Public Education on the Advantages of Using Wood Products

ITTO PD 928/22 Rev.1 (I)
Development Of Sustainable Domestic Market
For Wood Products

Jakarta, February 2025

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

JAPANGOV THE GOVERNMENT OF JAPAN

MAFF Ministry of Agriculture, Forestry and Fisheries

MINISTRY OF FORESTRY REPUBLIC OF INDONESIA

FINAL REPORT ACTIVITY 1.5

PUBLIC EDUCATION ON THE ADVANTAGES OF USING WOOD PRODUCTS

Prepared by:
Dr. Rina Kristanti - Project Coordinator ITTO Project PD 928/22 Rev.1 (I)

Activities conducted by:
Faculty of Forestry and Environment IPB University
Faculty of Forestry Gadjah Mada University
Faculty of Agriculture Brawijaya University

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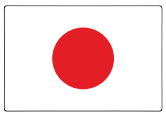
TIMBER ORGANIZATION



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Executing Agency

Mr. Erwan Sudaryanto

Krisdianto, Ph.D. (former)

Dr. Drasospolino (former)

Dr. Ristianto Pribadi (former)

Director of Forest Product Processing and Marketing,
Directorate General of Sustainable Forest Management, Ministry of Forestry

Dr. Deden Nurochman

Dr. Sudarmalik (former)

Deputy Director of Forest Product Processing Planning
Directorate General of Sustainable Forest Management, Ministry of Forestry

Project Coordinator

Dr. Rina Kristanti
Policy Analyst of Sustainable Forest Management,
Directorate General of Sustainable Forest Management, Ministry of Forestry

Address: Manggala Wanabakti Building, Block I, 11th Floor,
Jl. Gatot Subroto, Jakarta 10270
Phone number: +62 21 5704618
Fax number: +62 21 5704618
Email: itto.woodproduct@menklhk.org
Website: https://sihutanku.phl.menlhk.go.id/

EXECUTIVE SUMMARY

Public education regarding the benefits of wood utilization can foster trust in wood as a material within society and cultivate a culture of wood (both solid and composite) usage, in daily life, which should be valued more due to its environmentally friendly nature. Environmental and climate change issues are currently of global concern due to the significant impact of greenhouse gases on human life. Based on the results of studies, public education is more focused on the utilization of solid wood and wood composites for furniture due to the extensive development and demand for furniture by the wood industry. The public education activities can include wood product exhibitions, seminars/talk shows/workshops (online or offline), training, socialization through social media, and innovative competition. Public education must continue to be carried out regarding the developments, opportunities, threats, and challenges of the wood industry in current and future conditions. Continuous collaboration among various stakeholders to support the development of the wood industry is important.

Several important factors that need to be considered in furniture production are raw materials, types of furniture to be manufactured, technology, design and finishing, management and market, and human resources. In terms of raw materials, the potential of wood availability, types of wood, and the properties/qualities of the wood used need to get attention. Some specifications for wood raw materials for furniture include wood that is sufficiently strong, flexible, moderately hard to hard (strength classes I-III), sufficiently smooth to silky wood texture, older and decorative wood colors being prioritized, relatively large size scale, and sufficiently durable (durability classes I-III), capable of being integrated into well-constructed furniture, and easily finished with satisfactory results. Meanwhile, the origin, function, quality of furniture, and others need to be considered in selecting the type of furniture to be manufactured. In terms of technology, the category and scale of furniture production need to get attention, and also the types and preferences of the community should be considered in determining design and finishing.

In the furniture industry, sustainability and the availability of raw materials are two continuously challenging aspects, especially solid wood, which serves as the traditional raw material providing beauty and strength to furniture, which is beginning to face limited resources and making it increasingly scarce. High-quality woods such as teak are highly demanded in the furniture manufacturing industry due to their exceptional strength and durability. However, high-quality woods like Teak and other hardwoods face acquisition challenges due to their slow growth rates. This slow growth rate does not align with the continuously increasing global demand. Consequently, the demand for high-quality and high-durability furniture is not fulfilled. This phenomenon is evidenced by the decreasing number of teak plantation forests, particularly in Java Island, while readily available are fast-growing wood species with low wood quality, such as Sengon, obtained from community forests. On the other hand, the wood industry heavily relies on the continuity of raw material supply. Without adequate raw material availability, the industry cannot sustain its operations amidst furniture industry competition.

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION

1.1 Background

Economic development is a continuous planning process carried out by the government to improve people's lives and improve long-term per capita income. Economic development planning in Indonesia, one of which is through the forestry sector. Since the 1970s the Indonesian processed wood industry has developed rapidly. This was triggered, among other things, by the government's policy to increase the exploitation of production forests based on Law No. 5 of 1967, and has increased rapidly since the implementation of the log export ban policy in the late 1970s. These two policies resulted in an increase in the production capacity of the processed wood industry, especially the sawn timber and plywood industries in the 1980s. The COVID-19 pandemic slowed down economic activities in all sectors of the economy due to reduced state funds for development in favour of funding for public health protection and strict enforcement of health protocols by the government authorities that practically restricted the movement of people hence economic activities. As reported by the ITTO, domestic consumption has proven to be a stabilizer for tropical timber production in previous economic crises. Amidst the outbreak of the COVID-19 pandemic, the government and the wood industry are attempting to invigorate the sluggish development of domestic consumption of wood products. In its report titled "Impact of the COVID-19 Pandemic on Tropical Timber Production", ITTO points out three critical conclusions:

- Exports of primary wood products are highly vulnerable to economic shocks.
- The focus and strong dependency on unprocessed wood products should be reconsidered to chance forest sector resilience in the future.
- Domestic consumption has proven to be a stabilizer for tropical timber production in previous economic crises.

Domestic consumption may become a stabilizer for timber production reduced consumption in Indonesia should be overcome by all means. The sluggish development of consumption observed in recent years has to be addressed with the main purpose of promoting a strong and resilient domestic consumption of wood products such that the increasing consumption will serve as a stabilizer of economic shock in the sector. The domestic market for wood products will be strengthened through the improvement of advantages of using wood products relative to substitutes, more diversified wood products offered to consumers, and weakened penetration of wood substitutes which in turn will yield a larger contribution to the national economy. The community's need for wood products is increasing along with the current increase in population. Most of these wood products are used as building construction materials, raw materials for pulp and paper, fuel and charcoal, as well as materials for making furniture.

From the preliminary survey, it is concluded that most of the wood products consumed at the domestic scale to support daily life in Java Islands consist of furniture, construction, and woodcraft products. From the producer's perspective, to increase product sales, wood product industry actors (producers, intermediaries, and sellers) must pay attention to consumer behavior trends toward the products being marketed. By paying attention to consumer behavior, it is expected that business actors can determine the level of consumer satisfaction with the products being marketed so that in the end business actors can implement appropriate marketing strategies including product characteristics and prices to determine consumers' interest in wood products.

Project PD 928/22 Rev.1 (I) "Development of Sustainable Domestic Market for Wood Products", conducted by the Directorate of Forest Product Processing and Marketing Development, Directorate General of Sustainable Forest Management, Ministry of Environment and Forestry, aims to promote the development of domestic consumption for wood products, in anticipation of population and economic growth, through increased resilience of consumption, enhanced supply chains, and improved government policies. The project will be implemented in a participatory, collaborative manner, for which partners will be selected based on competence. Risks will be managed by putting in place the relevant mitigating measures since the onset of project operations. Its specific objective is to promote a strong and resilient domestic consumption of wood products, to be achieved through the delivery of two outputs, namely: i) increased capacity of the domestic market to satisfy consumers' need for wood products, and ii) enhanced institutional arrangement for steadily rising domestic consumption of wood products. To support the achievement of the outputs, 9 activities will be conducted and one of those is to conduct public education on the advantages of using wood products.

1.2 Objective

This activity aims to increase domestic consumption of wood products based on knowledge of the results of Activity 1.3 through public education regarding the benefits of using wood products to potential users of wood products in the project area.

1.3 Output

The study covers the activity of public education on the advantages of using wood products to potential consumers. The activity was conducted by the universities consisting of the Faculty of Forestry and Environment IPB University for the locus of West Java, Banten, and DKI Jakarta Province, the Faculty of Forestry Gadjah Mada University for the locus of Central Java, and the Faculty of Agriculture of Brawijaya University. The output of the study consists of 1 package of activity reports.

II. LITERATURE REVIEW

Public Education Definition

Public education is any planned effort to influence others, whether individuals, groups, or communities so that they do what the educator expects. (Notoadmojo 2003). Education is the process of learning from not knowing to knowing (Suliha 2002). Public opinion comes from Latin, general meaning populous, and populous from Populus, meaning people. So, public education attempts to influence people about a particular issue or topic. Public education has the purpose of raising public awareness and understanding of a particular issue or topic. Public education can be carried out by various parties, such as governments, non-governmental organizations, public institutions, and the mass media.

