Quest Journals
Journal of Research in Agriculture and Animal Science
Volume 11 ~ Issue 11 (2024) pp: 08-17
ISSN(Online) : 2321-9459
www.questjournals.org

Research Paper

The Quality of Tree Seedlings in The Nursery Owned by PT Bukit Asam, Tarahan Port Unit, Bandar Lampung City, Lampung Province, Indonesia

RizkyLazuardi Santoso[1], Indriyanto[1*], Ceng Asmarahman[1]
[1]*Department of Forestry, Faculty of Agriculture, Universitas Lampung, Indonesia*
[*]*Corresponding Author*

ABSTRACT
Rehabilitation of post-coal mining land and other land that has been used as a site for a series of mining activities requires seedlings of adequate quantity and quality. Therefore, research on the quality of tree seedlings in the nursery owned by PT Bukit Asam was carried out to determine the physical-physiological condition and classification of the quality of the seedlings. Observations were made on 10 sample seedlings which taken randomly from each tree species. The data collected consists of tree species, seedling height, stem diameter, straightness of the stem, length of the woody stem, number of leaves and/or live crown ratio, compactness of the growing medium, and health condition of the seedling. The seedling quality analysis was carried out based on the criteria that listed in the Indonesian National Standards (INS). The results of the research show that tree species which its seedling meet the standard criteria for normal seedlings are 11 species or 68.75% of all trees species. There are no species of tree seedlings in the first quality category (F). There are 6 species of tree seedlings in the second quality category (S) or 37.50% of the total number of trees species. There are 5 species of non-quality tree seedlings or 31.25% of the total number of trees species. Meanwhile, there are 5 species of tree seedlings which quality criteria are not listed in INS.
Keywords: *Nursery, Seedling quality, Tree seedling*

***R**eceived 13 Nov., 2024; **R**evised 25 Nov., 2024; **A**ccepted 27 Nov., 2024 © The author(s) 2024.*
P**ublished with open access at **www.questjournals.org

I. INTRODUCTION

The Importance of Land Rehabilitation

Indonesia has natural mining resources such as minerals and coal. The potential for coal in Indonesia approximately 31,695.63 million tons (Kementerian Energi dan Sumber Daya Mineral, 2022), thus opening up opportunities for the establishment of a mining industry. One of the state-owned companies in Lampung Province, Indonesia which is active in the coal mining industry is the Limited Liability Company Bukit AsamTbk.

The operation of the coal mining industry has both positive and negative impacts.The positive impact of the mining industry are to increase the country's foreign exchange and open up employment opportunities.Meanwhile, the negative impact of mining activities are the emergence of environmental problems such as water pollution, air pollution, and land damage at the mining site and its surroundings. Fitriyanti (2016) stated that the mining process can cause a decrease in the quality of soil, water, and air, as well as threaten the stability of biodiversity due to habitat destruction and loss of vegetation cover. In addition, the mining activities cause damage to the soil profile due to dredging, filling, and compaction. This results in an imperfect structure of the soil horizon and worsens the water system and soil aeration. Poor soil conditions have a negative effect on the growth and development of young plants (Sittadewi, 2019).

The deteriorating land conditions, both physical, chemical, and biological properties that occurs on post-mining land indicates land degradation (Dewi & Ulfa,2023). Furthermore, Dewi & Ulfa(2023)stated that the process of post-mining land degradation and other operational areas related to mining industry activities can be controlled with rehabilitation efforts. Land rehabilitation can be done by planting trees (Sittadewi, 2019). Tree planting is one of the vegetative techniques that used as efforts to rehabilitate damaged land. The aim of trees planting is to improve unstable and unproductive land, reduce erosion, and in the long term it is hoped that it can improve the microclimate, restore biodiversity, and increase land productivity (Wasis & Fatimah, 2010).

The Need for Quality Tree Seedlings

The achievement of planting goals is influenced by many factors, among the important factor that influences the achievement of tree planting goals are the availability of seedlings in sufficient quantities and of adequate quality (Indriyanto, 2022). Munir & Setyowati(2017)stated that trees planting requires tree seedlings which are able to grow well.Likewise, the success of post-mining land rehabilitation activities are greatly influenced by the availability of seedlings in sufficient quantities and of adequate quality (Nurhasybi et al., 2019).

According to Indriyanto (2010), land rehabilitation can be successful if it uses tree species which ecological needs are the same as the ecological conditions of the land. One of the criteria for selecting tree species for post-mining land is pioneer tree species (Setyowati et al., 2017). Pioneer tree species are local tree species that live easily, are able to adapt to new environments, grow and reproduce quickly, and have strong roots (Indriyanto, 2017) . These trees can function to create good microclimatic conditions on post-mining land (Sittadewi, 2019). In addition to choosing the right tree species, that the success of land rehabilitation are influenced by the availability of sufficient and high quality seedlings. Land rehabilitation often fails due to the limited supply of seedlings and the low quality of the tree seedlings used (Yustika et al., 2022).

