



## Capacity Building of Forest Local Community, Tree Seeds Providers and Forestry Extension Workers on Plus Tree Selection Technique in Kediri, East Java, Indonesia

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**Abstract.** Community forests play significant role in supplying national demand of woods, sustaining local ecosystem and increasing benefit for local community. Tree plantings for both community forests and rehabilitation of degraded forests and lands, however often neglect utilization of good quality seeds, which resulted in low quality of forest plantation. In order to support the procurement of good quality seeds, it is necessary to raise awareness of local community, seeds providers and forest extension workers on the production of good quality seeds through tree selection program. This paper reported the activity to build the capacity of local community, seeds providers and forest extension workers on plus trees selection, as sources of good quality seeds production. The training activity took place two times at Ngancar Village, Kediri Regency, East Java. The participants in each training received lectures in a classroom and hand-in practical work on tree selection techniques in the field. The topics given are considered as important by participants, as evident from the increasing number of participants in the second time of training. Analysis of pre- and post-test conducted showed that the participants knowledge and skill increased by 27,9 % after training, regardless of their ages and educational backgrounds.

**Keyword:** Community Forests, Plus Trees, Selection, Seed Source

**Abstrak.** Hutan rakyat memainkan peran penting dalam memasok kebutuhan kayu nasional, mempertahankan ekosistem lokal dan meningkatkan manfaat bagi masyarakat lokal. Penanaman pohon baik untuk hutan rakyat maupun rehabilitasi hutan dan lahan yang terdegradasi, seringkali tidak menggunakan benih berkualitas baik, sehingga mengakibatkan rendahnya kualitas hutan tanaman yang terbentuk. Guna mendukung pengadaan bibit yang berkualitas perlu dilakukan sosialisasi kepada masyarakat sekitar, penyedia bibit dan penyuluh kehutanan tentang produksi bibit yang berkualitas melalui

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*program seleksi pohon. Makalah ini melaporkan peningkatan pengetahuan masyarakat lokal, penyedia benih dan penyuluh kehutanan tentang pemilihan pohon plus, sebagai sumber produksi benih berkualitas. Kegiatan pelatihan berlangsung dua kali di Desa Ngancar, Kabupaten Kediri, Jawa Timur. Para peserta dalam setiap pelatihan mendapatkan kuliah di ruang kelas dan praktek langsung tentang teknik pemilihan pohon di lapangan. Topik-topik yang diberikan dianggap penting oleh peserta, terbukti dari peningkatan jumlah peserta pada kegiatan pelatihan kedua. Analisis pre- dan post-test yang dilakukan menunjukkan bahwa pengetahuan dan keterampilan peserta meningkat sebesar 27,9% setelah pelatihan, terlepas dari usia dan latar belakang pendidikan mereka.*

**Kata Kunci:** Masyarakat Desa Hutan, Pohon Plus, Seleksi, Sumber Benih

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## 1. Introduction

Community forest is a forest which planted and maintained by local community on privately owned or customary land, and has a minimum area of 0.25 hectares with a 50% canopy cover of the woody or other types of trees (Ministry of Environment and Forestry Decree 1997). Development of community forests has recently been enhanced by the GOI thru Decree No 23, year 2021 on Social Forestry. Community forests has historically sustained agriculture, served as an environmental buffer, protected ecological stability, and regulated regional water supply [1]. Recently community forests are developed to increase the socio-economy or community welfare in rural areas and supply the demand for industrial raw materials [2]. Current sengon log production in Indonesia is 5,47 million m<sup>3</sup> (9,44% total log production) (BPS 2020).

Sengon, mahogany, acacia, teak, and African wood are among the plant species that are frequently chosen to be grown in the community forest [3]. Among those species Sengon (*Falcataria moluccana*) is preferred by community due to its ability to grow on all types of soil, short harvest life, and economic significance [4]-[6]. National Forest Estate (Perum Perhutani) cultivates sengon especially in Kediri Regency, East Java and engages local community in their plantation activities. As Kediri Regency is center of sengon plantation, this area has become center of pandemic of Bektor stem borer pest and gall rust disease. Attacks of boktor pest and gall rust disease are the main problem of sengon plantation throughout Java Island, even Indonesia. Efforts to control the pest and disease has been done using various methods, however it was not effective and efficient.