Public Education Objectives

Public education has the purpose of raising public awareness and understanding of a particular issue or topic. Public education can be carried out by various parties, such as governments, non-governmental organizations, public institutions, and the mass media. In general, the objectives of public education are as follows:

1. To raise public awareness of a particular issue or topic
2. Increase public understanding of a particular issue or topic.
3. Increase public understanding of a particular issue or topic.
4. Develop the skills and abilities of the community.
5. Increase public participation.

Public Education Benefits

Public educational activities should have a target, a group of people being targeted. Public education has four benefits:

1. It helps people to understand the importance of a particular issue or topic so that they can take the right action.
2. Public education can help people to gain a deeper understanding of a specific issue or subject, so they can make better decisions.

3. Public education may help people develop the skills and abilities they need to deal with a particular topic or issue.

4. Public education could help people participate actively in dealing with a specific topic.

The objectives of public education may vary depending on the issue or topic raised. For instance, public education on the importance of environmental hygiene is aimed at raising public awareness to maintain the cleanliness of the environment, while public education about timber use is carried out to:

1. Raise public awareness regarding the conditions and challenges of timber product use;

2. Provide a deeper understanding to the public about the conditions associated with and the challenges of timber product use;

3. Increase public knowledge about the related conditions and problems of the use of wood products;

4. Encourage the public to take action and participate actively in addressing the challenge of the utilization of timber products.

Public Education Goals

Public educational activities should have a target, a group of people being targeted. Public education objectives can be determined based on a variety of factors, which include:

1. Age: Public education can be targeted at certain age groups, such as children, adolescents, adults, or the elderly.

2. Gender: Public education can be targeted at a specific gender, such as male or female.

3. Education: Public education can be targeted at specific educational groups, such as primary, secondary, or higher education.

4. Socioeconomic: Public education can be targeted at specific socioeconomic groups, such as the poor, middle, or rich.

5. Geography: Public education can be targeted at specific geographical areas, such as urban, rural, or border areas.

6. Interests: Public education can be targeted at community groups that have specific interests, such as environmental groups, health groups, or educational groups.

Principle of Public Education

According to Notoatmodjo (2010) factors that affect education state that several factors can affect education, among others:

1. Internal factors: These factors consist of several sub-factors such as educational level, public confidence, and delivery time.

a. The level of education, education affects the way participants view the information received, so the higher a person's education level, the easier it is for a person to receive the information obtained;

b. Public confidence, people pay more attention to the information provided by people they already know because there is public confidence in the information obtained;

c. At the time of delivery, the information should take into account the level of activity of the community or the family to guarantee a level of presence and readiness to follow the arrangement.

2. External factors: This factor consists of media, educational material, teachers, and teaching environment.

a. The media is a tool or mass media as an intermediary to deliver messages. Information is obtained from various mass media different. Information from mass media from various sources becomes a means of rapid communication and adds to knowledge.

b. The educational material is adapted to the needs of delivering the subject. The material can be new, complementary, or repetitive material for the subject. The material is processed from simple to complex so that the participants can understand the information.

c. Teachers should have the ability to communicate to provide information so that participants are more easily accepted.

d. An optimal learning environment supports the learning process more effectively because it provides a sense of physical and psychological comfort, thus making it easier for participants to understand the information provided.

Public education has principles to uphold or uphold. The educational principles to be observed according to Suliha (2012) are as follows:

1. Provide positive support and advice and avoid emergencies
2. Give information gradually, starting with simple things
3. Take an approach to solving the problem
4. Give a simple and complete explanation of the treatment program and discuss the results of the laboratory examination
5. Give motivation by giving appreciation to the family
6. Involve family/accompany in the educational process
7. Pay attention to physical and psychological health as well as the level of education of the patient and his family
8. Use mass media aids.

Innovation in Wood Products

Several important factors that need to be considered in furniture production are raw materials, types of furniture to be manufactured, technology, design and finishing, management and market, and human resources. In terms of raw materials, the potential of wood availability, types of wood, and the properties/qualities of the wood used need to get attention. Some specifications for wood raw materials for furniture include wood that is sufficiently strong, flexible, moderately hard to hard (strength classes I-III), sufficiently smooth to silky wood texture, older and decorative wood colors being prioritized, relatively large size scale, and sufficiently durable (durability classes I-III), capable of being integrated into well-constructed furniture, and easily finished with satisfactory results. Meanwhile, the origin, function, quality of furniture, and others need to be considered in selecting the type of furniture to be manufactured. In terms of technology, the category and scale of furniture production need to get attention, and the types and preferences of the community should also be considered in determining design and finishing (Kasmudjo, 2012).

In the furniture industry, sustainability and the availability of raw materials are two continuously challenging aspects, especially solid wood, which serves as the traditional raw material providing beauty and strength to furniture, which is beginning to face limited resources and making it increasingly scarce. In the furniture manufacturing industry, high-quality woods such as Teak are highly demanded due to their exceptional strength and durability. However, high-quality woods like Teak and other hardwoods face acquisition challenges due to their slow growth rates. This slow growth rate does not align with the continuously increasing global demand. Consequently, the demand for high-quality and high-durability furniture is not fulfilled (Hongqiang et al., 2012; Purnomo et al., 2009). This phenomenon is evidenced by the decreasing number of teak plantation forests, particularly in Java Island, while readily available are fast-growing wood species with low wood quality, such as Sengon, obtained from people's forests (Listyanto et al., 2010). Sengon is abundant in Central Java with national production increasing from 2020 to 2021 (BPS 2023). The availability of abundant and easily accessible fast-growing woods like Sengon still faces challenges due to its low wood quality and resulted in less consumer and market demand. On the other hand, the wood industry in Jepara for instance, heavily relies on the continuity of raw material supply. Without adequate raw material availability, the industry cannot sustain its operations amidst furniture industry competition (Yovi & Nurrochmat, 2009).

The increasing demand for high-quality furniture and the limited types of wood available creates a need for alternative materials that can meet quality, aesthetic, and ecological criteria. Engineered Wood Products (EWP) is a solution for producing high-quality wood materials from available resources and has emerged as an advanced technology that is increasingly in demand in the furniture industry. Unlike solid wood, EWP is produced by bonding layers of wood fibers, particles, or veneer, resulting in a material that exhibits increased strength, stability, and usability. One of the most well-known EWPs is Cross-Laminated Timber (CLT) (Llana et al., 2022; Szczurek et al., 2021). CLT can be produced from small diameter, fast growing trees, into large diameter wood that has excellent strength and dimensional stability. Because of these properties, CLT can be used in construction or structural components, furniture, and other wood products that require high strength and dimensional stability. Processing low-quality wood into high-quality products is a solution to utilize available resources and reduce the environmental impact associated with harvesting (Trisatya et al., 2023).

CLT has very high stability, strength, and stiffness due to its arrangement crosswise at 90-degree angles, making it suitable for various applications such as construction, walls, and furniture. Nowadays, the use of CLT in furniture manufacturing has experienced a significant increase. CLT, which was previously exclusive to construction projects, has now become an attraction in the furniture industry (Huang et al., 2022). The cross-laminated CLT manufacturing technique provides exceptional strength, ensuring that the resulting furniture is not only visually appealing but also sturdy and durable. Additionally, the unique construction of CLT allows designers to create intricate designs, unique shapes, and furniture innovations that are challenging to achieve with traditional materials. Results obtained from CLT materials also exhibit a natural and warm wood appearance, adding an elegant touch to furniture made from CLT (Fellin et al., 2022; Smardzewski & Łabęda, 2018).

Generally, softwood is used as the core layer in the CLT structure (Mohebby & Broushakian, 2022), while sometimes combined with hardwood in outside layers to produce high quality composite (Espinoza & Buehlmann, 2018). This shows that even though softwood has low quality, it has great potential to produce high quality composite wood. Corpataux et al. (2020) suggested the used of sengon (*Falcataria moluccana*) combined with acacia hybrid (*Acacia mangium* x *A. auriculiformis*) or red jabon (*Anthocepahlus macrophyllus*) for CLT panel production. The results revealed that the CLT panel showed higher mechanical properties than single lumber of each wood used in the study. Similar work was reported by Trisatya et al. (2023) using sengon combined with Jabon and coconut lumber for CLT panel, and demonstrated higher mechanical properties. In the implementation of this activity, we used sengon wood as the core layer combined with mahogany as the face layer to produce CLT as a raw material for furniture manufacturing.