Quality seedlings are seedlings that have advantages in terms of genetics and physical-physiology (Indriyanto, 2010). The use of quality seedlings have an impact on many things. Quality seedlings greatly determine the success of planting (Irmayanti et al., 2020). Quality seedlings will easily adapt in the field so that their physiological processes run well, their growth is normal, and their vitality is high (Masilewi et al. 2022).The success of planting is closely related to the quality of the seedlings and timeliness of planting (Azham et al., 2024).Doni et al. (2023)stated that high quality of seedlings will be able to survive in various locations of planting environments and grow quickly.Nurhasybi et al. (2019)stated that quality seeds have high adaptability in the planting area, so that initial growth in the field will be good. Apart from that, the physiognomy condition of the trees in the planting area looks good if the seeds planted are of high quality (Yustika et al., 2022).

The quality tree seedlings have perfect growth criteria, including have a single and straight stem, being in a healthy condition or not attacked by pests and diseases, have a woody stem that is at least 50% long, > 20 cm in high, > 2 mm in stem diameter, the growth medium is intact/compact , number of leaves > 3 or LCR > 30%, and age 3-12 months (Badan Standarisasi Nasional, 2018; Indriyanto & Asmarahman, 2020).Tree seedlings with these quality criteria have resistance to various tree-damaging factors (Indriyanto, 2022), so their survival rate is very high. Then, the quality of tree growth in the planting area can be guaranteed to be better if high quality seedlings are used (Indriyanto, 2020).

Limited Liability Company Bukit AsamTbkTarahan Port Unit, Indonesia has attempted to build a nursery as an effort to provide tree seedlings for post-mining land rehabilitation and other land used as a place for mining industrial processes. The quality of the seedlings produced in the nursery needs to be known in order to support the success of tree planting in the land rehabilitation program. Therefore, research was carried out to determine the physical-physiological conditions and quality classification of seedlings produced in the PT Bukit Asam Unit Tarahan Port nursery.

II. METHODS

Research Location

The research was carried out for 3 months, namely from March until May 2024. The research location was at the nursery of PT Bukit AsamTarahan Port Unit, Bandar Lampung City, Lampung Province, Indonesia (Figure 1).

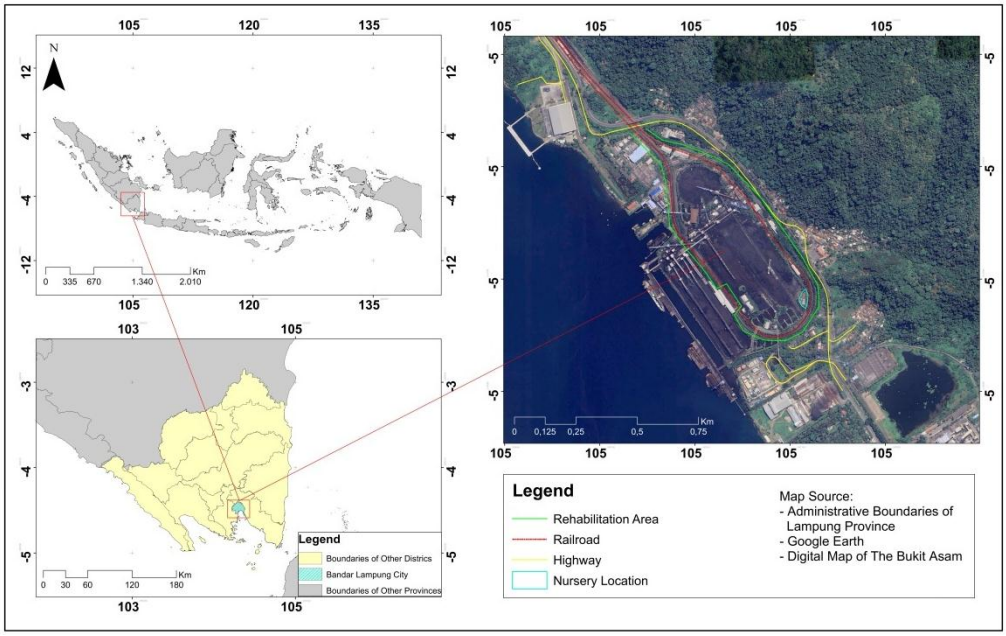

Figure 1. Map of research locations at the nursery owned by PT Bukit AsamTarahan Port Unit nursery, Bandar Lampung City, Lampung Province, Indonesia.

The materials used for the roof or shade of the nursery are UV (ultra violet) plastic and paranet with an intensity of 50%. The average daily intensity of solar radiation in the nursery area is 40,802.5 lux, the average air temperature is 27.5^{o} C, and the air humidity is 85.3%.

The nursery owned by PT Bukit Asam, Tarahan Port Unit have a land area of 288 m^2 with a capacity of 5,000 seedlings. When the research was carried out, the total number of seedlings in the nursery was 1,704 seedlings, consisting of tree seedlings, ornamental plants, and bamboo seedlings. The number of tree seedlings were 1,284 seedlings.

Equipment

The equipment used for this research consists of caliper, ruler, measuring tapes, a thermohygrometer, a lux meter, a writing board, ballpoint pens, camera, and tally sheets.

Data Acquisition

The data were collected includes tree species, seedlings height, stem diameter, stem straightness, woody stem length, number of leaves and/or LCR (live crown ratio), compactness of the growing medium, health condition of the seedlings, and age of the seedlings. The data was acquisition through direct observation of sample seedlings. The number of samples was taken randomly as many as 10 seedlings. Determination of the number of sample seedlings was guided by the Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standards 8420: 2018.

