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Local Wisdom of the Community of Rambangaru Village, Sumba District, East Nusa Tenggara East in the Cultivation of Sandalwood Plants (*Santalum Album* L.)

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ABSTRACT: The sandalwood plant (Santalum album L.) originates from the Indonesian islands in the southeast, mainly on Timor Island and Sumba Island, according to some experts. It is one of the 25 tribes of the Santalaceae and is spread throughout Asia. The communities in the village of Rambangaru are very helpful to the government of East Nusa Tenggara Province with the conservation, cultivation, exploitation, and processing of sandalwood. The Haharu community hopes to support their efforts to preserve and grow sandalwood plants both outdoors and in the courtyard. Sandalwood is an important plant for local communities in Rambangaru Village, Haharu district, and therefore needs further conservation efforts. The aim of the research is to explain the cultivation techniques of sandalwood plants (Santalum album L.) in Rambangaru village in Haharu district of East Sumba. The qualitative method is a paradigm for describing an event or a society's behavior in detail and in depth in the form of a narrative. The results of the research showed that the cultivation technique of sandalwood plants in the village of Rambangaru, Haharu district, is a single and double planting technique. The community of Rambangaru village has its own technique for planting sandalwood seedlings. The techniques used are single and double planting. Single planting is done using only one guest plant when sandal wood seedlings are planted, while for dual planting, it takes 2–5 guest plants at the time of planting sandalwood seedlings.

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INTRODUCTION

Many parties have stated that the sandalwood potential in the NTT Province must be improved and enhanced through planting activities. Sandalwood planting began in the early 20th century and continues to this day. No effort is being made to enhance the potential of sandalwood at the moment. It's been planted in scattered locations on small grounds with no guarantees of security, so the success rate is so low. Besides, it is not directed at building a sustainable sandalwood company (Ahmad, 2001).

Sandalwood plants have been known by the general public, especially the Sumba people, as a very valuable type of plant known as sandal wood in international trade. Terraced wood has economic value because of the essential oil content of santalol, which has a unique aroma (Lestari, 2010). The potential source of essential oil and non-wood commodities in the NTT province, especially on Sumba Island, is sandalwood. Its unique flavor and oil content, along with a particular aroma, make it a luxury commodity.

The high oil and timber production is an advantage of the East Nusa Southeast sandalwood plant that cannot be found anywhere else. (Sumanto et al., 2011). Santalum album L is a species that grows naturally in Asia. Other species, such as Santalum macgregorii F. Muell. and Santalum papuanum S, are found in Papua New Guinea. Another type, Santalum spicatum (R. Br.) A. DC, is found in Western and South Australia and is a source of sandalwood oil in Australia. (Arifriana et al., 2017).

Sandalwood wood oil is commonly used as perfume for spices, cosmetics, perfumes, and soaps. Kayak not only has a refreshing aroma, but it can also be used to make beautiful engravings. In addition, the sandalwood tree is also often used as a food and beverage ingredient, aromatherapy, and traditional medicine. According to Santha and Dwivedi (2015), sandalwood has antiplogistic (anti-inflammatory), antiseptic, antispasmodic, carminative, astringent, diuretic, emollient, expectorant, relaxant, and tonic properties.

The sandalwood plant (Santalum album L.) originates from the Indonesian islands in the southeast, mainly on the islands of Timor and Sumba, according to some experts. It is one of the 25 families of the Santalaceae and is spread throughout Asia.

Sumba Island, also known as Sadalwood Island, and some of the other major islands in the NTT are sandalwood-producing areas that have been attractive, which have driven the region's openness to isolation through a long-running sandal wood trade. The potential of sandalwood in this region is an ever-changing ecological, social, and economic reality that provides market opportunities for sandalwood policy and trade. (Njurumana et al., 2014).

In Praibakul Village, Rambangaru Village, and Wunga Village in Haharu District, East Sumba District, Nusa Tenggara East, there is one kind or species of sandalwood plant with two varieties: big leafy sandals and small leafed sandals. Small leafy sandalwood leaves (Santalum album L. var. album) are old-green and are in the shape of lancets to egg-rounds. Large-leafed sandalwoodi leaves are elliptical-to-egg-round and are 4-5 cm in length and 3-4 cm in width, with light green leaves (Limbu et al., 2023).

Summarized and processed in the PAUP 4.0 program, Arifriana et al. (2017) determined that sandalwood plants belong to the Santalaceae family because of their morphological characteristics. (daun, bunga, and buah). In addition, a cladogram can describe relationships between species that form clusters based on similarities in properties and characteristics.

The sandalwood population is already very large; step-by-step, efforts to preserve sandalwood have begun with the moratorium method. This is demonstrated by the decline in production from 1992–1996 and the very large exports, falling from 30% to 0.8% (McWilliam, 2005).

In Timor, sandalwood can grow in shallow, rocky soil with a clay soil texture, neutral to alkaline pH, high nitrogen content, and a soil color of red to brown. However, they can't grow in dew or on vertices. (Sumardi et al., 2016).