III. METHODOLOGY

3.1. Time and Location

Activity 1.5 was carried out from November 2023 to February 2024 and was conducted in the project area with the locus of West Java, Central Java, East Java, Banten, and DKI Jakarta.

3.2. Methodology

3.2.1. Data Collection

The study focuses on education on the advantages of using wood products in the project area. The logical framework of the activity is summarized in the diagram below.

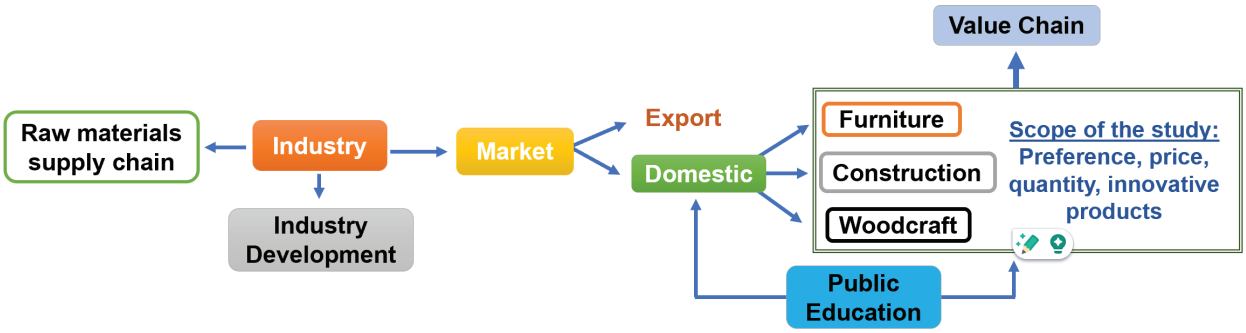


Figure 1 Logical Framework of the Activity

3.2.2. Data Analysis

This activity is carried out through several stages, namely preparation, planning, reporting, and implementation of the seminar. In the preparation stage, secondary data was collected through literature studies to understand market and consumer characteristics, not only that, primary data was also collected through consumer surveys using interview methods to understand in more detail consumer preferences for wood products. At the planning stage of public education, the results of research

conducted through studies are carried out in literature and through interviews.

The analysis results obtained are then communicated to the project coordinator and executing Agency to discuss and consider recommendations prepared for research activities. This is conducted to prepare for the implementation of public education to socialize the benefits of using wood products to the public. This form of education can be carried out using various strategies, one of which can be a public education seminar presenting speakers who are experts in their fields. Furthermore, the educational event will be disseminated on the Executing Agency Information System portal and the university information system portal as a sub-contractor so that it can be accessed by the wider community. In this research, public education aimed to increase the consumption of wood products, accomplished as follows:

1. To conduct any kind of arrangement on public education from preparation, implementation, and reporting;
2. To develop a comprehensive and detailed work plan to implement public education;
3. To identify and invite concerned participants and speakers;
4. To conduct logistic arrangements as required;
5. To conduct public education on the advantages of using wood products in the project area;
6. To provide documentation of public education;
7. To integrate the results of the analysis with the Timber Legality Information System.

IV. RESULT

4.1 Public education on the advantages of using wood products in West Java

4.1.1. Characteristics of the potential market

The public education is in line with the study on the Development of a Variety of Enriched Wood Products Sold in the Domestic Market in West Java Province (Activity 1.3) that was conducted by collecting secondary and primary data by distributing questionnaires to the public in West Jawa Province. Respondent characteristics provide information on how responsive and adequate respondents are to answer and understand research questions. In general, respondents have five characteristics: age, class, gender, education, income, and type of work. Age and gender are considered not sufficient to represent the level of understanding of various research questions. However, with the existence of other respondent characteristics such as type of work, education, and income, understanding various research questions is expected to be easy Roper (1940) argued that the classification of respondents for economic surveys is also determined by the type of occupation, level of education and income.

The survey has been conducted in 19 cities/regencies out of 28 cities/regencies in West Java province. The regions include Bandung City, Bogor City, Cimahi City, Bandung Regency, Bekasi, Cianjur, Bogor, Ciamis, Cirebon, Garut, Kuningan, Karawang, Majalengka, Depok, Indramayu, Purwakarta, Subang, Sumedang, and Sukabumi. The total number of respondents in West Java Province is 158 respondents. The following is a description of the characteristics of respondents in West Java Province.

1. Age

In terms of age, respondents were grouped into three age ranges: 17-25 years old, 26-45 years old and 45-65 years old. The three (3) age classes represent potential consumers as users of processed wood products. The survey results show that the 26–45-year class is the respondent who participated the most in the survey to find consumer preferences in using processed wood products in West Java Province; around 67% of respondents aged 26-45 years participated in answering survey questions.

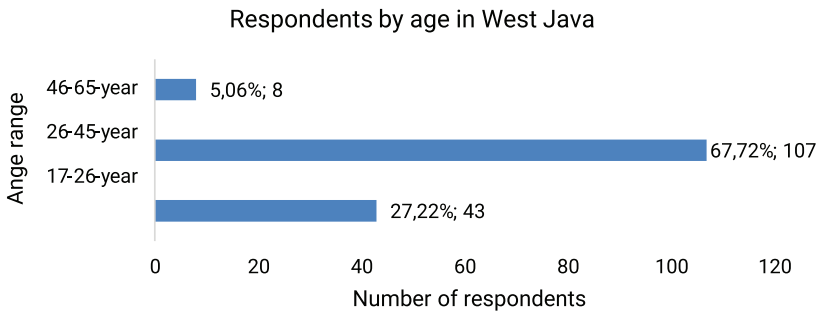


Figure 2 Respondents by age in West Java

2. Gender

Female respondents dominated in filling out the survey in both West Java Provinces. As in West Java Province, female respondents comprised 70.25% of the respondents.

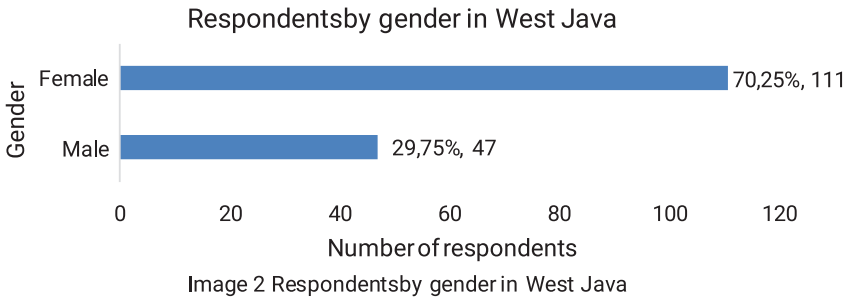


Image 2 Respondentsby gender in West Java

Figure 3 Respondents by gender in West Java

3. Education

There are five variables of respondents' education level, namely respondents with education level from college, high school, junior high school, elementary school, and not attending school. In West Java Province, 61.39% of respondents from high school education level dominated the survey, followed by 32.9% of respondents from tertiary institutions.

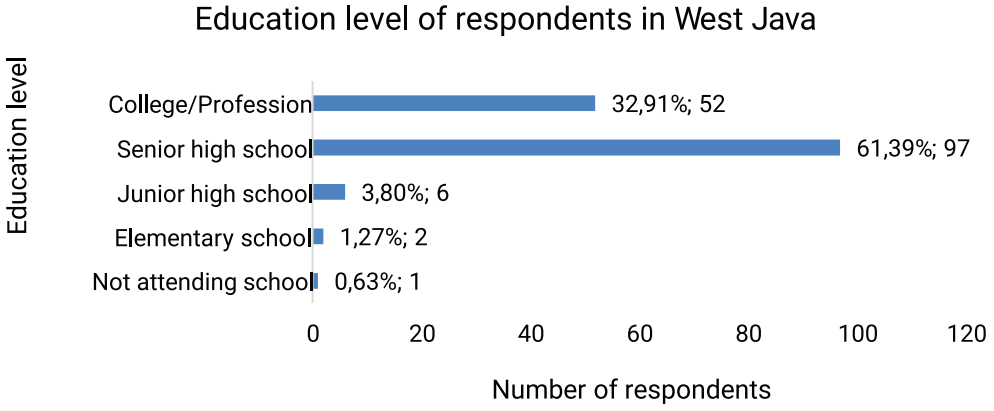


Figure 4 Education level of respondents in West Java

4. Income Level

Respondent's income levels fall into five income ranges: less than 5 million per month, 5-10 million per month, 10-15 million per month, 15-20 million per month, and more than 20 million per month. Figure 5 shows that most respondents in West Java Province have an income of less than 5 million / month, as much as 54.4%, followed by respondents with an income of 5-10 million / month, as much as 32.9%.

