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TRAINING IN BREEDING FOR USED AGARWOOD COMMODITY NORTH ACEH DISTRICT CONFLICT AREA

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ABSTRACT

Agarwood is a type of wood produced by several species of trees from the Aquilaria genus, especially Aquilaria malaccensis. Agarwood has high value in the perfume and traditional medicine industries because of its unique aromatic compounds. Agarwood can be formed due to interactions between microbes (certain inoculum) and host plants and chemical mechanisms that ultimately form a product, namely sapwood. Local inoculum is effective in producing gaharu, because it is endemic to certain areas. Some of the partners' obstacles that are strongly felt include (1) the low ability of farmer group members in terms of breeding agarwood plants both naturally (generatively) including propagation treatments using mature seeds and saplings (plucks) as well as plant cutting patterns. (2) There is no knowledge and skills of members of the two partner groups in carrying out the breeding and maintenance of gaharu seedlings. This service uses training and seeding methods for seed patterns and saplings (plucks) and plant cuttings. This method is appropriate to use where the participation of partner farmers in improving skills and the mentoring process is carried out directly by practicing. The pattern of implementing community service activities for partner farmers applies the principle of "learning by doing" learning while working. Agarwood Nursery Training in the Former Conflict Area in North Aceh has been able to increase knowledge, skills and change attitudes in the cultivation of agarwood plants. The impacts felt by the existence of agarwood plant breeding activities include; increasing the economic income of partner farmers, increasing social harmony among group members and the community at the location of service activities.

Keywords : ***Breeding, Cultivation, Agarwood, Training, Mentoring***

1. INTRODUCTION

Agarwood is an aromatic substance in the form of light brown, blackish brown to black lumps that form in layers of agarwood. Agarwood-producing plants, if they do not contain aloes in them, then the plants have no selling value at all. Agarwood can be formed or produced in two ways, namely naturally and with human assistance/intervention by inoculating with certain inoculants on agarwood-producing plants. The Aceh region has very high biodiversity which can provide many benefits for human life, one of which is thymeleaeceae (plants with medicinal properties). The Thymelaeaceae plant group includes *Aquilaria, Gyrinops, Enkleia, Gonystylus, and Wikstroemia*) Rahmanto and Suryanto 2014. In Aceh Province there are two types of Aquilaria malaccensis which are aloe-producing plants, Lukman et al. 2009. Until now, almost all farmers have cultivated aloes independently, both on a large and small scale, using monoculture and intercropping patterns (Turjaman & Hidayat, 2017). Agarwood in the form of sapwood harvested from cultivation is an aromatic substance (smells good) from the sesquiterpene group and has a specific chemical structure. Its formation can be influenced by various factors, including plant genetics, inducing microbes, and the environment. Agarwood can occur when certain microbes infect agarwood-producing trees. The plant's response to infection will produce secondary metabolites or resin compounds which cause a fragrant aroma (Sitepu et al. 2011).

The farming community in Aceh Province until now does not know much about the existence of a method for producing agarwood sapwood. The people's habit of harvesting agarwood in the forest is that it is produced naturally. In this service activity, the community is provided with an understanding of gaharu cultivation, especially the provision of production facilities for gaharu cultivation, namely nurseries for gaharu-producing plants with various seed sources (seeds, cuttings and cuttings of gaharu plants). Agarwood-producing plant seeds can be produced through generative and vegetative breeding. Generative breeding is carried out by exploiting potential; (1) seeds that have matured by downloading seeds or seeds that have fallen from the parent tree. (2) saplings that have grown (plucked) under the parent tree. Vegetative propagation can also be done using shoot, stem and tissue culture cuttings.

After the Aceh conflict, the enthusiasm of the farming community to carry out gaharu cultivation activities also increased, but farmers were often faced with the availability and affordability of superior gaharu seeds. The need for seeds for forestry commodity types, especially gaharu, in Aceh Province is very high, this is reflected in the increasing demand for plantation plant seeds, so that to meet demand, these seeds must be supplied from provinces on the island of Sumatra and Java. The Tunas Agarwood Farmers Group, which is a partner in this service activity, is a group that was recently formed but is already active in disseminating information and taking part in agarwood cultivation training with the Aceh Lestari Agarwood Community and the Aceh Agarwood Development Research Station. Members of the Tunas Gaharu Farmers Group, although they have received an introduction and brief training on gaharu cultivation, have not had direct contact with training on gaharu seeding, both geratively and vegetatively, so that gaharu cultivation properly and correctly cannot be implemented by the Tunas Gaharu Farmers Group in Sawang Sub- District, North Aceh District.

