The practice of agroforestry *Toona sureni* merr by the community of Simalungun Regency, North Sumatera

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Abstract. Agroforestry contributes to addressing the problems the world is facing today. Regarding economic well-being, agroforestry can increase diversify farmers’ incomes and allow them to have access to more nutritious food. The community of Pematang Sidamanik Sub-district conducted an agroforestry pattern that combined forestry crops with various crops. This research aimed to examine the practice of agroforestry. Methods of data collection were interview techniques and field observation (survey). Data processing was qualitative descriptive analysis method. Cultivation techniques for *T. sureni* in study site are the provision of seeds, maintenance, and harvesting simply done by the community. Suren tree is used as a raw material for building, furniture, ships and canoes, while suren leaves are used as vegetables, medicines and organic pesticides/insecticides. Agroforestry practices are influenced by the land and tree tenure system (private or state-controlled) that farmers operate. Tenure affects the decision of farmers to make about the kind of agroforestry system they can use.

1. Introduction
Agroforestry is a combination of deliberate agriculture and forestry to create an integrated and sustainable land use system. This system utilizes the interactive benefits of integrating trees and bushes with plants and/or livestock. One of the agroforestry practices in the study area is using *T. sureni* plants as forestry plants [1, 2].

*Toona sureni* (suren) is a type of forestry plant that has various benefits. Suren trees are classified as a medium to a large sized tree, up to 40 (60) m high and up to 100 cm in diameter (300 cm in mountainous areas) with a dark colour young brown branch. Bole is without branches up to 25 m and supported up to 2 m. The bark is usually peeled and scaly, whitish, greyish - brown or pale brown, scented when cut. Suren is one of the forestry commodities that produce high economic value timber and has good woody properties. Suren trees can be used for timber and non-wood products. A lot of literature explains various techniques of using parts of suren trees, in various regions in Indonesia, including [3].

*T. sureni* bark and fruit can be distilled into essential oils. Suren tree roots can be used as raw material for diarrheal medicine, and its leaf extracts are used as antibiotics and bio insecticides. The leaf extract has antibiotic activity against Staphylococcus, by dissolving the suren leaves on the swollen wound.

*T. sureni* can function as an ornamental plant and mosquito repellent by placing it at the end of the room in the house. For placement outside the room, it can be placed near the door.

The use and processing of suren trees carried out by the people of Pematang Sidamanik District have not been identified. Data on suren use techniques can increase the value of suren, the market prices and
the economy of the community. Thus, it is necessary to identify the use of suren practices in Pematang Sidamanik District.

2. Research methods

The research location was in the village of Pamatang Tambun Raya and Sipolha Horisan Village, Pematang Sidamanik District, Simalungun Regency, North Sumatra. The research was conducted in 2017 with the method of determining the number of respondents based on the Slovin formula [4] that is:

\[ n = \frac{N}{(1+Ne^2)} \]  

\[ n : \text{number of samples} \]
\[ N : \text{number of populations} \]
\[ e : \text{error} \]

The total number of household heads (KK) as population (N) in Pematang Sidamanik District is 4,414 households with an average of 441 families per village [5]. Respondents used in the study were 48 respondents who represented the community.

The primary data collection needed was cultivation techniques and utilization of \textit{T. Sureni}. While secondary data collected included: the general condition of the research location (the location and physical condition of the environment), the socio-economic condition of the community and population conditions, namely age, gender, livelihood, education, and population.

The sampling methods used were:

a. Purposive sampling, a sampling method is based on the opinion of researchers that the chosen respondents can provide the desired information in line with the research

b. Snowball sampling, a method of identifying the object of research through previous respondents who have relevance in the utilization of suren.

The data collected were processed using qualitative descriptive analysis and then presented in tables and diagrams.

3. Result and discussion

The use of \textit{T. sureni} trees can increase the use value of suren trees. Here are the techniques for using suren trees, leaves, and fruit.

3.1. Suren tree trunks

The community harvests \textit{T. sureni} at the deciduous tree or the turn of the leaf. It is intended so that the stem does not bend after harvested and processed into planks, broths and ship materials (figure 1). The techniques are explained as follows:

3.1.1. As raw material for houses (boards and brothies) and furniture. The local community, in general, assesses the yield from the use of wood products or harvests suren stems that will be used/processed into boards and broth. Wood is formed as a pillar of houses, walls of houses, doors, and windows for the construction of houses and furniture in the form of tables and chairs. Suren wood is resistant to water and termite attacks, so it can increase its use value and durability. \textit{T. sureni} has surenon, surenin and surenolactone ingredients which act as inhibitors of insecticidal growth. Because the wood motif is good, people only need to add varnishes in the manufacture of furniture [3].