Table 1. Determination of the number of sample seedlings for observation the physical-physiological condition variables of the tree seedlings

Number	Total number of seedlings was observed (individual)	Number of sample seedlings (individual)
1.	<1,000	10
2.	1,000 until <10,000	100
3.	10,000 until <50,000	200
4.	50,000 until <100,000	500
5.	100,000 until <1,000,000	1,000
6.	≥1,000,000	2,000

Source:Badan Standardisasi Nasional (2018) ; Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial (2009)

Analysis of Data

1. Physical-physiological Conditions of Seedlings

General requirements for the physical-physiological quality of seedlings include: the number of stem seedlings, the straightness of the stems, the health condition, and the percentage of woody stem length from the

total height of the seedlings. Seedlings that meet these general requirements are then verified for the special condition variables for the physical-physiological quality of the tree seedlings, which include seedling height, stem diameter, compactness of the growing medium, number of leaves, LCR (live crown ratio), and age of the seedlings. Then, the data was analyzed according to the seedlings quality variables based on the formulas contained in the Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standards 8420.

Seedlings that meet the general physical-physiological quality requirements are called normal seeds, while seedlings that do not meet the general requirements for quality seedlings are called abnormal seedlings (Indriyanto, 2022). The criteria for normal seedlings are seedlings that have a single stem or unbranched stem, upright and straight stems, are healthy or not attacked by pests and diseases, normal leaf color, and a woody stem length percentage of 50% of the total height of the seedling (Badan Standardisasi Nasional, 2018). The percentage of normal seedlings number was calculated as follows (Badan Standardisasi Nasional, 2018).

$$\text{Percentage of normal seedling number} = \frac{\text{the number of normal seedling}}{\text{the number of sample seedling}} \times 100\% \quad (1)$$

The special condition variables for the physical-physiological quality of seeds are analyzed using the following formulas (Badan Standardisasi Nasional, 2018).

a. Percentage of seedlings number which height meets the standard (BST).

$$\text{BST} = \frac{\text{the number of seedling which height meets the standards}}{\text{the number of sample seedling}} \times 100\% \quad (2)$$

b. Percentage of seedlings number which stem diameter meets the standard (BSD).

$$\text{BSD} = \frac{\text{the number of seedling which stem diameter meets standards}}{\text{the number of sample seedling}} \times 100\% \quad (3)$$

c. Percentage of seedlings number which growth medium is compact or intact (BMK)

$$\text{BMK} = \frac{\text{the number of seedlings which growth is compact}}{\text{the number of sample seedling}} \times 100\% \quad (4)$$

d. Percentage of seedlings number which leaf amount or LCR meets the standard (BSJD).

$$\text{BSJD} = \frac{\text{the number of seedlings which leaf amount or LCR meets standards}}{\text{the number of sample seedling}} \times 100\% (5)$$

e. Average percentage of seedlings for each tree species that meets special requirements (RPK).

$$\text{RPK} = \frac{\text{BST+BSD+BMK+BSJD}}{4} \quad (6)$$

2. Quality of Forest Plant Seedlings

The quality standards for forest plant seedlings in Indonesia were grouped into three classes, namely first quality, second quality, and rejected (do not meet the first quality or second quality) (Badan Standardisasi Nasional, 2018). The first quality is forest plant seedlings that meet general requirements with a quantity percentage > 95% and meet special requirements with a quantity percentage > 90%. The second quality is forest plant seedlings that meet general requirements with a total percentage of 75 – 95%, and meet special requirements with a total percentage of 70 – 90%. Rejected seedling are seedlings that are not included in the first or second quality class because the percentage of the number of seedlings that meet the general requirements is <75% and the percentage of the number of seedlings that meet the special requirements is <70%. Rejected seedlings cannot be issued seedling quality certificates by the Forest Plant Seed Center or by the Certification Institute under the Directorate General of Land Rehabilitation and Social Forestry (Indriyanto, 2022).

III. RESULT AND DISCUSSION

The seedling on the nursery owned by PT Bukit Asam, Tarahan Port Unit include 16 species of tree species seedlings. The results of this research show that there were various physical-physiological conditions of tree seedlings. The percentage of normal seedlings for each tree species was presented in Table 2.

Table 2. Percentage of normal seedlings number or seedlings that meet general requirements for seedling quality

Number	Tree species		The number of sample seedling (individual)	The number of normal seedling (individual)	The percentage of normal seedling number (%)
	Local name in Indonesia	Botanical name			
1.	Cemara kipas	*Thujaoccidentalis*	10	6	60
2.	Cemara laut	*Casuarinaequisetifolia*	10	9	90
3.	Damar	*Agathisloranthifolia*	10	9	90
4.	Eboni	*Diospyroscelebica*	10	7	70
5.	Glodokan tiang	*Polyalthiapendula*	10	9	90
6.	Kemiri	*Aleuritesmoluccana*	10	9	90
7.	Ketapang kencana	*Terminaliamantaly*	10	7	70
8.	Ketapang pantai	*Terminaliacatappa*	10	0	0
9.	Mahoni	*Swieteniamacrophylla*	10	8	80
10.	Pulai	*Alstoniascholaris*	10	7	70
11.	Tanjung	*Mimusops elengi*	10	8	80
12.	Alpukat	*Persea americana*	10	9	90
13.	Durian	*Durio zibethinus*	10	8	80
14,	Pala	*Myristica fragrans*	10	8	80
15.	Pucuk merah	*Eugenia oleana*	10	8	80
16.	Tabebuya ungu	*Tabebuiachrysotrichus*	10	9	90