Although sengon cultivation by both the estate and local community started long time ago and expands to many locations throughout Indonesia, utilization of good quality seeds and seedlings is still rare. To save money, farmers typically use their own seeds or obtain them from natural saplings that are readily available on their land or elsewhere [7]. Utilization of uncertified and low-quality seeds or seedlings for plantation has probably become the reason why the pest and disease remain uncontrolled in the sengon population throughout Jawa. The loss due to pest and disease reportedly could reach 70% [8].

High-quality seeds and seedlings can be obtained from selected seed sources. Sources of seeds are forest stands, either natural or plantation forests that have been specifically identified, selected or established and managed to produce seeds [9]. Seed sources, especially seed orchards are usually developed by tree improvement or selection program. The first step in tree improvement program is selection of a superior or plus tree, which is a tree that phenotypically shows greater growth performance than the average growth in terms of growth pace, shape, qualities, and properties of the wood. As the plus trees usually outperform the surrounding trees they can be used as mother trees to established seed orchards. Considerable genetic variations must be kept in mind when selecting plus trees and determining their numbers for improvement base populations. Tree improvement program of certain tree species can be a collaboration between communities or agencies that have plus trees. The composite, good quality seeds resulted from these collaborations can be distributed back to the community or parties who need them.

The process of selecting plus trees involves identifying and evaluating phenotypes of several individual trees that are qualified to be plus trees. The observations include a complete set of specific details about an individual tree, such as wood properties, the time of fruiting and flowering, also resistant or susceptibility to a pest and disease, depending on the objectives of the improvement program. As tree improvement is a very specific topics and relatively new to forestry sector in Indonesia, common people are rarely has the appropriate knowledge on it. This paper reports the activity of community service, in the form of capacity building directed to local forest community in Ngancar Village, Ngancar District, Kediri Regency, also local seeds providers and forest extension workers from East Java Province on techniques of plus tree selection as important aspect for producing and distribution of good quality tree seeds.

## **2. Methods**

### **2.1 Location, Date, and Trainees**

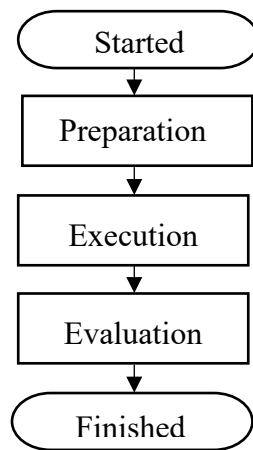
This capacity building was held in Ngancar Village, Ngancar District, Kediri Regency, East Java Province in June 2022 and October 2022. The activity is part of community service activity by IPB University called “Dosen Pulang Kampung” which was funded by the university, and involving a team of three lecturers from the Department of Silviculture, Faculty of Forestry and Environment, IPB University. The partner institutions involved in this activity were National Forest Estate (Perum Perhutani), Management Unit (KPH) Kediri and Task Force Unit for Forest Tree Seeds (UPT Perbenihan) of East Java Forestry Service (Dinas Kehutanan Propinsi Jawa Timur). The participants of the trainings composed of members of local forest community (LMDH) from Ngancar Village, who involved in a collaborative forest management with Perum Perhutani, private seeds providers from East Java Province, and forest extension workers under Dinas Kehutanan Propinsi Jawa Timur.

## 2.2 Tools and Materials

Before the training a Training Module on Plus Tree Selection was developed and used as reference and guide for practical work in the field. During lecture in a classroom, a power-point presentation was given to the participants. Other tools for tree phenotypic measurements were used, such as stationary, Hagameters, measuring tapes, and tally sheets. Questioners, problems for pre- and post-test were also used to measure knowledge of participants before and after the trainings.