The agarwood nursery business is very feasible to carry out from the aspect of its economic value in line with the increasing number of community plantation and forestry development activities in Aceh Province and can have a positive impact on social life, especially in alleviating farmer poverty in the plantation and forestry sub-sectors around protected forests in Aceh Province. The complete identification of the problems faced by the two partner groups is as follows; (1) the ability of members of the farmer group is very low in terms of cultivating gaharu plants both from seeds and saplings (plucked) and (2), there is no knowledge among the members of the two partner groups in caring for seedlings from gaharu seeds and saplings. The aim of this service activity is to increasing the capabilities of partner farmers in terms of seeding superior non-timber forest commodities, especially agarwood seeding, for which partner farmers have no skills.

2. METHOD OF IMPLEMENTATION

Community service in the form of training is carried out by combining theory and practice which is focused on the fields of the partner farmer group members. The members of the partner farmer group will be equipped with knowledge about how to breed generatively and vegetatively with a training material composition of 20% and followed by practicum and implementation of seeding and inoculant injection of pangolin-producing agarwood trees with a greater composition of up to 80%. The activity material includes general explanations in the form of problem analysis and solutions in the form of theories which are packaged into modules and resumes or summaries and delivered using a lecture system using tools in the form of newspapers, laptops and LCDs.

The practical material and implementation of the nursery for agarwood-producing plants is carried out using direct practice where all members of the partner group are involved in the process of implementing the nursery for agarwood-producing plants. Service activities include preparing nursery facilities, providing seedling media, the seeding process for both seed and plucking patterns as well as the process of maintaining the nursery properly and correctly. During the activity, members of the partner farmer groups were actively involved in every stage of preparing nursery facilities, providing nursery media, the nursery process for both generative and vegetative

patterns as well as the process of maintaining the nursery for agarwood- producing plants and the practice of injecting agarwood-producing trees. Active involvement of partners is very important to realize the success of knowledge transfer activities (cognitive), affective (attitude) and psychomotor (skills) with a learning by doing pattern (learning while working). The implementation of science and technology transfer for partner farmer members is directly guided by the service team and assisted by three trained students. The stages of the process of implementing gaharu nurseries in the demonstration plot receive assistance from the service team during the nursery process.

The solution to the problems faced by target partners is related to (1) the low ability of partner farmers in terms of breeding agarwood plants both naturally (generatively) including propagation treatments using mature seeds and saplings (plucked), (2) lack of knowledge of group members both partners in maintaining aloes nurseries from seeds and uproots (gaharu saplings). The approach offered to answer the problems faced by the partner group is through training and implementation of agarwood plant nurseries both by seeding with seeds and saplings (plucks) carried out in the partner farmer's environment in a way that allows for a high level of success in the nursery. Science and technologywill be transferred to partner farmer groups including :

1. Training to increase knowledge and skills in terms of natural (generative) aloes plant breeding includes propagation treatment methods using mature seeds and saplings (plucks) with good and correct treatment so that the success rate of seeding agarwood-producing plants is high.
2. The method of mass producing gaharu plant seeds in a short time is by providing training and assistance to increase the skills of partner farmer group members in carrying out nurseries using good and correct seeds and saplings (plucks) as well as caring for the seeds to produce high levels of gaharu producing plant seeds. high success.

Figure 1. Agarwood Cultivation Training Activities and Handover of Agarwood Seeds to Partner Farmers

3. RESULTS

The implementation of the activity began with socialization activities by holding deliberations with the chairman and several members of the Tunas Gaharu farmer group. At the socialization stage, the service team explains the activity plan related to gaharu breeding innovation and identifies existing resources in the partner farmer's domicile environment. TahaThe next pan was an activity to the gaharu mother plantation for an introduction to the method of harvesting and the knowledge of partner farmers regarding sources of material for gaharu seedlings. Sources of seeds for sowing aloes during service activities include aloes seeds, uprooted aloes seeds and cuttings of shoots/twigs of aloes plants.

The training on cultivating and sowing gaharu seeds was carried out by presenting members of the Tunas gaharu farmer group by providing material through lectures and demonstrations of methods ranging from media preparation to maintaining gaharu seeds. Each stage is carried out by actively involving partner farmers to ensure the transfer of innovation can take place well. Providing agarwood seeds can be done in two ways, namely generatively and vegetatively. Generatively, seedlings are carried out using seeds/fruit and vegetatively, it is the provision of seeds from branches (cuttings or grafting and grafting and tissue culture using vegetative organs). Currently, seeds are generally prepared generatively, either by direct sowing or through uprooted seeds. Vegetative seed provision is currently rarely done because generative seed provision is easier and is still widely available in nature. Apart from that, the success rate of providing seeds genetically is greater than providing seeds vegetatively. Propagation Generative plants are propagated through a mating process between selected male and female parent plants through the floral organs of one of the parents, then pollination occurs and produces fruit containing seeds in it and the resulting offspring will follow the characteristics of their respective fathers and mothers. one to one. Plants that are propagated by seed have strong roots, the costs are relatively cheap, the life of the plant will be longer, and it can produce new varieties due to a cross between the two parents.