Based on Table 2, the percentage of normal seedlings for each tree species varies from 0% to 90%. There are 11 trees species (68.75%) of the 16 trees species in the nursery that are categorized as normal seedlings, while 5 trees species (31.25%) are categorized as abnormal seedlings. As stated above, normal seedlings are seedlings that have single and straight stems, woody stems that are ≥ 50% of the seedling height, and in a good health (Indriyanto, 2022). Normal seedlings that have reached the age of more than 3 months are generally suitable for planting in the planting area. Insusanty& Ikhwan(2022) stated that tree seedlings are suitable for planting if their stems are woody, single and sturdy, in healthy condition, the growing medium is compact, and the height and diameter of the trunk are sufficient.

The physiognomy of a normal seedling that has a single stem and straight stem can be seen in Figure 2.

Figure 2. Physiognomy of nutmeg (*Myristicafragrans*) seedlings as normal seedlings with single and straight stems.

The health condition of the seedlings is a condition that affects the quality of the seedlings. Healthy seedlings mean seedlings that are not attacked by pests or diseases. Pest and disease attacks must be prevented and controlled properly so as not to disrupt the growth of the seedlings. Quick prevention and control of pests and diseases can avoid the spread and occurrence of serious attacks (Pramono et al., 2016). An overview of the condition of healthy and unhealthy seedlings are presented in Figure 3.

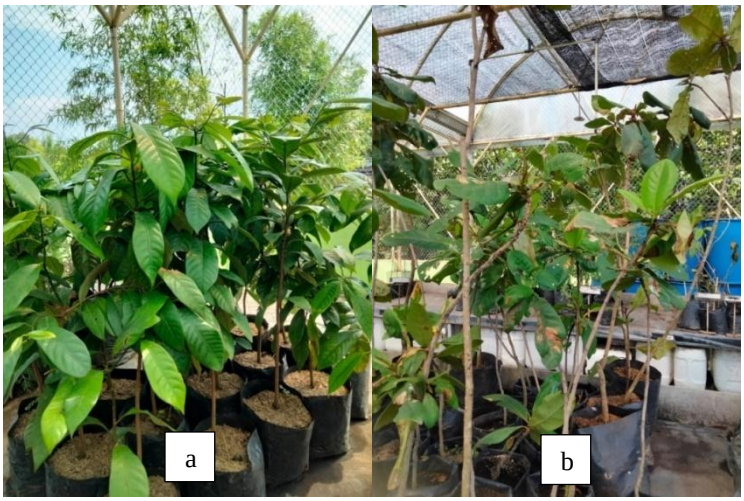

Figure 3. Health condition of the seedlings, (a) nutmeg (*Myristicafragrans*) seedlings look healthy, (b) catappa (*Terminaliacatappa*) seedlings look unhealthy.

Seedlings that physically appear to have woody stems indicate good physiological quality of seedling growth. Seedling stems are woody, meaning lignification goes hand in hand with the seedling growth process (Indriyanto, 2022). Lignification of the stem has a positive effect on the body strength of the seedlings which increases the survival of the seedlings in the planting area (Yustika et al., 2022).. The woody stem of a seedling is a component that determines the quality of the seedling and/or the readiness of the seedling for planting. According to Wawo et al. (2018), the criteria for seedlings ready to be planted in the planting area include seedling height of 80-100 cm, age of approximately 8-10 months, the stem is woody with a diameter at the base of the seedling of approximately 1 cm. Then, Wawo & Utami(2012) stated that planting trees requires quality seedlings with criteria including originating from quality trees, free from pests and diseases, able to adapt to environmental conditions, able to grow quickly, and produce sapwood.

Specific requirements for each seedling of forest plant species have been stipulated in the Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standards 8420. However, there are several tree seedlings that do not contain specific requirements in these regulations or in Indonesian National Standards 8420, so they cannot be classified into the seed quality class. Components of special requirements for tree seedlings include seedling height, seedling stem diameter, compactness of the growing medium or seedling weaning media, number of leaves or live crown ratio, and age of the seedling (Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial, 2009; Badan Standardisasi Nasional, 2018). The morphological characteristics of tree seedling that meet the standard criteria of Indonesian National Standards 8420 concerning Forest Plant Seedlings are presented in Table 3 and the morphological characteristics of tree seedling for which there are no criteria in the Indonesian National Standards 8420 are presented in Table 4 as follows.