## 2.3 The Phase of Implementation

The implementation of capacity building consists of three steps as shown in Figure 1, i.e. preparation, execution and evaluation phase (Figure 1).



**Figure 1.** Flow chart of training activities on plus tree selection

### 2.3.1 Preparation

Preparation begin with a meeting to discuss the topics covered, schedule, coordination between team and partners, arranging the tools, and distribute the task for each member. This preparation are followed by permit application, prepared training modules, questionnaires, pre-test and post-test documents.

### 2.3.2 Implementation

The training activity on plus tree selection was held twice, i.e on June 14–15, 2022, at Damarmas Restaurant and Hotel and on October 6-7 2022 at Meeting Hall of Lembah Kelud Villa and Glamping Resort, both venues were at Ngancar Village, Kediri Regency, East Java Province. The topic was delivered in two stages, i.e classroom explanation and practical work in the field, using available forest tree stands in or nearby the venue. Before starting the class, participants were asked to filled out a pre-test and questionnaires. The pre-test and questionnaires contain basic

knowledge and glossaries usually found in tree improvement program, especially plus tree selection.

After classroom explanation the participants were separated into several groups and given Modul on Plus Tree Selection and tally sheet for practical work. Each group of participants would select a forest stand and at least six candidates of plus trees and taking the phenotypes measurements. The tree phenotypes observed included tree height, diameter, stem straightness, clear bole height, degree on pest and disease attacks. In the first training venue, the forest stands for practical work was belonged to Perum Perhutani KPH Kediri. In the second venue, the forest stands belonged to the Glamping Resort. After taking all the measurements in the field, participants were back to classroom to calculate and analyze the data, and eventually determine the plus tree from the candidates observed. Finally, one representative from each participants group presented the result in front of the classroom. Before finishing the training, all participants were asked to fill-out the post-test. The socialization and training program used interactive approach, where participants were given the opportunity to share their experiences and ask or discuss about the theory that has been given with a pleasant discussion atmosphere. According to [10], presenting interactive theory could improve audience understanding.

The practical knowledges given in this training include: determining crucial characters for selection; selecting nine candidate trees; how to use a Haga Altimeter; how to measure the height and diameter of the candidate trees; and scoring them as plus tree candidates and eventually determine and select the plus tree. The training should be implemented following the prepared theory.

### 2.3.3 Evaluation Stage

The success of this program is known by doing an evaluation. Pre-test and post-test questionnaires were given to participants as part of the evaluation process. A questionnaire containing related knowledge of plus tree selection, both the pre-test and post-test contain 10 questions. Processing the percentage of the questionnaire was as follows:

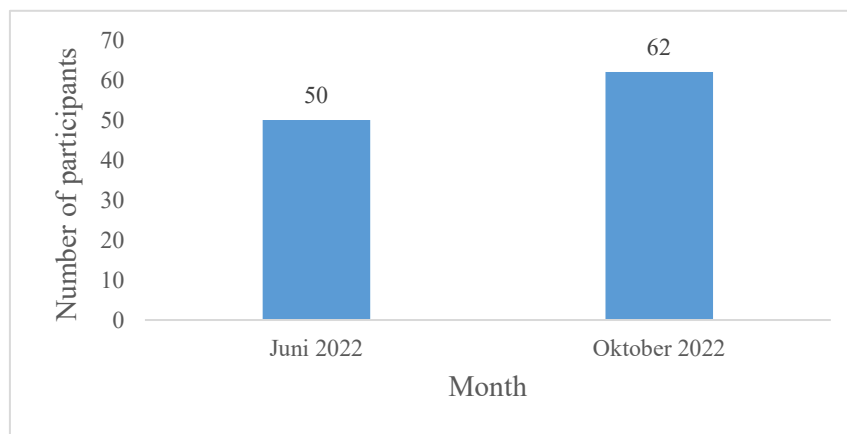
$$\% \text{ evaluation} = \frac{\text{amount of assesment}}{\text{amount of participants}} \times 100\%$$

To ascertain the impact of socialization and training on plus tree selection on participants, the assessment percentages from the pre-test and post-test were compared.

