

# Increasing productivity of valuable agarwood in Senggren Village, Malang Regency

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## ABSTRACT

Wisma Gaharu as one of the plantations assisted by the Malang Regency Perhutani Service conducts an agarwood nursery with the species *Gyrinops Versteegii*. However, the agarwood plants cultivated at Wisma Gaharu are attacked by caterpillars annually, causing damage to the agarwood leaves. Accordingly, the growth of agarwood plants is hampered, and further dry out and die. This causes the owner of Wisma Gaharu to suffer huge losses, especially if the pest attacks the plant which is ready for the inoculation process in the dry season. To overcome this, agarwood farmers must pay high attention and vigilance to fight agarwood caterpillar attacks which occur throughout the year since it is considered as the most dangerous pest for plants. The unavailability of production support equipment is one of the problems faced by Wisma Gaharu; there is also a need for work safety training (K3) regarding proper supporting equipment use considering the risks faced by workers in the agriculture sector. The above problems underline the main reasons for supporting equipment procurement and administering work safety training.

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## 1. INTRODUCTION

Wisma Gaharu Malang, located in Senggren Village, Malang Regency, is a breeding post and nursery for agarwood-producing trees of the *Gyrinops Versteegii* species. Wisma Gaharu is fostered by the Malang District Forestry Service. Agarwood is a non-timber forest product that has high economic value, as a raw material for perfume, incense, and medicinal ingredients in the pharmaceutical industry (Yesu et al., 2017). Having a form of solid lumps and blackish brown to black in color also fragrant smells, Agarwood lumps are produced in the wood or roots of host trees. The host trees are required to undergo the physical and chemical changes process, or infection as the agarwood farmers call it, with the help of special fungus. Therefore, not all agarwood-producing trees produces agarwood lumps. Only the ones successfully undergo the infection will produce agarwood lumps. Traditionally, agarwood is used,

among others, in the form of body and room fragrances, cosmetic ingredients, and simple medicines (Fitriana et al., 2019; Mulyono, 2019). Agarwood is one of the non-timber forest product commodities which currently has very good prospects for development (Kusumaningsih & Asmita, 2022; Pincita et al. 2021). Currently, the use of agarwood has widely developed, including for perfumes, aromatherapy, soap, body lotions, medicinal ingredients which have properties as anti-asthmatic, anti-microbial, and stimulants of nervous and digestive work. Agarwood must be produced from cultivation process to preserve the nature as well as a means of export sustainability. Up till now, the regional governments of several provinces which are the natural distribution areas for agarwood have implemented agarwood planting programs (Helmi & Karsiningsih, 2018; Triadiati & Miftahudin, 2021; Yasir et al., 2021).

Wisma Gaharu has been carried out sowing, cultivating, and inoculation process of Agarwood plants for years. The type of cultivated agarwood plant cultivated here is the *Gyrinops Versteegii* species since it is one of the rare agarwood species with high market demands, as shown in Figure 2. The *Gyrinops* species is one of the seven agarwood-producing genera in Indonesia where this species is the most widely used besides *Aquilaria* and *Gonystylus* (Mulyaningsih & Sukenti, 2019). Nursery products that are usually sold are agarwood plant seeds which are distributed to other agarwood farmers either in the Malang area or outside the city of Malang. Meanwhile, agarwood inoculation is the process of infusing or injecting agarwood trees with microbes in the form of liquid from fungi. The aim of this process is to obtain agarwood sapwood faster compare to that of the natural process; therefore, it can be sent to the market more quickly. It is important to know that not all agarwood-producing trees can produce agarwood sapwood. Therefore, with the inoculation process created through engineering innovation, agarwood-producing trees can produce agarwood sapwood. Inoculation methods are divided into two groups, namely the conventional and modified methods (Wahyuni et al., 2020). The method used at Wisma Gaharu is the conventional one, namely by nailing and injuring the tree trunk and then injecting the fungus into the produced hole in the nail. This traditional method takes a long time to produce agarwood. This inoculation process eventually produces aromatic compounds from the agarwood tree (Mega & Kartini, 2020), which can be used for numerous things.