Table 3. Morphological characteristics of tree seedlings in the nursery owned by PT Bukit Asam, Tarahan Port Unit which listed in the tree seedling quality criteria based on Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standards 8420

Number	Trees species		Seedling height (cm)	Stem diame-ter (mm)	Media compactness	Leaf amount (strands) /LCR(%)	Age (month)
	Local name in Indonesia	Botanocal name					
1.	Cemara kipas	*Thujaoccidentalis*	62-80	11-20	intact, broken	64–85%	7-12
2.	Cemara laut	*Casuarinaequisetifolia*	103-128	6-9	intact	78-88%	7-12
3.	Damar	*Agathisloranthifolia*	87-117	16-23	intact	215-257	7-12
4.	Eboni	*Diospyroscelebica*	59-79	5-10	intact	28-37	7-12
5.	Glodokan tiang	*Polyalthiapendula*	138-200	20-30	intact, broken	132-176	5-7
6.	Kemiri	*Aleuritesmoluccana*	54-83	13-17	intact, broken, cracked	4-11	7-12
7.	Ketapang kencana	*Terminaliamantaly*	50-94	9-22	intact	45-95%	7-12
8.	Ketapang pantai	*Terminaliacatappa*	40-120	7-22	intact	6-15	7-12
9.	Mahoni	*Swieteniamacrophylla*	48-99	15-25	intact, broken	47-83	7-12
10.	Pulai	*Alstoniascholaris*	30-70	9-15	intact, broken, cracked	0-38	7-12

11.	Tanjung	*Mimusops elengi*	34-116	5-33	intact	13-31	7-12

Table 4. Morphological characteristics of tree seedlings in the nursery owned by PT Bukit AsamTarahan Port Unit for which there are no quality criteria based on the Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standards SNI 8420

Number	Trees species		Seedling height (cm)	Stem diameter (mm)	Media compactness	Leaf amount (strands) /LCR(%	Age (month)
	Local name in Indonesia	Botanical name					
1.	Alpukat	*Persea americana*	58-78	13-16	intact, broken	20-52	5-7
2.	Durian	*Durio zibethinus*	50-86	10-22	intact	15-58	5-7
3.	Pala	*Myristica fragrans*	50-73	8-18	intact	32-72	7-12
4.	Pucuk merah	*Eugenia oleana*	62-74	9-12	intact, broken	50-90%	5-7
5.	Tabebuya ungu	*Tabebuiachrysotrichus*	170-270	21-33	intact	42-86	5-7

Based on the result of this research contained in Table 3 and Table 4, all the seedlings that have been observed have varying heights between 30 cm and 270 cm. The diameter of the seedling stem varies between 5 mm and 33 mm. The compactness of the growing media for tree seedlings is considered good because most of the seedlings have intact growing media. The number of seedling leaves varies greatly, namely between 4 and 257, as well as the live crown ratio (LCR) varying between 45% and 95%. The age of the seedlings varies between 5 months and 12 months.

Seedling height and seedling stem diameter are also important variables in assessing the quality of forest plant seedlings. Seedlings that grow well can be seen from the physical dimensions of their body such as the height of the seedling and the diameter of the stem (Indriyanto, 2022). Junaedi (2009) also stated that the quality of tree seedlings can be seen from their physical quality, namely from the dimensions of the seedling's organs. Seedling height and seedling stem diameter are tree dimensions that are influenced by genetic composition (Hasnah & Windyarini, 2014). However, according to Hasnah & Windyarini (2014) the influence of genetic composition is stronger on tree height than on stem diameter. Seedling height and seedling stem diameter are indicators of growth, so they are generally used to determine seedlings ready for planting. Therefore, seedling height and seedling stem diameter can be used as variables in selecting seedlings in the nursery (Sudrajat et al. 2010).

The compactness of the seedling growing media at the research location was mostly in the good category (compact/intact), and only a small part was not good, namely broken and cracked (Table 3 and Table 4). The compactness of the seedling growing media indicates the ability of the root system to aggregate with the growing media. Growing media that have good physical, chemical, and biological properties influence the growth and development of the seedling root system (Indriyanto, 2022). If the roots grow and develop well, the root system is able to aggregate well with the growing media (Indriyanto, 2022;Yustika et al., 2022). Therefore, when the seedlings are lifted or moved to the planting location, the growing media is not easily damaged, so that the percentage of live seedlings in the planting area is relatively large (Irmayanti et al., 2020).

The condition of the compactness of the media for growing tree seedlings in the nursery owned by PT Bukit Asam, Tarahan Port Unit can be seen in Figure 4.

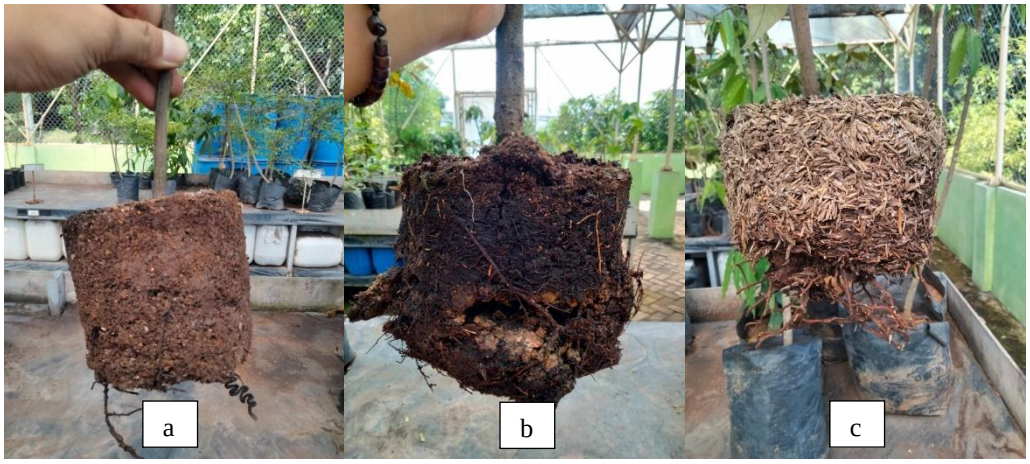

Figure 4. Compactness of the growing media for tree seedlings, (a) growing media in intact condition, (b) growing media in broken condition, (c) growing media in cracked condition.