### 3. Result and Discussion

#### 3.1 Training Partner Support

All partners including the LMDH members, Officers from Perum Perhutani KPH Kediri, and the Local Government Officers, showed high interest and very supportive towards the program. The positive welcome and willingness of the partners to participate in the process of coordination, preparation, and implementation revealed their enthusiasm. The enthusiasm is also shown in Figure 2, where the number of participants increased in the second training program from 50 on June to 62 on October 2022.

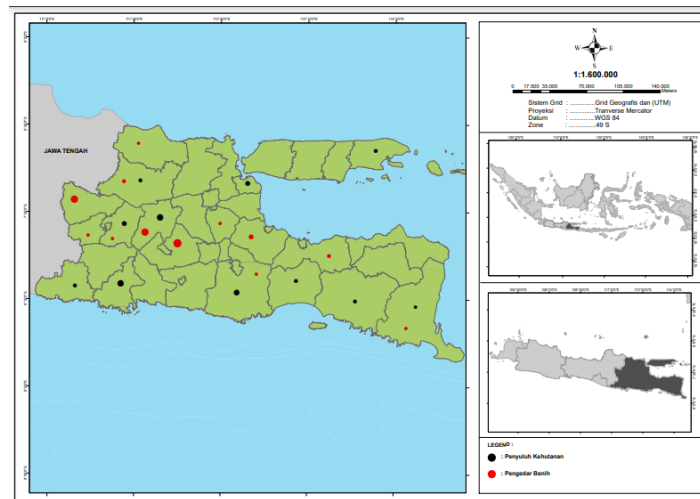


**Figure 2.** The number of participants attended the training in June and October 2022

Most participants, especially from forest extension workers stated that the topics in very important in supporting the campaign for utilization of good quality and certified seeds in any tree plantation activity, to ensure the success of the plantations.

#### 3.2 Distribution of the Origin of the Training Participants

In the first training program held on 14–15 June, 2022 there were totally 50 participants, which consisted of members of local forest community (LMDH) with some officers from Perum Perhutani KPH Kediri, also few seeds providers and forest extension workers attended the training activity. In the second training activity held on 6-7 October, 2022 total attendance were 62 (Figure 2) consisted of mainly forest extension workers, i.e 33 participants on the first day and seeds providers of 29 participants on the second day. Although most participants were coming from nearby Kediri Regency, however as shown in Figure 3 the distribution of participants is encompassing the whole area of East Java Province.



**Figure 3.** Participant distribution map

Having participants that coming from all over places in East Java Province were possible because unlike the members of LMDH, which concentrated in Kediri Regency, most forest extension workers and seeds providers are stationed throughout East Java Province. This situation also gave added positive impact of the training, that although the training was held only twice, in one same Kediri Regency, the awareness might have reach out farther encompassing whole East Java Province. Figure 4 shows the condition of classroom lecture, where the theoretical aspect of tree improvement was delivered to the participants.

The theory given included understanding of genetics and environmental components that affected a tree performance or tree phenotypes, how to get information on genetic factors from genetic testing, the meaning of selection in term of alleles frequency and criteria of plus tree. Several examples of successful tree improvement program in several forest companies in Indonesia with the genetic gains were given as an illustration [11].



**Figure 4.** Presenting theory on training plus tree selection

After understanding the theoretical aspect of tree improvement program in the classroom, the participants continued their training by participated in intensive practical work (Figure 5). Most tree improvement program have objective to increase the productivity of the forest plantations through genetic gains. However, in the future there might be other specific objective in certain

tree improvement program, such as obtaining certain non-timber forest product (NTFP), secondary metabolites, or for adaptation in certain harsh environment. Tree improvement program to increase the production of non-timber forest products have been applied to pine to increase sap production [12], while to improve adaptation to drought has been tested on several nyamplung plant provenans [13]. In the practical work the measurements of phenotypes were mostly quantitative characters related to wood production, such as diameter at breast height, total height, branch-free height, volume, and pest attack/diseases. After selecting a tree plot, 9 plus tree candidates that are near to one another and have the best appearance in terms of the predetermined key characteristics or qualities were chosen. After that, measurements were done for each plus tree candidate's characters or qualities and recording the measurements on a tally sheet.