Every year the agarwood plants cultivated at Wisma Gaharu are attacked by caterpillar pests, causing damaged or bare agarwood leaves which inhibit the growth of agarwood which can even cause the agarwood plants to dry and die because the leaves are eaten by caterpillars. This will certainly cause huge losses to the owners of the agarwood house and the agarwood farmers, especially if the pest attacks the agarwood plants which are ready to carry out the inoculation process during the dry season this year. Agarwood farmers must pay high attention and vigilance because agarwood caterpillar attacks occur throughout the year and these agarwood caterpillars are the most dangerous pests for agarwood plants (Kuntadi et al., 2016). One of the obstacles to agarwood plants in various regions is the existence of caterpillar pest attacks which cause agarwood plants to become bare and then die (Ngatiman & Erwin, 2020; Rahayu & Maharani, 2012).

The preliminary observations results and interviews by the team at partner locations, shows that there are two main problems currently being faced by Wisma Gaharu. The first problem relates to partners' lack of knowledge regarding Occupational Health and Safety (K3) standards during activities in the plantation which can have a serious impact on the health and safety of partners at work. In addition, another problem relates to the absence of several tools to support partners' activities in cultivating agarwood plants, causing many agarwood plants to be attacked by caterpillars and resulting in a decrease in the amount of production of agarwood plants. Therefore, in this community service activity, the team assists partners in increasing the productivity of plantation products through agricultural tools procurement and training in the use of tools, as well as providing knowledge related to K3 therefore partners can carry out activities safely according to proper procedures.

## **2. METHODS**

This community service activity uses survey and training methods. The team conducted a survey and socialization of community service activities to Wisma Gaharu partner locations at Jalan Raya Senggeng RT 07 RW 03, Krajan, Senggeng, Sumberpucung, Malang Regency. Accompanied by the owner of Wisma Gaharu, the team conducted a survey of plantation activities at Wisma Gaharu including problem identification related to the K3 handling of employees during work, as well as the productivity results of the agarwood plant which is the main product at Wisma Gaharu.

Training on K3 and the use of agricultural tools were also carried out for employees at Wisma Gaharu. The training method was chosen aiming at increasing the knowledge and skills of employees at partner locations. This training method consists of the following activities: (1) Survey on partner activities was conducted on April 3, 2022 aimed at observing and identifying problems experienced by partners; (2) K3 presentation and discussions from the team to partners regarding K3 material while working in the agricultural sector which was carried out on July 16 2022 to provide partners with an understanding of the causes of work accidents in the agricultural sector; (3) Provision of agricultural equipment assistance to support the productivity of agricultural products which was carried out on July 16, 2022 to increase the productivity of agarwood plants; (4) Assistance on how to use agricultural tools and the practice of implementing K3 at work which was carried out on July 16, 2022 to provide understanding to partners therefore they can use the tools properly and avoid the risk of work accidents; (5) Evaluation of the results of community service activities on August 6, 2022 to measure the increase in partners' knowledge and skills regarding community service activities that have been carried out by the team through K3 training and the use of agricultural tools.

## **3. RESULTS AND DISCUSSION**

This community service activity was carried out from March 2, 2022 to October 31, 2022, while the visits to Wisma Gaharu's partner locations on Jalan Raya Senggeng RT 07 RW 03, Krajan Senggeng, Senggeng, Sumberpucung, Malang Regency were carried out on April 3, 2022, 16 July 2022, July 17 2022, and August 6 2022. Increasing the productivity of agarwood plants is an output to be achieved through community service activities planned for Wisma Gaharu as an activity partner. To overcome these partner problems, there were several stages of activities carried out by the team together with partners, including: (1) Carrying out surveys and dissemination activities; (2) Providing an understanding of K3 aspects to partners to carry out plantation activities; (3) Providing assistance in agricultural tools procurement such as pruning shears, garden shears, chainsaw adapters, hand grinders, sprayers and folding ladders as well as assistance on how to use agricultural tools and practice K3 implementation; (4) Evaluating the results of activities.