The seedling growing media used in the nursery owned PT Bukit Asam, Tarahan Port Unit meets the requirements for good growing media, namely a mixture of topsoil and compost in a ratio of 2:1, as well as a mixture of topsoil with compost and rice husks in a ratio of 2:1 :1. The growing media container used is a polybag with dimensions of 10 cm x 15 cm and 17.5 cm x 40 cm. Indriyanto (2010)stated that the criteria for a good seedling growing media include being able to store water and nutrients, having good drainage and aeration, being able to maintain moisture in the rhizosphere zone, not containing pollutants or toxins, not being a source of disease, contains sufficient nutrients, is easy to obtain, and is cheap.

Leaves are plant organs that function as a site for the process of photosynthesis. Leaves are the most important organ for plants to survive, because plants are autotrophic organisms that can synthesize organic materials and convert solar radiation energy into biochemical energy (Irmayanti et al., 2020). Thus, the number of leaves and/or LCR is used as a component of the physical-physiological quality of seedlings (Irmayanti et al., 2020).

The percentage of the number of tree seedlings which morphological characteristics meet the criteria according to Indonesian National Standard 8420 is presented in Table 5.

Table 5. Percentage of seedling number for each tree species which morphological characteristics meet the standard criteria for tree seedling quality based on the Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standard 8420

Number	Tree species		BST (%)	BSD (%)	BMK (%)	BSJD (%)	RPK (%)
	Local name in Indonesia	Botanical name					
1.	Cemara kipas	*Thujaoccidentalis*	100	100	60	100	90
2.	Cemara laut	*Casuarinaequisetifolia*	100	100	100	100	100
3.	Damar	*Agathisloranthifolia*	100	100	100	100	100
4.	Eboni	*Diospyroscelebica*	100	100	100	100	100
5.	Glodokan tiang	*Polyalthiapendula*	100	100	90	100	98
6.	Kemiri	*Aleuritesmoluccana*	100	100	80	80	90
7.	Ketapang kencana	*Terminaliamantaly*	100	100	100	80	95
8.	Ketapang pantai	*Terminaliacatappa*	100	100	100	100	100
9.	Mahoni	*Swieteniamacrophylla*	100	100	90	100	98
10.	Pulai	*Alstoniascholaris*	90	100	80	70	85
11.	Tanjung	*Mimusops elengi*	90	100	100	100	98

Remarks:
BST=percentage of seedling number which height meets the standards
BSD= the percentage of seedling number which stem diameter meets the standards
BMK= percentage of seedling number which weaning media is compact or intact
BSJD= percentage of seedling number which leaves or LCR meets the standards
RPK= average percentage of seedlings for each tree species that meets special requirements

As for the percentage of normal seedling number, percentage of seedling number that meets special requirements, and the quality class of tree seedlings at the research location are presented in Table 6.

Table 6. Percentage of normal seedling number and percentage of seedling number that meets special requirements, and the quality class of tree seedlings based on Regulation of the Director General of RLPS Number P.05/V-SET/2009 and Indonesian National Standard 8420

Number	Tree species		Percentage of normal seedling number (%	Percentage of seedling number that meets special requirements (%)	Quality class of seedling
	Local name in Indonesia	Botanical name			
1.	Cemara kipas	*Thujaoccidentalis*	60	90	Reject
2.	Cemara laut	*Casuarinaequisetifolia*	90	100	Second quality
3.	Damar	*Agathisloranthifolia*	90	100	Second quality
4.	Eboni	*Diospyroscelebica*	70	100	Reject
5.	Glodokan tiang	*Polyalthiapendula*	90	98	Second quality
6.	Kemiri	*Aleuritesmoluccana*	90	90	Second quality
7.	Ketapang kencana	*Terminaliamantaly*	70	95	Reject
8.	Ketapang pantai	*Terminaliacatappa*	0	100	Reject
9.	Mahoni	*Swieteniamacrophylla*	80	98	Second quality

10.	Pulai	*Alstoniascholaris*	70	85	Reject
11.	Tanjung	*Mimusops elengi*	80	98	Second quality

Of the 16 trees species, there are 11 trees species that can be classified as quality classes for their seedlings, while 5 trees species cannot be classified as quality classes because their quality criteria are not yet listed in the Indonesian National Standard 8420. Eleven trees species which seedlings are found in the nursery belong to PT Bukit Asam, Tarahan Port Unit were categorized into 2 classes of seedling quality, namely second quality and rejected quality. There are no seedlings that fall into the first quality class. There were 6 species of tree seedlings categorized in the second seedling quality class and 5 species of tree seedlings categorized in the quality class of rejected seedlings.

