± 460 cm long, ± 25 cm wide, 27 x 29 cm, 6 x 6 x 2 cm in the form of blocks.

The phase of taking raw materials from the harvesting location is that the entrepreneur buys teak stands at a price that has been agreed between the entrepreneur and the private forest owner, provided that the harvesting costs are borne by the timber entrepreneur [6]. The entrepreneur hires a felling operator to cut trees using chainsaws. The results of pre-pandemic research, the wage system used and the costs incurred were not much different. At the time of the dividing stems activity carried out in logging sites, the timber entrepreneur take into account the sizes of wood to be produced, it is because employers take into account the costs and waste that will be generated when dividing the stems, because the smaller the size of wood sortiment produced, the more cost needed in bearing manufacturing activities, skidding activities and the waste that will be generated [7].

3.1.1. Dividing Stems. The dividing of stems is carried out at the felling site where the dividing of the stems is carried out after the tree has fallen, then the stems are cleaned of branches or branches to make it easier for the operator to carry out the division of the stems. The dividing of stems cut by a certain size to the length and diameter of the tree, the desire of employers or timber merchants and orders from the wood processing industry. Stems dividing is done by dividing the trunk into pieces of logs and in the form of pads which are then transported to the wood processing industry. The cut wood has various sizes ranging from sorting with a length of ± 75 - 285 cm, a width of ± 15-30 cm and a pad with a length of ± 460 cm, a width of ± 25 cm. The workforce used is four people, the provision of equipment and facilities, all infrastructure is borne by the timber entrepreneur. Peeling bark is done after the trunk is cleaned of twigs or branches to facilitate the operator in the cleavage to form a square or pads. Activities for these stems are influenced by the length, diameter of the tree and orders from the wood processing industry, because the sorting or bearing that will be produced is adjusted to the needs of the wood processing industry. The rest of the wood of the results of trunks that can’t be used as wood sortiment used for household needs, for example firewood and others.

3.1.2. Transportation. Especially for the harvesting area in Pattojo Village, it does not use a skidding system or technique but loading, because the felling location can be passed or entered by means of transportation and is located on the edge of the village highway so that it can be easier to transport it directly to the wood processing industry. Loading is the activity of loading wood at the TPn into trucks to be transported to the TPK or to the wood processing industry. The loading is carried out after the felling and dividing of the stems are completed, which is carried by three (3) human workers. Loaded wood has various sizes ranging from sorting with a length of ± 75 - 285 cm, a width of ± 15-30 cm and a pad with a length of ± 460 cm, a width of ± 25 cm.
Timber transporting activities are carried out, i.e. transporting sortiment and pads at the wood collection point to the wood stockpile or wood processing industry. All of these are borne by the timber entrepreneur to provide the facilities and infrastructure. The timber entrepreneur sell teak wood obtained from timber harvesting in community forests in Pattojo Village in the form of sort and bearing wood to teak wood processing industry companies located in Soppeng Regency by using a Mitsubishi Fuso Super HD type truck which can load about 100 bearings or 3 m³ for one-time loading and unloading and some are taken to Jepara by ship that has been ordered by the industry to be processed into goods that have high selling value with the wood criteria must be free from defects, have a large diameter and have the beauty of the wood which can be seen from its pattern and color.

3.2. Harvesting activities relations with the Wood Processing Industry during Covid-19 Pandemic

The relation between logging and the wood processing industry is that when logging, the chainsaw operator pays attention to the lowest possible felling technique with an average arrears height of below 20 cm, and the wage system is that the operator gets a production cost of IDR 6,000 per m for each piece, and to improve quality timber and reduce felling waste so that the quantity of raw material supply to the harvesting industry can be increased. The relation between stem dividing and the wood processing industry is the operator for the trunk dividing the stems based on industry demand and the log condition, which depends on the shape of the tree, when the tree shape starts to change or the tree shape starts to look bent or branched, the felling operator will cut the log at the so that the log length is irregular and the length ranges from 80 - 300 cm. Furthermore, the relation between transportation and the wood processing industry is shown in table 1, i.e. the results of the felling and distribution of stems which are carried out directly are brought to the wood processing industry to be further utilized into goods that have a high selling value. The role of timber entrepreneurs at the research location, i.e. finding the labor needed for harvesting, then the results of the harvest are brought to the wood processing industry for use.

| Harvesting Activities | Labor System | Provision of Equipment Facilities and Infrastructure | Cost (IDR per m³) | Wood Size |
|-----------------------|--------------|-----------------------------------------------------|-----------------|-----------|
| Logging i.e. as low as possible | Piece work (two persons) | Borne by timber entrepreneurs | 110,000 (borne by timber entrepreneurs) | 3x6 cm, length ± 1–2 m (board) |
| Dividing the stems, i.e at the felling site | Piece work (four persons) | Borne by timber entrepreneurs | 110,000 (borne by timber entrepreneurs) | Length ± 460 cm, width ± 25 cm, 27 x 29 cm, 6 x 6 x 2 cm (block) |
| Transportation by using truck | Piece work (two persons) | Borne by timber entrepreneurs | 120,000 (borne by timber entrepreneurs) | |

The wood processing industry is a sector that has been affected by the Covid-19 pandemic. This affects industrial activities in marketing their products because in some even in almost all regions, both domestic and foreign, economic activity has stopped. This encourages the wood processing industry to only stock raw materials from farmers. This happen because the raw material for teak wood is very limited.

4. Conclusion

Based on the results and information obtained in the field, it can be concluded that the harvesting technique during the pandemic was carried out with the lowest possible felling system, dividing of stems at the felling site, and transportation using trucks of the Mitsubishi Fuso Super HD type to the wood
processing industry. Especially for the harvesting area in Pattojo Village, no skidding, because the felling location can be passed by means of transportation and is located on the edge of the village main road so that it can be easier to transport it directly to the wood processing industry.

The relation between the harvesting system and the wood processing industry during the pandemic is the result of felling and dividing the stems that have been carried out in the form of sorting, bearing and based on certain sizes according to the needs of the wood processing industry to be used into goods that have high selling value, for example chairs, tables and so on. However, during the pandemic, the wood processing industry only stocked raw materials, but the activities of producing goods did not do it because market demand had greatly decreased as all economic activities stopped.

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