### **Conducting Surveys and Dissemination of Activities**

On April 3<sup>rd</sup> 2022, the team visited the partner's site, namely Wisma Gaharu Malang, which is located at Senggeng Village, Kab. Malang, to observe and identify problems that are being experienced by partners. In addition to observing and identifying problems, the team also disseminated the proposed activities to locations. In this activity, the team discussed with partners the aim of the visit, discussed the problems faced by the partners, the solution plans provided by the team to partners, as well as confirmed the partner's commitment for their consent to participate in the entire activities so that the partners would benefit from the activities carried out. Figure 1 is a documentation of partner activities when the team made observations at Wisma Gaharu.

Based on the results of the survey conducted by the team at the Wisma Gaharu plantation site, it is known that most employees did not meet K3 standards while gardening, which include: (1) Do not wearing boots when gardening; (2) Do not wearing gloves when using agricultural tools; (3) Do not wearing a mask when burning agarwood; (4) Do not use ladders when climbing the trees.

Figure 1 shows the daily activities of the partners at Wisma Gaharu. Here the partner did not wear protective shoes, he only wore flip flops when checking the agarwood seedlings. It also seen that there were no gloves used when checking the seeds. Figure 2 shows one of the partner's activities when checking the health condition of the agarwood plants through the plant stems. From the picture, it can be seen that the employees did not use gloves when carrying out activities in the garden. Employees only use a small knife to cut the agarwood bark to check the quality of the agarwood. On another occasion, employees also did not wear masks when burning garden waste that was cleaned. When checking the health of agarwood leaves on rather tall tree trunks, employees did not use ladders. This certainly endangers the safety of employees if they slip or when the employee loses his balance.



**Figure 1.** Partner activities at Wisma Gaharu  
**Figure 2.** The employee did not use gloves when gardening

### **Providing Understanding of Occupational Health and Safety (K3) Aspects**

There are many risks that must be faced by workers in the agricultural sector, be it safety, health, environmental, biological, and respiratory. Agricultural equipment as well as extensiveness of other supporting elements can be a cause of work accidents in the agricultural sector and several other factors. Therefore, on July 16 2022 the team visited Wisma Gaharu to provide understanding to employees at partner locations regarding aspects of Occupational Health and Safety (K3) during activities within Wisma Gaharu. Figure 3 is a documentation of discussion and understanding of K3 aspects with partners.



**Figure 3.** Discussion and understanding of K3 aspects

In this activity, there were several materials related to K3 that were delivered by the team to employees at Wisma Gaharu, such as the goals and benefits of maintaining K3, factors for accidents and health problems, the importance of K3, prevention of work accidents, control of work accident risks, and system for work safety management. Human behavior is one of the important elements in causing accidents. Therefore, an effective way to prevent work accidents is to avoid unsafe behavior. These issues were conveyed by the team to Wisma Gaharu employees. Unsafe actions or also known as unsafe actions are actions that can endanger both the worker himself and others. This may cause an accident. Examples of other unsafe actions that can cause accidents include not using personal protective equipment (PPE), not following work procedures, being careless or do not working carefully, do not following work safety regulations, etc. These were what the team conveyed to Wisma Gaharu employees, that is when we work carelessly, there will be one accident which results in a lost of one working day. In addition to delivering material through mini presentation, in this activity, the team also provided assistance on the practice of implementing K3 while working in the garden.

### **Providing Assistance with Agricultural Equipment Procurement, Assistance in the Use of Tools, and K3 Implementation Practices**

In increasing the productivity of the agarwood plants produced, it cannot be separated from the availability of adequate equipment to produce goods. On July 16-17 2022, the service provided assistance in the form of procuring several supporting equipment such as pruning shears, garden pruning shears, chainsaw adapters, hand grinders, dual mode sprayers (manual-and electric) and folding ladders as shown in Figure 4. Apart from procuring the agricultural tools, the team also provided training to partners regarding how to use these agricultural tools. The aim of this training is that the partners can directly apply the use of tools that can help seeding and nurseries in the field, which consequently can improve the quality of agricultural products at Wisma Gaharu.

After providing an understanding of the importance of K3 to employees at partner locations, the service team also assists partners to practice K3 implementation during their activities. The practice of implementing K3 was guided by Mrs. Eka Larasati Amalia as the head of the community service team, attended by members of the service team and seven employees at partner locations. Documentation of K3 implementation practices is shown in Figure 5. The following is an explanation of K3 discussion material with employees of Wisma Gaharu, Malang Regency.