There are still many seedlings in the rejected quality category which are thought to be caused by less than optimal seedling maintenance. Seedling maintenance is an activity that includes regular watering, weed control, pest and disease control, fertilization, and root cutting (Indriyanto, 2022). Regular plant maintenance, both the intensity of maintenance activities and the type of maintenance, greatly influences plant growth (Indriyanto, 2010).Regarding the tree nursery process, the maintenance of seedlings greatly influences the growth and quality of the seedlings (Nurhasybi et al., 2019).

IV. CONCLUDING REMARK

Conclusion

There are no species of tree seedlings in the first quality category (F) in nursery owned by PT Bukit Asam, Tarahan Port Unit, Indonesia . There are 6 species of tree seedlings in the second quality category (S) or 37.50% of the 16 species of trees seedlings. There are 5 species of non-quality tree seedlings or 31.25% of the 16 species of trees seedlings. Meanwhile, there are 5 species of tree seedlings which quality criteria are not listed in Indonesian National Standards 8420 (INS 8420).

The small number of quality tree seedlings is caused by a lack of intensity in maintenance for seedlings in nurseries, so that the seedling growth process does not run optimally.

Recommendation

The quality of tree seedlings in the nursery owned by PT Bukit Asam, Tarahan Port Unit, Indonesia must be improved in order to support the success of the land rehabilitation program. Efforts to improve the quality of tree seedlings can be achieved through various things, including using plant material (seeds) from quality seed sources, using fertile soil as a growing media, and carrying out regular maintenance of the seedlings.

Research on the use of various types and various ratios of organic material mixtures in soil as a media for growing seedlings is very necessary, especially for tree seedlings which growth quality is currently poor (not of good quality). Research on identifying species of pests and diseases and efforts to control them is very helpful in preventing possible attacks on tree seedlings.

ACKNOWLEDGEMENT

Acknowledgements are extended to the lecturers at the University of Lampung who have guided them in carrying out research and writing scientific articles. Thanks are also expressed to PT Bukit AsamTarahan Port Unit, Lampung Province, Indonesia for allowing me to conduct research in the nursery area belonging to PT Bukit Asam, Tarahan Port Unit.

REFERENCE

[1]. Azham, Z., Derita, D., Yahya, Z., & Sipayung, M. (2024). Pengabdian masyarakat penanaman pada hutan tanaman industri (HTI) tanaman *Eucalyptus* di PT Surya Hutani Jaya di Sebulu Kabupaten Kutai Kartanegara. *Jurnal Abdimas Untag Samarinda*.2(1): 21--30. https://doi.org/10.31293/jaus.v2i1.7822

[2]. Badan Standardisasi Nasional. (2018). SNI 8420 Tahun 2018 tentang Bibit Tanaman Hutan. http://sipth.pdashl.menlhk.go.id/v2/lib/peraturan.php

[3]. Dewi, C., & Ulfa, B. R. M. (2023). Efektivitas program rehabilitasi hutan dan lahan (RHL) dalam meningkatkan perekonomian masyarakat di sekitar hutan pelangan Kabupaten Lombok Barat. *Nusantara Hasana Journal*.2(9): 152–158. https://nusantarahasanajournal.com/index.php/nhj/article/view/771

[4]. Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial. (2009). Peraturan Dirjen RLPS Nomor P.05/V-Set/2009 tentang Petunjuk Teknis Penilaian Mutu Bibit Tanaman Hutan. Jakarta. http://sipth.pdashl.menlhk.go.id/v2/lib/peraturan.php .

[5]. Doni, D., Ekyastuti, W., & Oramahi, H. A. (2023). Respon pertumbuhan semai jengkol (*Archildendron pauciflorum*) terhadap pemberian asap cair tempurung kelapa.*Jurnal Lingkungan Hutan Tropis*.2(1): 258-267. https://jurnal.untan.ac.id/index.php/jlht/article/view/76182

[6]. Fitriyanti, R. (2016). Pertambangan batubara dampak lingkungan, sosial dan ekonomi. *Jurnal Redoks Teknik Kimia*.1(1): 34–40. https://doi.org/10.31851/redoks.v1i1.2017

[7]. Hasnah, H., & Windyarini, E. (2014). Variasi genetik pertumbuhan semai pada uji provenan nyamplung (*Calophyllum inophyllum*) dari delapan pulau di Indonesia. *Jurnal Perbenihan Tanaman Hutan*.2(2): 77–88. https://dx.doi.org/10.20886/bptpth.2014.2.2.77-88