To get a quality sandalwood plant, first of all, you have to choose a good seed plant. The way is to soak the seeds in water for two nights or forty-eight hours. Sandalwood seeds drowned in water are the characteristic, while floating seeds are less qualified. To get the best results, sandalwood seeds must sink. (Sumanto et al., 2011).

The community in the village of Rambangaru is very helpful to the government of East Nusa Tenggara Province with the preservation, cultivation, exploitation, and processing of sandalwood.

Sandalwood is an important plant for local communities in Rambangaru Village, Haharu district, and therefore needs further conservation efforts. The aim of the research is to explain the cultivation techniques of sandalwood plants (Santalum album L.) in Rambangaru village in Haharu district of East Sumba.

METHOD

The qualitative method is a paradigm for describing an event or a society's behavior in detail and in depth in the form of a narrative.

RESULT AND DISCUSSION

1. Sandalwood Plant Crop Engineering in Rambangaru Village, Haharu district of East Sumba East Nusa Tenggara East.

From the observations carried out in the village of Rambangaru, the Haharu department's cultivation techniques are as follows:

a. **Seed Selection**

In order to obtain quality sandalwood seeds from the community of Rambangaru Village, cleansed sandal wood seeds will be immersed in water for 3-5 days to sort quality seeds, then observe seeds that are sinking (viabel) are good sandalwoods and floating (nonviable) are less good. The sandalwood seed immersion process is done to soften the skin of the sandal wood seed so that it can germinate quickly.

After the sandalwood seed immersion process is completed, the seed packing process is carried out using a wet cloth and stored for 5-7 days until the germinating seed is ready to be soaked. The selection of sandalwood seeds can be seen in Figure 1.

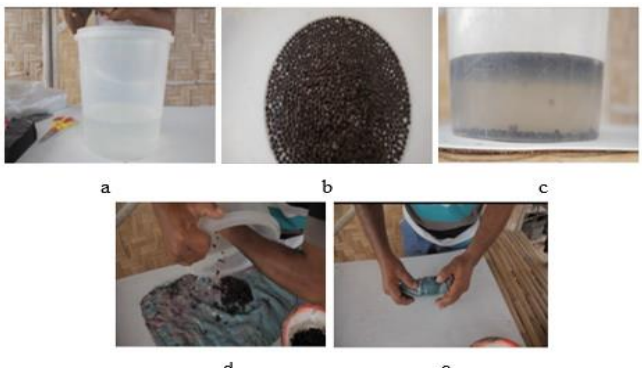

Figure 1. Selection of sandalwood seeds: a). Water preparation. b) Sandalwood Seeds that have been soaked. c) Floating and drowning sandal wood seeds. d) Process of packing sandalwoods. e) Sandals that have already been wrapped.

According to a study by Michelle et al. (2021), before the sowing phase, sandalwood seeds have to go through two stages of preparation: immersion and irrigation. Both stages are carried out for 24 hours, so it takes 48 hours for the seed to be ready to sow. The important thing to note is that sandalwood seeds cannot germinate when soil conditions are filled with water.

Water absorption is the first process that occurs in the germination of seeds, followed by the depletion of the seed skin and the development of seeds. Water absorption by the embryo and endosperm causes the swelling of both structures, pushing the skin of the already soft seed to break and give room for it. Water plays a role in softening seed skin, facilitating O2 entry, and serving as a serving as a means of food transportation. Temperature plays a role in the breakdown of dormancy. (Anonymous, 2010).

Unlike Surata and Purwadi (1993), seed sorting is done by soaking, filtering, and washing sandalwood seeds until clean, then the seeds are dried in a shaded room. The seeds are then treated with a disinfectant and stored at a temperature of 4 °C. The seed treatment before sowing is soaked in a solution of 0.05% giberellic acid, then washed and sown on a sink or directly into a polybag.

The sandalwood seed before sowing is treated as a 12-hour immersion in regular water or a slight exocarp seed skin and subsequently submerged in normal water for 12 hours or immersed in giberelic acid 0.05% for 1 hour. Next, the sandalwood seeds are planted in an exposure medium with a depth of 1 cm (Surata, 2006).

b. Preparation of a seed for sandalwood

For the preparation of the filling site, a seed barrel is prepared in advance. The size of 1 kg of sandalwood seed required is 0.5 m × 0.5 m, a mixture of soil and cattle debris with a ratio of 4:1 (4 buckets of ground and 1 bucket of cattle dirt), a board size 10–15 cm, a piece of bamboo or wood, and white plastic size 0.2–0.3 mm or any existing type of plastic.

The soil is soaked with a 2–3 mm thick stalk, and then the soil is mixed with cattle dirt to the same extent. For the size of 1 kg of sandalwood seed, it can produce about 2000–3000 seed trees. The process of preparing the seed site can be seen in Figure 2.

Figure 2. Preparation of sandalwood seed site: a). Soil cultivation. b) Mixing of soil with cage fertilizer. c) Making of cages.