Vegetative propagation is propagation carried out using vegetative organs such as shoots, branches, stems, roots and others other than seeds. The advantages of vegetative propagation are that the plant bears fruit more quickly, the offspring's characteristics match those of the parent, and the desired characteristics can be combined. The disadvantages are that the roots are not good, it is more difficult to do because it requires certain skills, and the fruiting period is shorter. So far, the propagation of gaharu seedlings has been chosen generatively because if every gaharu that has grown is inoculated with an inoculant of the best quality, if the climatic conditions support it, it will produce good sapwood. Before carrying out seeding there are several things that must be considered. The main thing that is necessary is the availability of plant material (seeds or uprooting and the source of the mother tree as a source of explants), preparation of growing media or seedlings and the location of the nursery. This is necessary for both generative or vegetative breeding. The seedling media that must be prepared is top soil (top soil that contains a lot of humus/fertile) then sand or charcoal, husks or cocophytes. This is done for clay or soil that is not yet sandy and ready-made compost. Mixing is done in a ratio of 3:1:1 (3 parts top soil: 1 part charcoal husk/cocophyte/sand and one part mature compost). The seeding location must be done in a shaded place, either shaded by trees or other things such as using plastic paranets or coconut leaves, not in a dark place with a light intensity of 30-40 percent. The prepared media is put into the seedbed.

Technique for providing agarwood seedsgeneratively

The implementation of generative seed production generally goes through several stages of activities, namely :

a. Sowing seeds from seed sources

Seed preparation is cleaning the seeds from the skin of the fruit or often called seed extraction. Usually, agarwood fruit is harvested from the tree, because in general the old fruit will break and hang on the tree and after a while will fall. Extraction of agarwood seeds can be done by drying the fruit in the sun until the fruit bursts, then drying and selecting good seeds (ripe and old) to be used as material for sowing.

Figure 2. Source of Agarwood seeds and seedlings

Seeds that have been extracted should be soaked in fungicide for 30 minutes, then dried for 2 hours, then soaked again in ZPT or you can also sow them directly. Sowing seeds is carried out in the media provided and in shady or shaded conditions. The seeds are sown in a nursery by sowing them evenly and then sprinkling just a little bit of soil/rice husk charcoal so that the agarwood seeds are still visible. Next, a coconut frond or something similar is placed on top of the seed, then covered with grass or something else. This is done to condition conditions in the area where the seeds are sourced (forest). If this is not paid attention to, the percentage of seed growth is usually very low. Watering is done once every three days, so that it is not too wet, watering is only done at the top. The seed caps from coconut leaves and grass must be moved after 3 weeks of seeding because usually the seeds will grow evenly after 2-3 weeks, and the seeds must be moved into polybags after the seeds have 2-4 pairs of leaves. Seedlings that have been transferred to polybags need intensive care so that the seedlings grow quickly and are healthy. Usually seedlings can be moved to the field after they are 8-9 months old or the seed height has reached 90-100 cm.

b. Providing plucked seeds

Providing seeds using the natural plucking method is a practical way of providing seeds because if there is no special treatment for aloe seeds it will be difficult to grow. One of the efforts taken is to provide plucking seeds. To obtain these plucked seeds, information on the source of the seeds is required, this can be done by exploration and this can only be done if the source of the seeds is clearly available. Several stages that need to be carried out are collecting information on agarwood trees. The existence of gaharu trees can be done by asking the public, friends, colleagues who are familiar with gaharu plants that grow naturally in the surrounding area. If information about the existence of the parent tree has been found and has seeds that have grown and are ready to be used as seedlings, then the plan for making new uprooted seedlings can be carried out. The second is collecting the uprooting, if in dry conditions the uprooting must be done carefully so that not many of the roots are damaged, therefore you need to be assisted with a special uprooting tool.

Seeds that have been removed must be conditioned in a fresh condition, namely by putting them in plastic and adding a little water so that they do not wilt easily, or putting them in a cool box that has been given ice cubes or other coolant. Collecting the pluckings must be separated based on size so that not many are damaged, especially the small pluckings. The activity should be carried out during the rainy season, so that the ground is not hard so that pulling out the aloes is easy and there is less stress. The extraction technique must be careful, such as positioning it straight up so that the neck of the stem is not damaged or scratched due to friction with the ground. After the extraction is collected, it is immediately processed using cardboard or storefoam or an ice box and the condition of the container must be monitored so that it is damp or wet so that the extraction does not dry out and wilt.