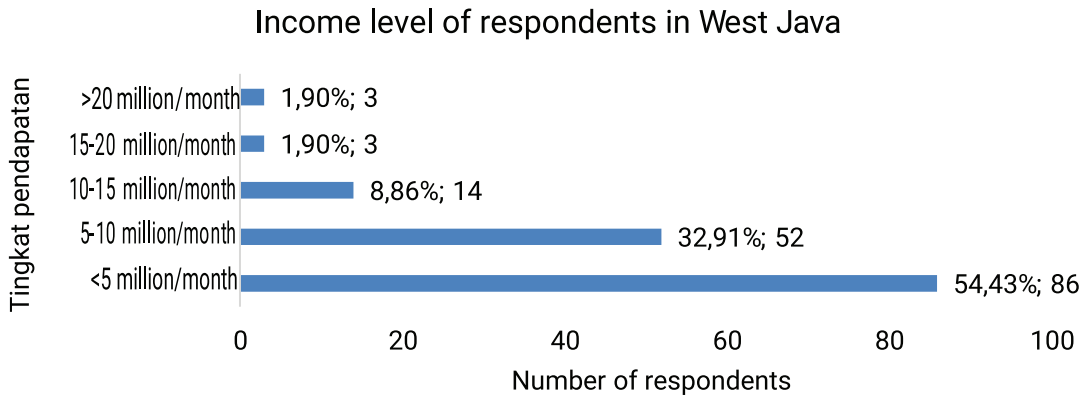


Figure 5 Income level of respondents in West Java

5. Type of Work

12 types of respondent occupations are part of filling out consumer surveys, including cashiers, private employees, entrepreneurs/self-employed, homemakers, farmers, traders, laborers, freelance, fresh graduates, developers, BUMN, academics, and ASN. Figure 6 shows that private employees are the most common respondents in West Java Province at 53.16%, homemakers at 17.7%, and self-employed/entrepreneurs at 13.9%, respectively. The presentation of information on the type of work of respondents in West Java Province is shown in Figure 6.

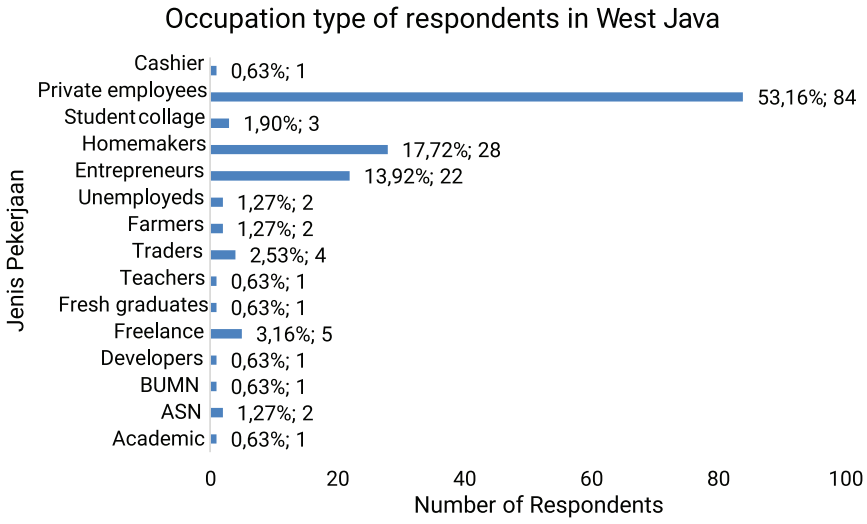


Figure 6 Type of occupation of respondents in West Java

4.1.2. Consumers' preference for the product by type of consumers

The survey was conducted to determine consumer preferences for the use of processed wood products and substitute products. The use of processed wood products includes furniture, handicrafts, and construction. Consumer preferences for various processed wood products are described in the section below.

1. Respondents' interest in furniture products in West Java

The survey shows that respondents still have a high interest in the use of wood products for furniture. The results shown in Figure 7 show that respondents in West Java prefer wood products for furniture as much as 63.9%, while interest in substitute products is 23.42%.

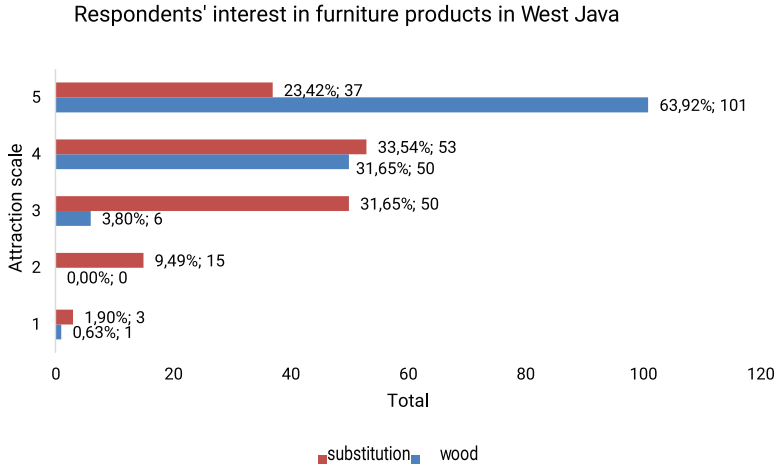


Figure 7 Respondents' interest in furniture products in West Java

2. Respondents' interest in wood products as construction in West Java

As with the use of wood for furniture, respondents in West Java Province also still have an interest in using wood for construction. The survey shows that around 44% of respondents are still interested in using construction timber with an interesting scale of 5, while for substitute goods, it has an interest level of 30%. Even on an interest scale of 4, the choice of using wood for construction is still high at 40%. The results of the survey with an interest scale of 1-5 for the use of wood as construction are presented in Figure 8.

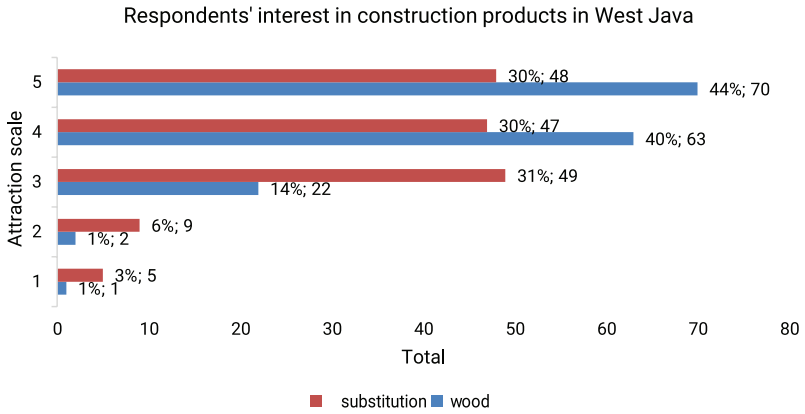


Figure 8 Respondent's interest in construction products in West Java

3. Respondents' interest in wood products as crafts in West Java

The use of wood as a craft product is also still in demand. Based on the results of the survey on respondents' interest in using wood as a craft, 59.49% of respondents were on an interest scale of 5 compared to 19.62% of substitutes. An attraction scale of 4 shows that wood and substitutes are close. Wood products were 28.48% while substitute products were 22.78%. The tabulation results are shown in Figure 9.

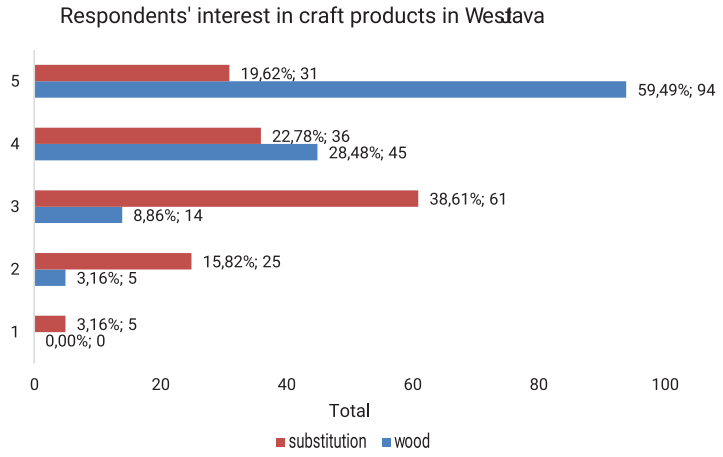


Figure 9 Respondent's interest in craft products in West Java

4. Respondents' interest when faced with wood compared to substitutes

To assess the level of interest of respondents when faced with the choice to use timber or substitute goods, an assessment was made using the criteria of a 1-10 rating scale. The results of the assessment showed that respondents were more interested in using timber than using substitutes. As shown in Figure 10, the interest in wood with the highest rating of 10 is 33%.