According to Surata (2006), the area of the seedlings requires 60%–70% of the location assigned for seedling needs, while the remaining 30%–40% is used for water pipes, water supply tanks, work cages, and other buildings. Some provisions are to be observed in the manufacture of seedlings with a size of 5 x 1 m or 10 x 1 m.

c. Seeding sandalwood seeds

For the seeding phase, prepare a seed medium and water a little so as not to be too dry. Spread the sandalwood seeds evenly so that they do not stack. Cover the sandals with soil as high as ± 1 cm, then cover with UV plastic and spray 2 days once. The Haharu people put the seams freely, some curved from north to south and some curved from east to west. The process of sowing sandalwood seeds can be seen in Figure 3.

Figure 3. Sandalwood refining process: a). Media test. b). Seeding sandalwood seeds. c). Closure of sandalwood seeds using soil. d). Sandalwood seed plastic packaging process. e). Sandalwood seeds packed in plastic.

According to Surata (2006), the sandalwood seedings are laid out from a barrel to a plastic bag in the size of 15 x 20 cm when the seedlings are 1 month old or have leafed 2 strands. The irrigation was done in conjunction with the planting of the primary host (Alternanthera sp.) planted with a spruce steak inside the polybag.

d. Transferring sandalwood seedlings to a polybag

The mixture of soil and cattle dirt is mixed to the same level, then inserted in a 15 x 21 cm polybag. Remove a 7 cm sandalwood seed, then cut the ends of the rodent root and plant it in the polybag. The people of the village of Rambangaru in the Haharu district use the crocodile plant (Portulaca oleracea) as their host in the polybag. The process of transferring sandalwood seeds can be seen in Figure 4.

Figure 4. The process of transferring sandalwood seeds involves a soil mixture and seed fertilizer. b. polybag filling. c. cutting the root ends of sandalwood seeds. d. planting sandalwood seeds into polybags. e. sandal tree seeds with crocodile plants as their host.

According to Surata (1998), three of the best long-term secondary hosts were found: Casuarina junghunniana, Cassia siamea, and Dalbergia latifolia, and the secondary medium-term hosts are Acacia villosa, Leucaena leucocephala, and Sesbania grandiflora. Medium-term secondary hostels are used to replace short-term primary hostel functions, and long-term secondary hosts are used to replace medium-term hostel functions.

e. Transferring sandalwood seedlings to the plantation

When the sandalwood seed reaches a height of 30 to 40 cm and the leaves begin to be abundant, it can be planted in the field. (kebun). Before planting sandalwood, make sure that the hostel plants are fresh. The community of Rambangaru village, Haharu district, has its own technique for planting sandalwood seedlings.

The techniques used are single and double planting. Single planting is done using only one host plant when the sandalwood seed is planted, whereas for double planting, it takes 2–5 host plants at the time the sandals are planted. According to the community of the village of Rambangaru, sandalwood plants can grow well if planted together in a hole with a tourist breed (Sesbania grandiflora) as a host, with a planting distance of 20 cm to 50 cm.

However, in order to preserve the possibility that when the first host tree dies, it will be planted in the vicinity of acacia (Acacia villosa), kelor (Moringa oleifera L.), gamal (Gliricidia sepium), and lamtoro (Leucaena leucocephala) with a planting distance of 2 m from each type of tree as an additional host. The hole size is 30 × 30 cm with a depth of 40–50 cm, and the gap between the planting holes is at least about 2–3 meters.

The cage fertilizer is first inserted into a hole as deep as 20–25 cm, then the sandalwood seedlings are planted in the hole and replenished with soil. Planting is usually done in the morning and in the afternoon, and irrigation is done at the time of planting, then done once a week. The transplantation process of sandalwood can be seen in Figure 5.

Figure 5. The process of planting sandalwood breeds: a. planting holes and fertilizer. b) Release of sandalwood seed from the polybag. c). Planting of sandalwood seedlings

Sandalwood is a semi-parasitic plant, so its cultivation technology requires intensive treatment, such as the provision of host plants at the first seed or at the beginning of growth in the field. (inang sekunder). One of the kinds of host plants in the parish is the crocodile. (Alternanthera sp). The function of the host is to aid in the absorption of the element of haras through haustoria. This function will be effective when the roots of sandalwood plants and the host plants are attached to each other. (Ari Fiani, 2014).

Surata (2010) stated that the hares absorbed through haustoria are N, P, amino acids, and water, whereas those absorbed directly through sandalwood roots are Ca and K. The secondary host functions in the field, in addition to helping the absorption of hares as an initial protector, to maintain soil moisture with its title closure, as well as to reduce the competition of plants with weeds.

CONCLUTION

The cultivation techniques of sandalwood plants in the village of Rambangaru, Haharu district, are single and double planting techniques. The village of Rambangaru has its own technique for planting sandalwood. The techniques used are single and double planting. Single planting is done using only one host plant when the sandalwood seed is planted, whereas for double planting, it takes 2–5 host plants at the time the sandals are planted.

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