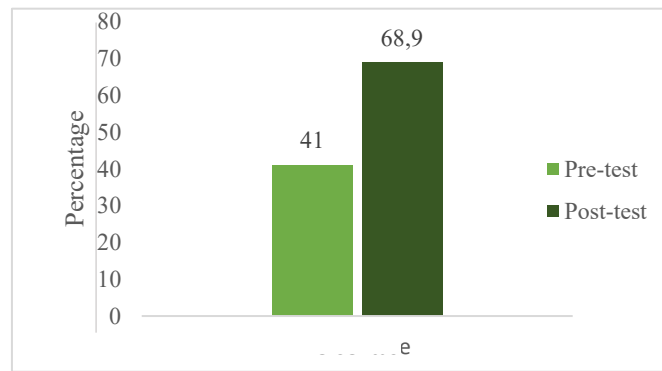
**Figure 5.** Practical work on plus tree selection activity in the field

The next step is to carry out the scoring of characters that have been evaluated among 9 candidate trees. Scoring on plants is intended to obtain data on the total value of all parameters measured in each individual. Each parameter that is measured has a certain score. The maximum total score is 90 points. The scoring is carried out together with the facilitator so that the trainees can directly ask questions when finding difficulties (Figure 5).

### 3.3 Training Impact Analysis

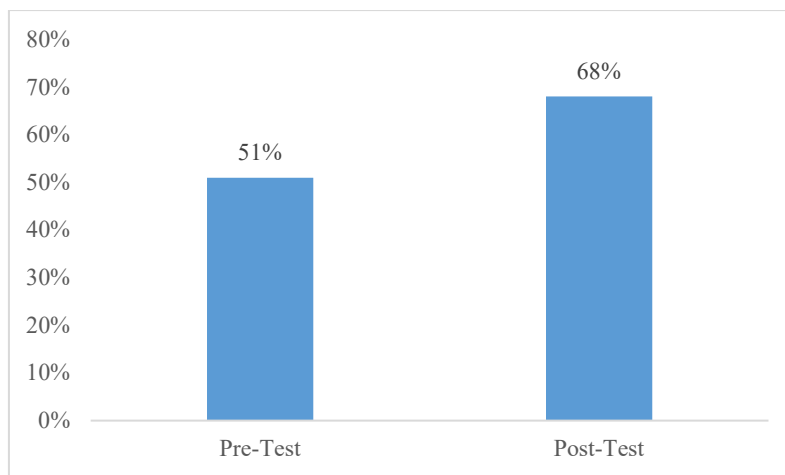
Participants are looking forward to taking part in training exercises that include the methods and phases of accurately selecting plus trees. The pre-and post-test results of the socialization and training on plus tree selection for all participants showed an enhancement in LMDH members' knowledge of the previously presented theory. It can be seen from Figure 6 that shows the increase of score percentage to 27,9 %.





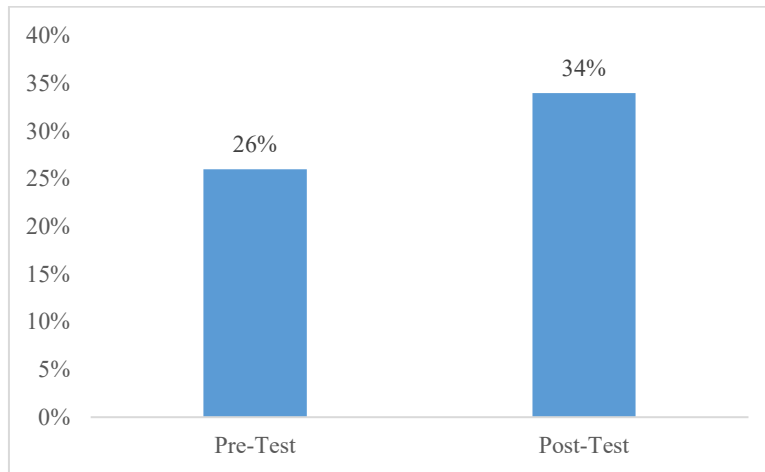
**Figure 6.** Percentage of participants’ pre-test and post-test score on day one