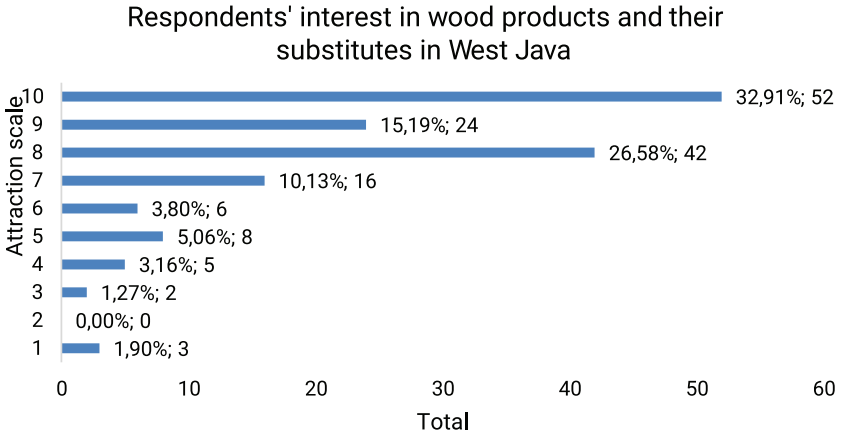


Figure 10 Respondent's interest in wood products and substitutes in West Java

5. Respondents' preferences on preferred wood products and substitutes

In addition to respondents' interest in wood products, there is also a choice of types of goods that are the choice of respondents. Based on the survey results, it is known that the types of goods with low prices and easy to find are favored by respondents for both wood products 46.84% and their substitute products 58.23%. Not only that,

respondents also chose discounted and negotiable products for wood products 19.62% and their substitutes 22.78%. The results of the survey on the types of goods with other classifications are presented in Figure 11.

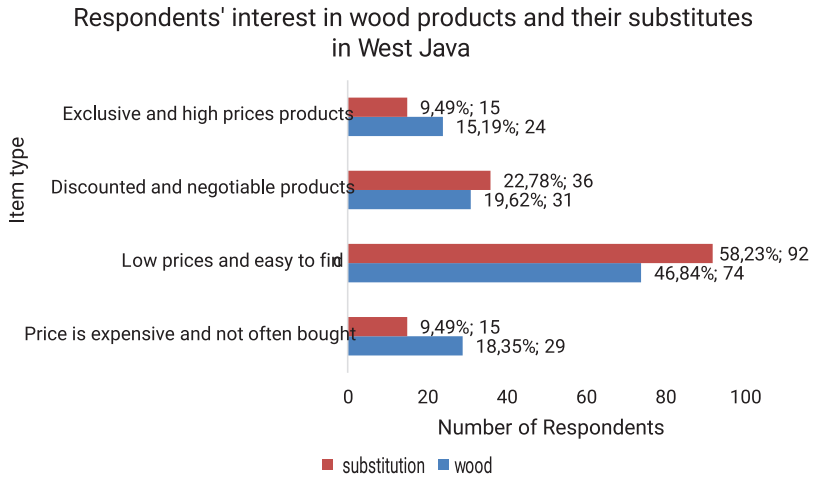


Figure 11 Respondent's interest in wood product types and substitutes in West Java

6. Respondents' preferences on design for wood furniture products and their substitutes

Based on various designs, the survey results show that the design of wooden furniture products that are in demand by respondents is whole furniture at 35.4%, then built-in furniture at 25.3%, and multifunctional furniture at 20.3%. At the same time, the preferred design choices for substitute products are built-in furniture at 26.6% and furniture with wheels at 22.8%.

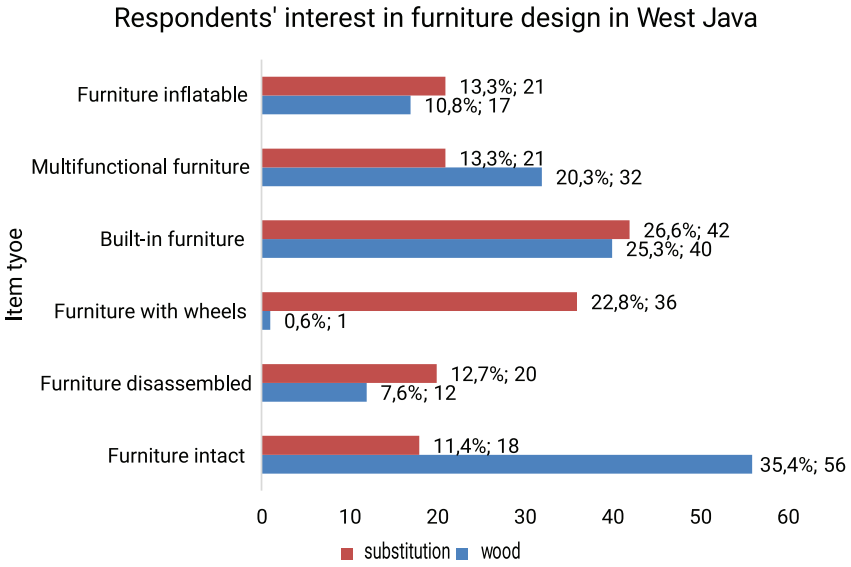


Figure 12 Respondent's interest in furniture design in West Java

7. Respondents' preferences on design for wood craft products and their substitutes

The various craft designs of interest to respondents included fashion and lifestyle craft designs, artwork, home décor, toys and more. The survey results show that the

choice of wood crafts for home decoration is the most preferred by respondents, which amounted to 48.10%, while for substitute goods, the respondents' preference was also 48.10%. The next most preferred craft product design was artwork at 39.24%. For fashion and lifestyle needs, substitute products were preferred by 39.24%, while wood products were only 5%. Overall, the most preferred designs for wood crafts and substitutes can be seen in Figure 13.

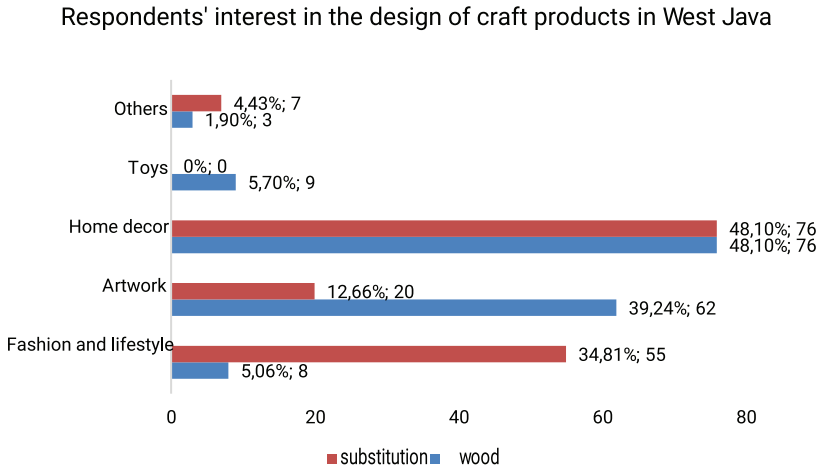


Figure 13 Respondent's interest in the design of craft products in West Java

8. Respondents' preferences on the price of wood furniture and handicraft products versus its substitutes

The survey results show that for the purchase of wooden furniture products, the cost that consumers can incur is in the range of IDR 1 – 3 million, with 37.97% of respondents. This is the same for substitute products; respondents can spend IDR 1 – 3 million, with 47.47% of respondents. The survey results regarding the costs that can be incurred for wooden furniture products and their substitutes are shown in Figure 14.

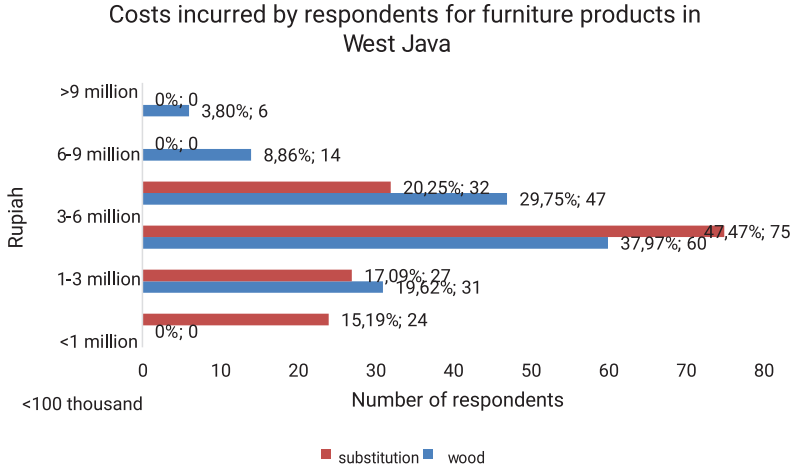


Figure 14 Costs incurred by respondents for furniture products in West Java

Figure 14 shows that consumers can spend much more on wood products when compared to substitute products. Consumers are still willing to spend between IDR 6 – 9 million and even more than IDR 9 million to buy wood products for furniture purposes.