One way to maintain damp or wet conditions is to cover the top with a wet cloth/wet newspaper. The position of the extraction is arranged alternately between the leaves and roots so that it is neat and can fit more. Good plucking is one that is 1-2 months old or has a height of 10-15 cm or has 4-5 pairs of leaves, but if the location is very far away in the forest, it can be done in any condition as long as it can still be plucked. If the extraction is more than 5 months old or the height has reached more than 50 cm, then special treatment is needed. The special treatment referred to here is to prepare the planting media (appropriate polybags and then cover them for 1-2 months. The previously prepared media is put into a polybag and then placed in a shaded condition of up to 70 percent and equipped with a hood. The seeds that have been collected in the container are immediately transferred into the media and covered. Before sowing into the media that has been inserted into the polybag, it is best to apply sufficient insecticide, fertilizer fungicide and a little ZPT so that the shoots can recover in a short time. Seeding is done only at the root neck. Small and large shoots must be separated and placed in different beds. After sowing and arranging it neatly, immediately put a plastic lid on it and close it tightly to vacuum.

Figure 3. Agarwood seedlings originating from plucked plants that are 3 months old

The lid can be opened gradually after the seedlings are 1 month old or when the seedlings have not wilted and have grown new leaves. How to remove the lid, after one month, on the first day it is opened for one hour then closed again, and the next day on the second day it is opened for 2 hours or if the seedlings have symptoms of wilting, immediately cover it again, and so on on the third day until the seedlings no longer wilt. Preparing the seeds in this way, the seeds are ready to be moved to the field after they are 6-7 months old or the seedlings have reached a height of 80- 90 cm. If this procedure is carefully observed, the success rate can reach 90%.

Figure 4. Agarwood seedlings from Community Service Farmers who are 9 months old

c. Providing seeds by cuttings

Apart from seedlings, aloes can also be propagated by shoot cuttings. Providing seeds by cuttings is one way of vegetative propagation without using seeds. This method is usually used to obtain the same production results as the parent, such as in the propagation of fruit plants and so on. In this activity, agarwood plants will be propagated by shoot cuttings. The stages of plant propagation activities using cuttings include cutting growing media, selecting cutting material, making cuttings, sowing, maintaining cuttings before they take root and maintaining cuttings seedlings (Sumarna Y, 2008). The plant material or explants used in this activity are half-old shoots or twigs of aloes plants, it is best to use stagnant shoots or twigs to get a greater percentage of success. Considering that the process of seeding using cuttings takes a long time, in this service activity there is only a demonstration of the way (DemCa) of seeding using cuttings. When evaluating the success rate, it was shown that seeding with a cutting pattern had a relatively lower success rate (40%) when compared to seeding with a seed and uproot pattern in the agarwood nursery process, where success could reach 80-90%.

Influence and Impact of Community Service Activities

Farmer Empowerment service activities in the Non-Timber Forest Commodity Breeding activities (Aceh Gaharu) in Gampong Teupin Rusep, Sawang District, North Aceh Regency have had an impact in terms of increasing their knowledge and skills regarding the seeding and cultivation of agarwood plants with various patterns (seeds, uproots and cuttings This is illustrated by the results of the pre-test and post-test from the agarwood keeper training activities prepared by the service team.

Table 1. Description of Changes in Behavior of Agarwood Nursery Service Partner Farmers

No	Rated aspect	Score Before Training	Score After Training
1	Knowledge about agarwood breeding	52	88
2	Agarwood breeding skills	44	85
3	Attitudes towards agarwood breeding	46	78

The data above explains the increase in farmers' knowledge about agarwood breeding and nursery skills before and after the training carried out by the community service team. The training attended by partner farmers also resulted in a change in the attitude of farmers who previously perceived that seeding only came from nature (uprooted) and that it was difficult to carry out mass seeding. By increasing knowledge and skills, farmers believed that they could carry out seeding to meet the need for seeds and had great potential for development. as an effort to improve welfare. This is in line with the research results of Setia Budi, et al (2022) that agarwood nurseries can meet the need for seeds for agarwood cultivation and also be a business with great potential to improve farmers' welfare. Apart from the impact, there was an increase in knowledge, skills and attitudes of partner farmers, during monitoring activities the service team also received information that partner farmers received net income (profit) from the seeding carried out reaching IDR. 20,000,000 per seeding process with a seed volume of 5,000 stems. This service activity is also a means of improving relations between members of the community, especially members of partner farmer groups. This is reflected in the increase in social harmony between fellow communities at the location of the service partner farmers.

4. CLOSING

Conclusion

From the implementation of this community service activity it can be concluded :

1. Empowering farmers in Aceh Agarwood Nursery activities in the former Aceh conflict area in the North Aceh district has been able to increase knowledge, skills and change attitudes in the cultivation of agarwood plants.
2. The impacts felt by the existence of agarwood plant breeding activities include; potential increase in economic income as well as increasing social harmony among group members and the community at the location of community service activities.

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