The impact of training activities to participants on October 2022 can be seen from Figure 7. Figure 7 shows participant knowledge increase by 17% after the training. The pre-test result that reach 51% shows that participant had adequate basic knowledge about tree selection and could perform selection plus trees to get superior seed sources. After the training, the percentage of participant knowledge increase to 68%.



**Figure 7.** Percentage of participants’ pre-test and post-test score on day one

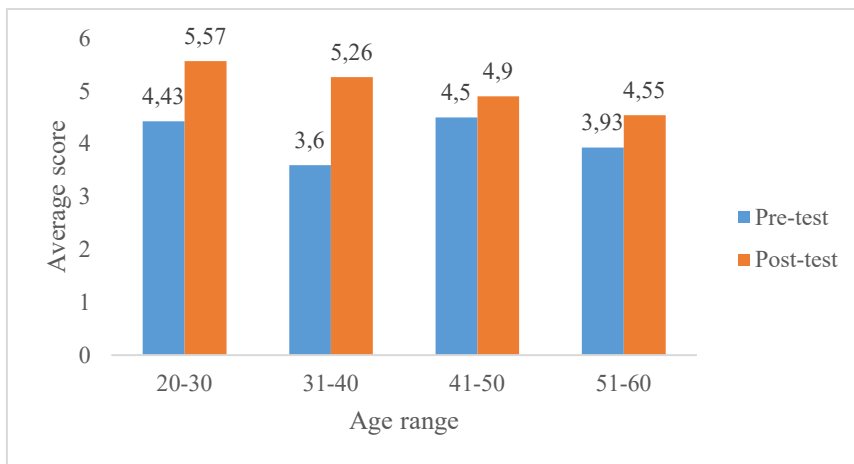
Participant on the second day also increasing in knowledge about plus tree selection. Figure 8 shows that their percentage of pre-test score that is 26% increase to 34% on their post-test score. It means that participant on the second day had their knowledge increase for 8%.



**Figure 8.** Percentage of participants’ pre-test and post-test score on day two

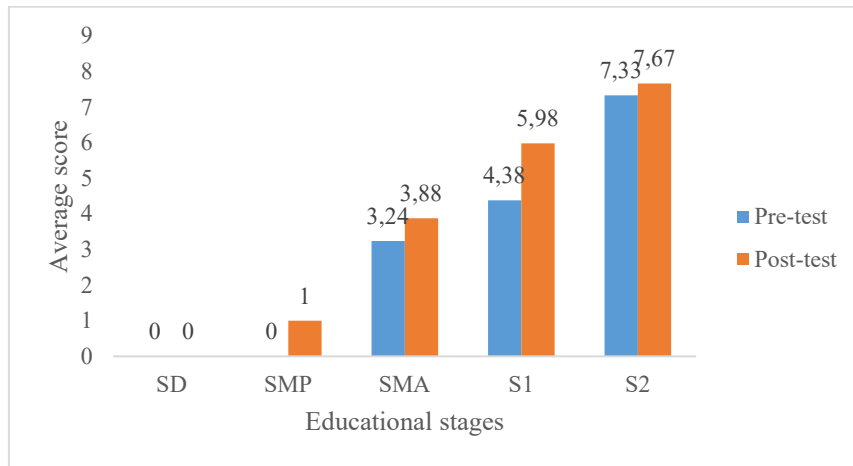
**3.4 Effect of participants background on the increment of knowledge**

Plus tree selection training participant has diverse age and background, therefore knowledge improvement could be categorized in different age and educational stage. Figure 9 shows average score of pre-test and post-test based on four age range. Training participant from all of age range has their knowledge increase, it marked by the percentage of post-test scores that are higher than pre-test scores. However, these increments are diverse between each age range. Participant with age between 31 to 40 years old has highest score increment that is 1.66 point.