3.1.2. As raw material for ships and canoes. In addition to being used as raw material for making houses, suren trees are sold to ship craftsmen as raw materials for ships and canoe making (figure 1). The use of suren wood as raw material for ships and canoes is due to the nature of suren wood which is resistant to water and does not easily rot. Besides, suren trees are commonly planted by the community, so the supply is also easy to do.
3.2. *Toona sureni* leaves

Leaves *T. sureni* are used as medicine for hives, organic pesticides, and fresh vegetables. The following techniques are explained: [3]

3.2.1. Medication for itching. The process of utilizing *T. Sureni* leaves for itching is as follows: Green leaves are boiled until boiling, cooled to warm nails and bathed. This drug can be used for humans and animals.

3.2.2. Organic pesticides/insecticides. The technique of using suren leaves for organic pesticides/insecticides is simple and uses simple tools. Suren leaves are mixed with mindi leaves and jihor leaves in a ratio of 1: 1: 1; then soaked in a medium-sized bucket for two days. After they are soaked, water is splashed around the plant. Based on the tests conducted by BPS [6], the treatment of suren leaf solution on bagworms shows a 100% mortality rate, indicating that suren leaves have insecticidal properties.

3.2.3. Vegetables. The leaves *T. sureni* used are young leaves, which are at the end of the suren tree branch. Leaves consumed can be soaked in hot water first or can be consumed directly. Based on the informant's information, the taste of suren leaves is the same as Jengkol

3.3. *Toona sureni* leaves

3.3.1. The community uses suren fruit, for the process of breeding/propagation either planted on their own land or cultivated for nurseries [7]. Suren fruit is used in a nursery business, where the seeds will be sold outside the area and to the forestry Aek Nauli. Based on information from the community, the characteristics of cooked suren fruit are dark brown. It is in accordance with Latifah et al. [3] statement which stated that ripe suren fruit was marked by the colour of the fruit skin changing from green to dull and rough dark brown. If it is broken, it will look like a star. The fruits obtained from the people who own the suren tree are bought at a price of 50,000 IDR/sack.
During the rainy season, the fruit will become heavy and fall under the tree so that it can be taken directly from the trees that grow well. The technique used is the same as the nursery carried out by farmers. In table 1, the practice of using suren trees in agroforestry systems by communities in the area of research is presented.

**Table 1.** Surene utilization techniques.

| No | Plant section   | Usage purposes               | Specifications         | Price           | Processing                                                                 |
|----|-----------------|------------------------------|------------------------|-----------------|---------------------------------------------------------------------------|
| 1  | Tree trunk      | Board, Broti (Building Materials) and furniture | -ten years old Diameter 25 cm | 300,000-500,000 IDR/trunk | Harvesting is done during autumn or leaf change. After harvested, it is immediately formed into a board or broti and processed as home materials and furniture |
|    |                 |                              | -20 years old Diameter of 35 cm | 600,000-700,000 IDR/tree |                                                                         |
| 2  | Seed/fruit nursery | Ripe seeds (seeds that fall into the ground) | 25 Years Old Diameter 45 cm | 800,000 - 1 million/tree IDR | Harvesting is done during the fall or leaf change. After harvested, it is immediately formed into part of the ship |
| 3  | Leaves          | Drugs/ Itchy leaves suren     | Age ≥35 years Diameter ≥ 70 cm | 4 million/tree IDR | Harvesting is done during autumn or leaf change. After harvested, it is directly formed into a canoe |
|    |                 | Green suren leaves suren     |                        | 50,000 IDR/sack | Seeds are shown on the grazed ground. After growing to a size of <10 cm, it is transferred to a polybag or place of planting |
|    |                 | organic insecticide / green suren leaves | | |                                                                         |
|    |                 | vegetables                  | Young leaves at the end of the twigs | | Leaves are boiled as much as 20-30 strands with one bucket of water. Then, the warm water is used for bathing. For animals, it should be applied to itchy marks Surenleaves, Jihor leaves and Mindi (resse) leaves are soaked for two days Soaked water is watered around the plant pink) Young leaves can be eaten or soaked first |

**4. Conclusion and sugegestion**

**4.1. Conclusion**

The conclusions obtained in the study are suren trees used as raw material for building (board and broti) and furniture, ships and canoes while old suren leaves (colored green) are used as itchy itching, and organic pesticides / insecticides by spraying soaking water around the plants. Young suren leaves (at the
end of the branch) are used as food (vegetables) and the fruit is used as seed for breeding and traded both in the form of fruit and seeds.

4.2. Suggestion

Further research on the harvesting process needs to be done by the community in the village of Pamatang Tambun Raya and Sipolha Horisan Sub-district, that is harvesting done in the fall or at the time of leaf change, so that it is known scientifically the things that influence it.

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