In the application of K3 during activities in the garden, some of the material discussed were regarding the potential dangers of being bitten by venomous animals such as snakes, the potential dangers of exposure to hazardous chemicals when caring for plants such as ingestion, contact with the skin, and/or inhalation can cause irritation to the eyes, skin, and/or respiratory system. From what have been previously mentioned, employees were then assisted to mind map unsafe conditions and unsafe actions from the two potentials above by using the brainstorming idea method, therefore this was more likely on exploring and encouraging them to share the knowledge they have gained based on experience in the plantation.

From the mind map made by the employees, they were then invited to find solutions together based on their experiences in the field on how employees can work safely. To avoid stings from venomous animals such as snakes, for example, the employees concluded from their experience during their work, namely not to carry out activities that damage the habitat of these venomous animals, such as trampling or destroying their nests. Furthermore, if the employee has seen the movement of the snake, it is advisable to simply stay away and avoid it since it is important no to make the snake to feel threatened. It is important to be careful in every step and it is also important to always pay attention to our surroundings. Personal protective equipment (PPE) such as gloves, long-sleeved shirts, trousers, rubber boots and other PPE can help avoid the potential dangers of venomous animal stings.



Completing the partner satisfaction questionnaire was also carried out by employees who participate in a series of community service activities at Wisma Gaharu. The partner satisfaction questionnaire consisting of five statements was transformed into a Likert scale consisting of four interval scales, namely Strongly Agree (SS), Agree (S), Disagree (TS), and Strongly Disagree (STS). Furthermore, the Likert scale calculation is carried out using the percentage index as shown in Table 1.

**Table 1.** Likert scale percentage index

Percentage	Explanation
0% - 24.99%	Sangat Tidak Setuju
25% - 49.99%	Tidak Setuju
50% - 74.99%	Setuju
75% - 100%	Sangat Setuju

The results of the recapitulation of partner satisfaction questionnaires that have been filled out by seven employees at partner locations, including the owner of Wisma Gaharu, were calculated using the Likert scale percentage index in Table 1 for each statement submitted in the questionnaire. The results of the Likert scale percentage calculation are shown in Table 2.

**Table 2.** Results of the percentage calculation of the Likert scale of the partner satisfaction questionnaire

Sentences	Percentage	Explanation
The PPM activities carried out provide solutions to problems faced by partners	85.71	Strongly agree
Team members involved in PPM activities are active in providing assistance	85.71	Strongly agree
The frequency of assistance provided by the PPM team is felt to be appropriate	82.14	Strongly agree
There is an increase in independence or additional knowledge and skills of partners	89.29	Strongly agree
Overall partners feel satisfaction with the PPM activities that have been implemented	92.86	Strongly agree
<b>Average</b>	<b>87.14%</b>	Strongly agree

The calculation results of the Likert scale percentage on the partner satisfaction questionnaire in Table 2 show that Wisma Gaharu's partners stated that they strongly agreed with each statement submitted with a percentage value above 80% for each statement and an overall average value of 87.14% for the entire statement. The partners also separately stated that this service activity had an impact on increasing independence and increasing partner knowledge and skills.

#### **4. CONCLUSION AND RECOMMENDATIONS**

This community service activity has been carried out successfully and achieved its goals, namely increasing the knowledge and awareness of employees on the importance of K3 standards in order to maintain the safety and health of employees during activities in the garden. Through the provision of agricultural tools and training in the use of these agricultural tools, employees can improve their ability

to work to increase the productivity of agarwood plants. Employees are accustomed to using gloves while working, especially when using dangerous agricultural tools.

K3 aspects that must be considered by employees at Wisma Gaharu are basically not only related to work rules in using personal protective equipment while working, but physical and mental conditions of the employees should also be taken into consideration. Employees with poor physical and mental conditions due to fatigue will certainly affect their activity and productivity. Therefore, in subsequent community service activities, routine employee health checks can be carried out to maintain the physical stamina and health of the employees. In addition, consultation media provision for employees along with health institutions can also be carried out to overcome employee mental health problems such as low work motivation, unstable emotions, lack of discipline level, fragile personality, and the likes in order to avoid unwanted risks during employees work at Wisma Gaharu.

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