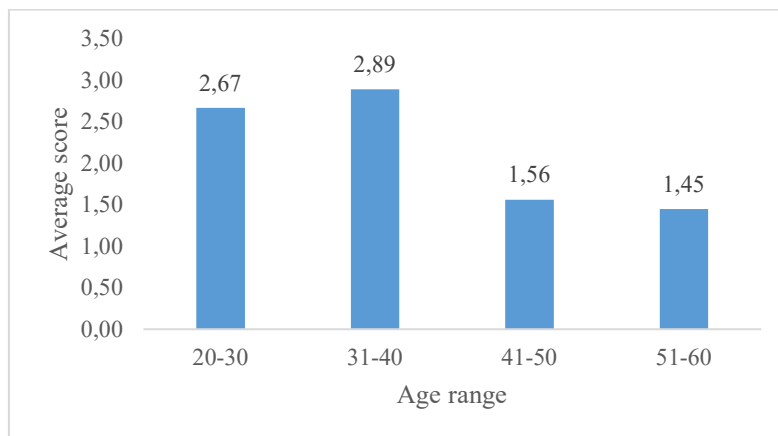
**Figure 9.** Average score based on participants’ age range

On educational stage category, average score increase in every educational stage except on elementary stage. Figure 10 shows that highest average score increase for 1.6 point on undergraduate degree, while 0.34 on master degree.



**Figure 10.** Average score based on participants’ educational stage

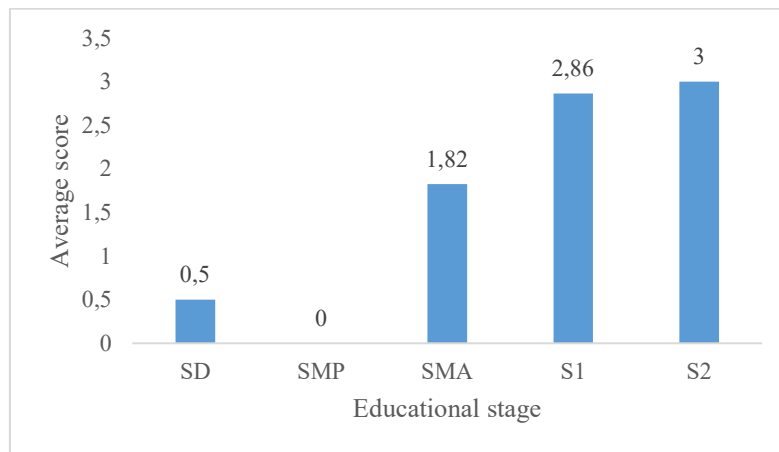
Competence test were given to the participants to know their capability and knowledge improvement after the training. The results categorized in two groups, age range and educational stages.



**Figure 11.** Average competence test score based on participants age range

Figure 11 shows participants on age between 31 and 40 years old have the highest average score, which is 2.89 point. Meanwhile participants on age between 51 and 60 years old have the lowest average score, which is 1.45.

Competence test result based on educational stages shows by Figure 12. The highest average score is 3 point that come from participants who graduated from master degree, while the lowest average score is 0 point from middle school graduate participants.



**Figure 12.** Average competence test score based on participants educational stages

From all the results it was clear that explanation on certain topics can greatly enhanced perception and knowledge increase in a training program. Explanation of a theory, followed by a practical work enhance the success of certain training. Then a live presentation or direct practice with the training participants is the best method. The practical-based direct learning model affects understanding knowledge and improving skills related to technical matters [14].

### 3.5 Impact and Sustainability Efforts

Extension activities that employ presentation, discussion, and demonstration techniques can improve LMDH members' skills in how to select the plus tree. All participants expressed their appreciation of the program and hoped that it continued. The expected sustainability of the program is assistance in the selection of plus trees until participants have their seed sources.

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