In addition to furniture products, the costs that respondents can incur to buy wood craft products are, on average, in the range of IDR 1 – 3 million USD, with 41.8% of respondents. As for substitute goods, respondents can spend less than IDR 1 million, with 48.7% of respondents. However, some respondents can spend more than IDR 9 million to buy substitute craft products which is 3.8% of respondents. The results of the survey on the cost of purchasing wood handicraft products and substitutes in West Java Province can be seen in Figure 15. Looking at the figure below, the cost of buying handicraft products from substitutes is still higher than that of wood products.

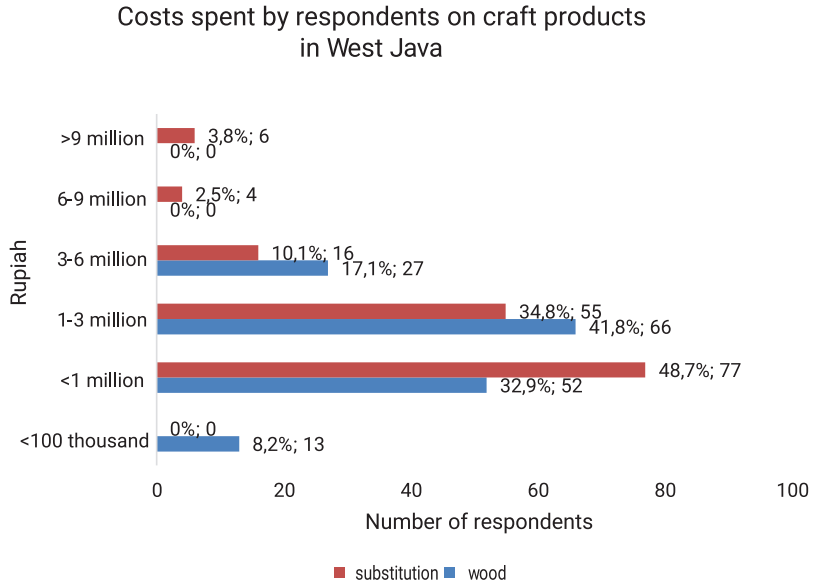


Figure 15 Costs spent by respondents on craft products in West Java

9. Respondents' preferences on the quality of processed wood products

Respondents' reasons for using engineered wood products are also determined by their knowledge of the product's quality. How superior the product determines the respondents' choice to use wood products or their substitutes. Respondents in West Java chose processed wood products because of their advantages of having a more beautiful appearance; this can be seen from the 28.6% of respondents who chose this advantage, followed by their environmentally friendly advantages with 28.4% of respondents.

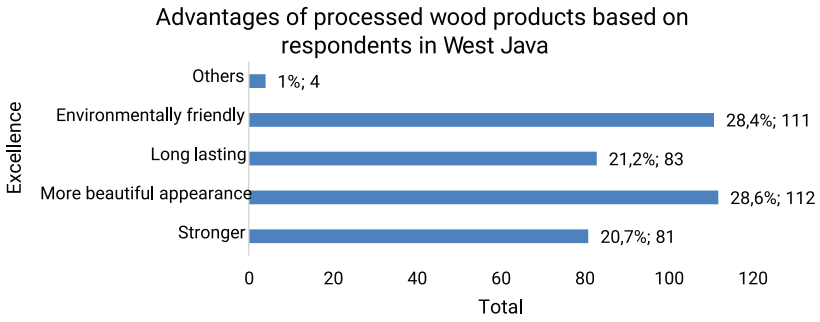


Figure 16 Superiority of engineered wood products by respondents in West Java

In addition to processed wood products, respondents also chose substitute products. Based on the survey results, respondents who dominated chose substitute products with waterproof advantages of 25.9%, followed by easy maintenance of 23.3%. Survey results on other aspects of excellence can be seen in Figure 17.

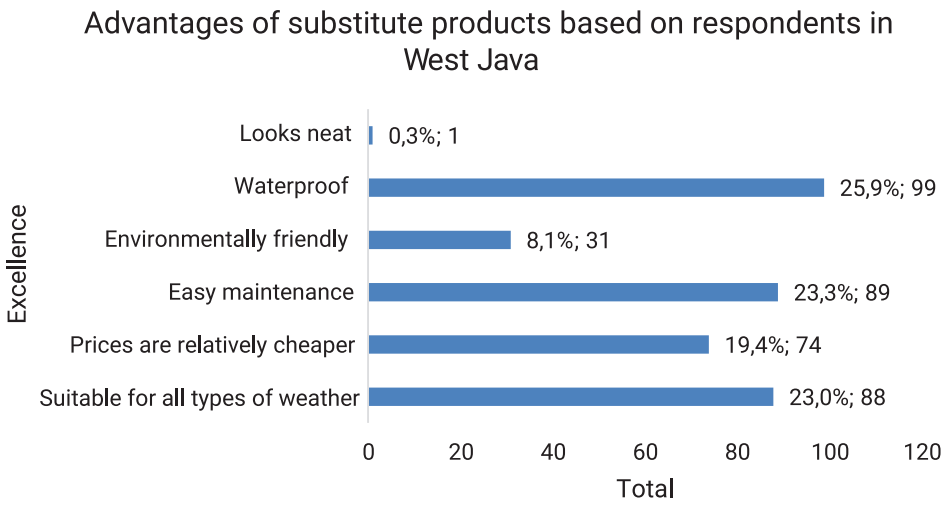


Figure 17 The superiority of substitute products by the respondent in West Java

Meanwhile, there are also disadvantages to using processed wood products. n. Specifically, the most prominent weaknesses of wood, according to respondents in West Java, are that it is susceptible to 34.5% termites, is not fire resistant 25.9%, and is not environmentally friendly 4.7%. The results of respondents' perspectives on the disadvantages of using wood products can be seen in Figure 18.

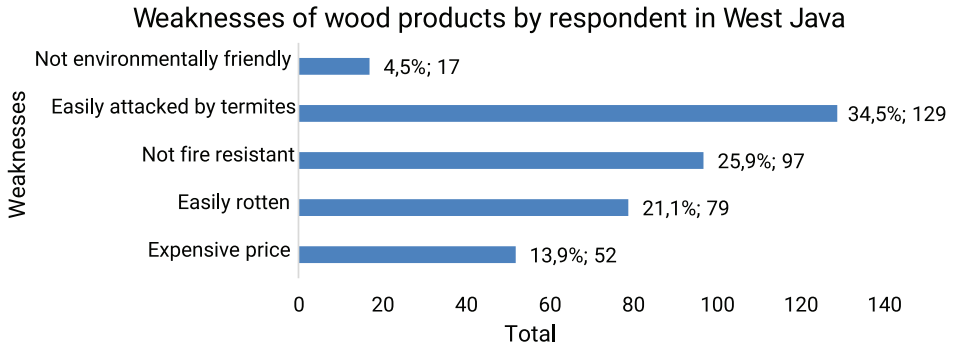


Figure 18 Weaknesses of wood products by respondents in West Java

Various negative campaigns that accuse using wood products of not being environmentally friendly are things that need to be straightened out through education to consumers. Some of the weaknesses regarding product strength should be answered through product innovations created by research institutions.

Substitute goods also have weaknesses. Respondents in West Java Province rated limited design at 50.8% as the most dominant weakness, followed by less robust materials at 33.7%. The survey results are shown in Figure 19.

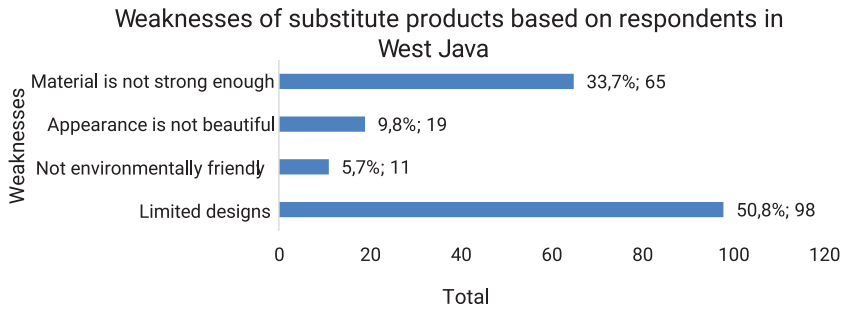


Figure 19 Weakness of substitute products by the respondent in West Java

10. Respondents' Preferences on type of payment for wood products

The payment method chosen by respondents in transactions to buy wood products and their substitutes is dominated by the cash payment method; this was obtained from 87.9% of respondents for wood products and 84.4% for substitute products. In addition to the cash method, there are also other methods such as debit/e- money, online, contract and credit payments. The survey results on payment methods are presented in Figure 20.