[8]. Indriyanto. (2010). *Pengantar Budidaya Hutan*. 2nd ed. Jakarta: PT Bumi Aksara. 234 p.
[9]. Indriyanto. (2017). *Ekologi Spesies Pohon*. 1st ed. Yogyakarta: Plantaxia. 303 p.
[10]. Indriyanto &Asmarahman, C. (2020). Pelatihan peningkatan mutu bibit tanaman hutan di Desa Batu Putu.*Jurnal Sinergi*. 1(1): 1-10. http://repository.lppm.unila.ac.id/29507/
[11]. Indriyanto. (2022). *Teknik dan Manajemen Pesemaian*. 1st ed. Yogyakarta: Plantaxia. 312 p.
[12]. Insusanty, E. & Ikhwan, M. (2022). Pengabdian kepada masyarakat sosialisasi dan edukasi lingkungan hidup di SMA Islam An Naas Pekanbaru. *Jurnal Pengabdian.* 3(2): 85–92. https://journal.unilak.ac.id/index.php/Fleksibel/article/view/10716
[13]. Irmayanti, L., Nurhikmah, A. F., & Mariati, M. (2020). Pengujian kualitas bibit Jabon Merah (*Anthocephalus macrophyllus*)yang diberikan pupuk hayati dan kimia.*Jurnal Ilmiah Bidang Pengelolaan Sumberdaya Alam dan Lingkungan*. 15(2): 204-210. https://doi.org/10.33387/cannarium.v18i2.2399
[14]. Junaedi, A. (2009). Pertumbuhan dan mutu fisik bibit jabon di polibag dan politub. *Jurnal Penelitian Hutan Tanaman*.7(1): 15–21. https://dx.doi.org/10.20886/jpht.2010.7.1.15-21
[15]. Kementerian Energi dan Sumber Daya Mineral. (2022). Rencana Pengelolaan Mineral dan Batubara Nasional Tahun 2022-2027. Jakarta.https://jdih.esdm.go.id/storage/document/Salinan%20Kepmen%20ESDM%20Nomor%20301%20RPMBN%202022%20sd%202027.pdf .
[16]. Masilewi, J., Nurdin, A. S., Marasabessy, M. H., Irmayanti, L., & Ashari, R. (2022). Growth of red jabon (*Anthocephalus macrophyllus*) seedlings on various planting media compositions. *Ulin: Jurnal Hutan Tropis*. 6(1): 98--104. http://dx.doi.org/10.32522/ujht.v6i1.6729
[17]. Munir, M., & Setyowati, R. D. N. (2017). Kajian reklamasi lahan pasca tambang di Jambi, Bangka, dan Kalimantan Selatan. *Klorofil: Jurnal Ilmu Biologi dan Terapan*.1(1), 11-16. http://dx.doi.org/10.30821/kfl:jibt.v1i1.1233
[18]. Nurhasybi, Sudrajat, D. J., & Suita, E. (2019). Kriteria Bibit Tanaman Hutan Siap Tanam untuk Pembangunan Hutan dan Rehabilitasi Lahan. 1st ed. Bogor: IPB Preess. 210 p.
[19]. Pramono, A. A., Sudrajat, D. J., Nurhasybi, N., & Danu, D. (2016). *Prinsip-prinsip Cerdas Usaha Pembibitan Tanaman Hutan*. Jakarta: Penebar Swadaya.
[20]. Setyowati, R. D. N., Amala, N. A., & Aini, N. N. U. (2017). Studi pemilihan tanaman revegetasi untuk keberhasilan pasca lahan bekas tambang. *Al-Ard: Jurnal Teknik Lingkungan*. 3(1): 14-20. http://repository.uinsa.ac.id/id/eprint/1872/
[21]. Sittadewi, E. H. (2019). Mitigasi lahan terdegradasi akibat penambangan melalui revegetasi. *Jurnal Sains dan Teknologi Mitigasi Bencana*.11(2): 50–60. https://download.garuda.kemdikbud.go.id/article.php?article=1255694&val=14309&title=MITIGASI%20LAHAN%20TERDEGRADASI%20AKIBAT%20PENAMBANGAN%20MELALUI%20REVEGETASI
[22]. Sudrajat, D. J., Kurniati, R., Syamsuwida, D., Nurhasybi, & Budiman, B. (2010). Kajian Standardisasi Mutu Bibit Tanaman Hutan di Indonesia. 1st ed. Bogor: Balai Penelitian Teknologi Perbenihan. 43 p.
[23]. Wasis, B., & Fatimah, N. (2010). Pengaruh pupuk NPKdan kompos terhadap pertumbuhan semai(*Gmelina arborea*) pada media tanah bekas tambang emas. *Jurnal Ilmu Pertanian Indonesia*.15(2): 123–129. https://garuda.kemdikbud.go.id/documents/detail/1313696
[24]. Wawo, A. H., & Utami, W. N. (2012). Tanggap pertumbuhan semai dua spesies gaharu terhadap intensitas cahaya dan media tanam. *Bul. Littro*.23(1), 21–33. https://garuda.kemdikbud.go.id/documents/detail/624902
[25]. Wawo, A. H., Utami, N. W., & Setyowati, N. (2018). Growth of *Gyrinops verstegii*seedling in response to thinning and foliar fertilization. *Buletin Penelitian Tanaman Rempah dan Obat*. 28(2): 137-144. https://garuda.kemdikbud.go.id/documents/detail/2483735
[26]. Yustika, V., Indriyanto, & Asmarahman, C. (2022). Evaluasi mutu bibit tanaman hutan di pesemaian PT Natarang Mining, Kabupaten Tanggamus. *Journal of Tropical Upland Resources*. 4(2): 69-81.https://doi.org/10.23960/jtur.vol4no2.2022.125.