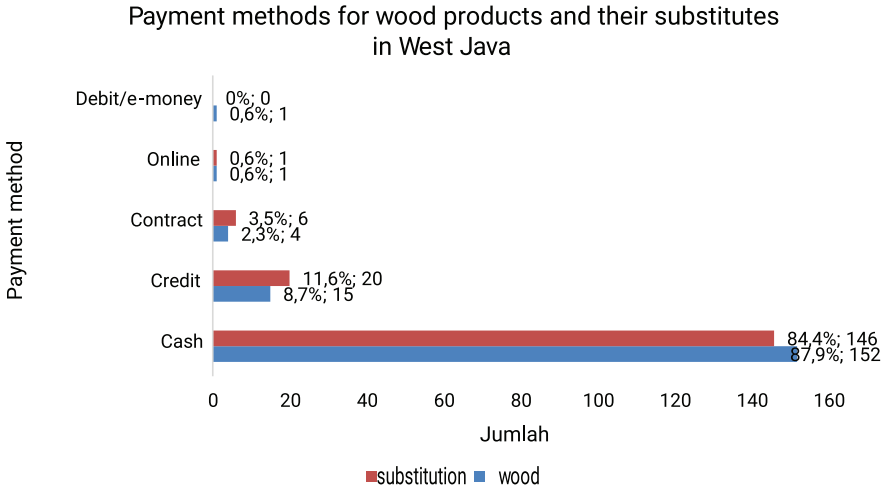


Figure 20 Payment methods for wood products and substitutes in West Java

11. Educational Facilities

Educational facilities are any form of facility or tool used to support and enhance the education and learning process. Educational facilities include various elements, both physical and non-physical, that are designed to create an environment conducive to improving knowledge, skills, and understanding. Wood product education tools play an important role in shaping public understanding of the sustainability, use, and benefits of wood products. Various options for educational tools can be implemented, and these choices depend on consumer preferences and behavioural trends.

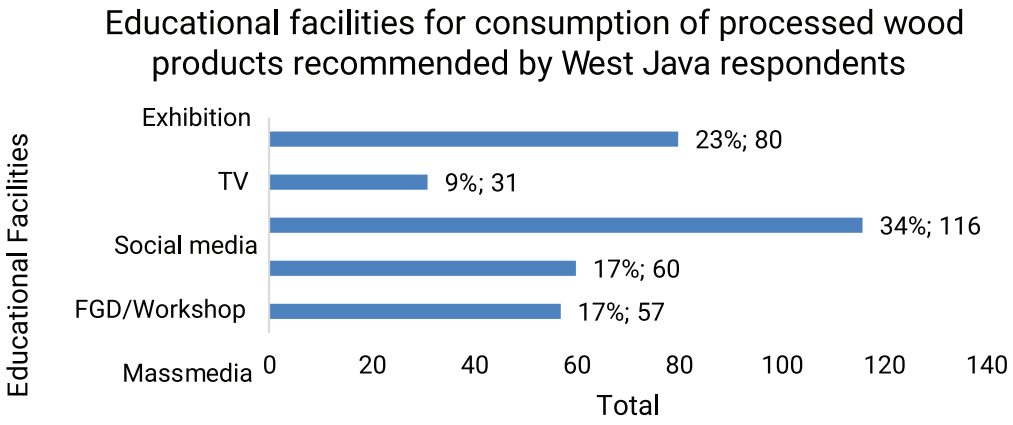


Figure 21 Educational facilities for consumption of processed wood products recommended by West Java respondents

Figure 21 provides an overview of the preference for educational tools for the consumption of processed wood products recommended by respondents from West Java. There are five options for educational tools evaluated, namely exhibitions, television (TV), social media, focus group discussions (FGDs)/workshops, and mass media. The use of social media stands out as the most recommended educational tool, with 34% of respondents stating that they find social media effective for understanding information about engineered wood products. This reflects a shift in consumer behavior that increasingly relies on social media platforms as a quick and easily accessible source of information.

The second highest choice was exhibitions, which received 23% of the support from respondents. Exhibitions provide an opportunity for consumers to see wood products in person, touch them, and get direct explanations from experts or manufacturers. This can be an effective means to increase consumer understanding and awareness of wood products. Meanwhile, TV showed a lower level of support, reaching only 9%. While TV is still a significant information channel, this result shows that people tend to prefer more interactive and flexibly accessible sources of information.

Regarding the gender of respondents, 70.25 percent of the respondents are female, and appropriate educational tools are recommended through social media and exhibitions. In summary, the role of women in the household is very important in creating and improving the resilience and welfare of families and communities. Thus, one of the important educational targets is women through social media and exhibitions. By understanding these preferences, those involved in the education of engineered wood products can direct their efforts more effectively. The use of social media and exhibitions can be increased to provide easily digestible and affordable information to the people of West Java, along with the shifting trend of consumer behavior in seeking knowledge about wood products.

12. Type of education

The type of treated wood product consumption education refers to the various methods and approaches used to provide consumers with information, understanding, and awareness about treated wood products. Figure 22 provides an overview of the

types of education on consumption of processed wood products recommended by respondents from West Java. There are six options provided for respondents to determine the type of education that is considered most relevant for educational activities, namely learning through the Internet, role-play stimulation, counselling, training, open discussions, and others.

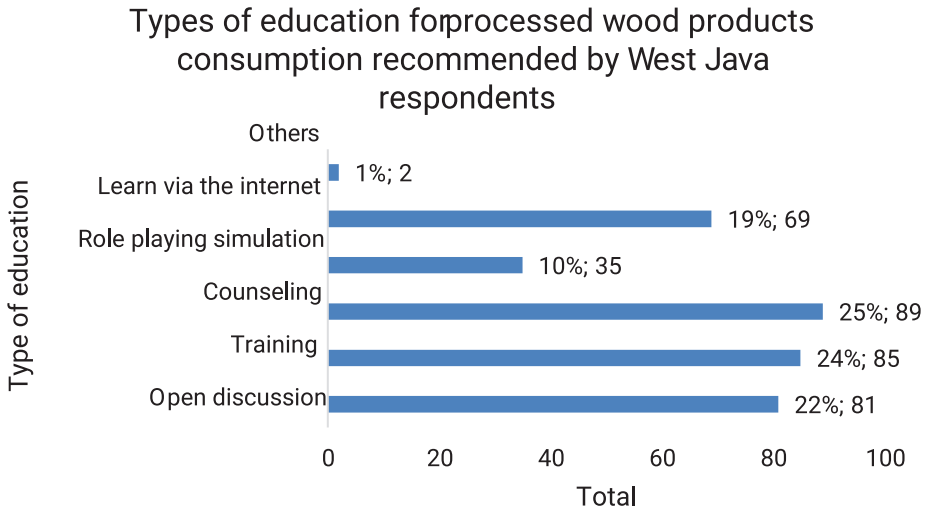


Figure 22 Types of education on consumption of processed wood products recommended by West Java respondents

The survey results show that extension emerged as the most recommended type of education, with 25% of respondents stating that extension is most relevant. Outreach provides direct, in-depth, and interactive information, which can improve consumers' understanding of engineered wood products.

The second highest choice was training, which received 24% support from respondents. Training shows that a hands-on, practical approach to teaching the use of wood products is considered effective by the community. Meanwhile, the other options had a relatively small percentage of 1%. These options may include preferences or creative ideas from respondents that need to be covered by the options provided.

Through this information, West Java communities are more likely to recommend an educational approach that involves counseling and hands-on training. Extension is perceived to provide in-depth knowledge, while training provides practical experience, both aimed at improving consumers' understanding and skills related to engineered wood products.

4.1.3. Information delivered in public education

Information about processed wood products is important in understanding their use, sustainability, and benefits. Misunderstandings related to the use of wood products that can damage the forest are still widely misunderstood, and this needs to be straightened out so that the sustainability of the forest and the wood processing industry can continue. Engineered wood has a variety of applications in the construction, woodworking, and furniture industries. Understanding the physical properties of wood can help consumers make wise choices in the use of this material. In addition, education

about the sustainability aspects and environmental impacts of engineered wood production is also highly relevant. This information can encourage more environmentally friendly decisions in choosing and using engineered wood products.

Figure 23 illustrates the advantages of processed wood products in West Java, with the highest result being 28.6%, stating that the appearance of wood is more beautiful. This reflects that the aesthetic aspect is the main factor considered by respondents when choosing processed wood products. Beautiful appearance provides added aesthetic value to wood products, both in the context of construction, furniture, and wood crafts.

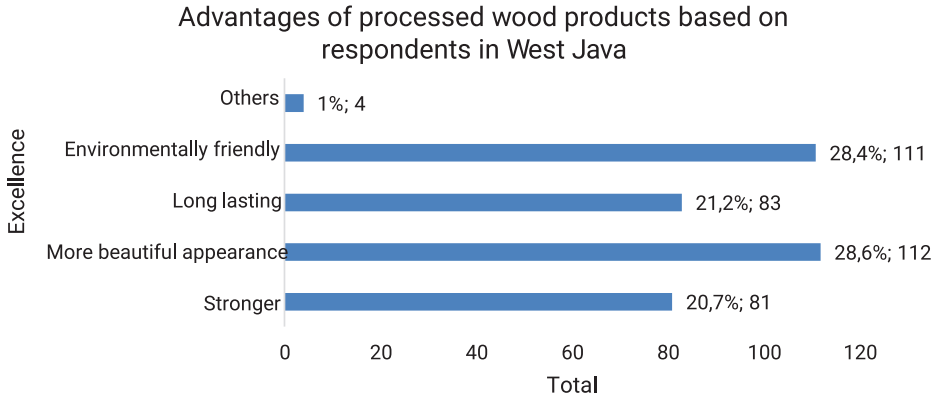


Figure 23 Superiority of engineered wood products based on West Java respondents

The smallest result, 1%, stating "other," indicates additional factors or advantages that may not be explicitly covered in the categories presented in the survey. These "other" factors could include specific advantages, such as sustainability, durability, or innovation in wood processing, that are not covered by the response options provided. From these data, people in West Java tend to appreciate the aesthetic appearance of processed wood as a major factor in the selection of wood products. This information can help develop marketing and production strategies to emphasize further the aesthetic advantages of wood products in the region.

Figure 24 provides an overview of the weaknesses of processed wood products in West Java, with the highest result being 34.5%, stating that they are susceptible to termites. This indicates that problems related to wood pests, such as termites, are a significant concern for people in the region. This may trigger concerns regarding the durability and longevity of wood products in an environment that may be susceptible to pest attacks.

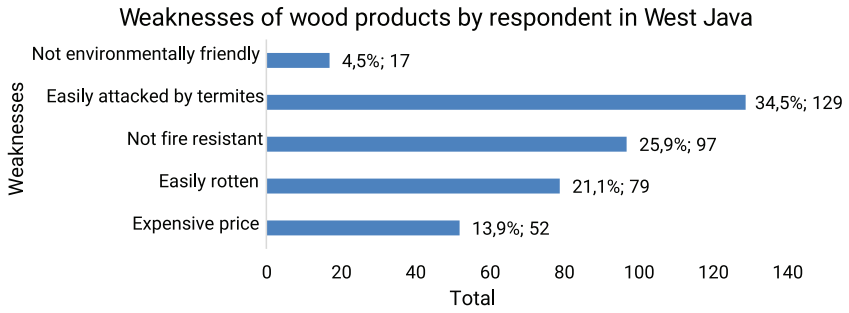


Figure 24 Weaknesses of engineered wood products by respondent West Java

The most minor result, 4.5%, stating that processed wood is not environmentally friendly, is of interest. A minority of respondents still maintain the traditional perception that the use of wood contributes negatively to the environment. Many engineered wood products obtained from sustainably managed production forests can be considered environmentally friendly. Research conducted by Lippke and Edmonds (2006) presents facts regarding the comparison of fossil fuel consumption in insulation and steelmaking to wood. The results showed that insulation and steelmaking require 82% more fossil fuels than processes involving wood. Along with this, it was found that the energy contribution from fossil fuels in the manufacture of basic materials such as wood is relatively small. However, further analysis of the use of steel in construction showed that 345% more energy was required for steel walls, while for concrete floors, the amount of energy required was even 150% higher than for wood floors. As a result, wood is not only a greener option due to its lower fossil fuel requirements but also due to its lesser impact on environmental pollution compared to the other two materials.

Paryoko and Rachman (2023) mentioned that engineered wood is the main choice as a furniture material that supports development. Not only is it environmentally friendly due to the sustainable production cycle, but it is also more friendly to the source of raw materials. This type of material not only has raw dimensions, which can reduce the amount of waste generated during the furniture production process but also allows its waste to be easily reused in creating derivative furniture products or complementing other furniture components.

4.1.4. Implementation of public education

One of the main strategies implemented to increase public understanding and awareness of wood products was the organization of educational seminars. The event was designed to involve various parties by presenting prominent speakers from academia and wood industry practitioners, as well as representatives from wood industry associations. The presence of prominent speakers is expected to provide in-depth insight into the sustainability and economic benefits of wood products. As part of a series of educational activities, there were workshops and educational video competitions.

1. Workshop

The workshop was geared towards providing participants with hands-on experience through panel discussions, case studies, and Q&A sessions. By involving various elements in a series of activities, participants are expected to gain a more thorough understanding of the critical aspects of using wood products.

The workshop with the theme “High Demand for Growing Forests: Potential and Challenges for Processed Wood Products” was a discussion forum that aimed to explore the potential and identify challenges associated with the increasing demand for processed wood products. Growing forests play a crucial role in meeting the needs of the timber industry, and the workshop aimed to discuss strategies that can increase the utilization of forest wood for furniture, wood crafts and construction. Below is the Rapporteur’s Report from the workshop:

EDUCATIONAL WORKSHOP

December 21, 2023

Caring for the Forest Through Wood Use

By: Prof. Sudarsono Soedomo, MS, MPPA, PhD (IPB University)

There have been many misleading slogans about forests, even slogans made by very well-known organizations with good intentions. For example, paper is made from cellulose, the main source of which is wood, and wood comes from forests, hence misleading slogans such as "Reduce the use of paper to preserve forests" and "Reduce the use of wood to preserve forests." Another analogy is a state forest that contains high-value timber; what will happen to the forest? The forest will be utilized but not restored (replanting), resulting in destruction because no one feels ownership of the forest. However, what about a private forest that contains high-value timber, what will happen to it? The forest will be utilized but will be replanted and managed correctly because the owner of the forest feels that the forest is valuable and must be planted so that it can be used again so that his forest becomes sustainable. It can be concluded that the sustainability of forests is not determined by the amount of use of products with raw materials derived from forests but by the clarity of ownership. For forests that have clear ownership, more use of products made from forest raw materials will further preserve the forest. Furthermore, in realizing good intentions, it is necessary to understand the correct science so that we need to be aware of every invitation, even those with good and noble intentions.

Community Preferences in West Java and Banten Provinces for Wood Products and their Substitutes

By: Prof. Dr. Ir. Bramasto Nugroho, MS (IPB University)

The decline in domestic consumption of wood products in Indonesia needs to be addressed by various efforts, including increasing public preference for the use of wood products rather than wood substitutes, providing more varied wood products for consumers, and reducing the use of wood substitutes so that domestic wood products will grow stronger and contribute more to the national economy. This study was conducted to determine the preferences of the people of West Java and Banten Provinces towards competing wood products and their substitutes. The number of respondents was 158 respondents in West Java Province and 30 respondents in Banten Province who were dominated by the age of 26-45 for West Java Province and in Banten Province, the last education was high school / high school / MA in West Java Province and in Banten Province. For the income of respondents in West Java Province, most had an income of < IDR 5 million per month, as well as respondents in Banten Province. The questionnaire results show that public interest in wood products is still higher and more attractive than substitute products in West Java and Banten. Purchases of wood products also show higher figures. The highest preference for wooden furniture design is for whole furniture, while wheeled furniture design is the lowest. In addition, the most preferred wood craft design is for artwork, while toys and other products are the lowest. The most desirable characteristics of goods and marketing systems are low-cost goods and similar prices among different brands, with sales at many retailers in locations near

the buyer. The main reason that wood products are perceived as superior to substitutes is their more beautiful appearance, while the advantage of substitutes lies in their lower price. The main weakness of engineered wood products, according to respondents, is that they are susceptible to termites, while the weakness of substitute products is limited design. The most recommended promotional media is social media, with the recommended frequency of promotion on a weekly basis.

Prospects for Using Wood for Construction Through Innovation and Technology Development

By: Prof. Dr. Ir. Naresworo Nugroho, MS (IPB University)

The development of innovation and technology in wood can improve the prospects of using wood. Wood has general properties that are easy to process, specific properties (strong, elastic, resilient) with distinctive patterns and colors, hygroscopic and anisotropic, and can burn and be attacked by wood-destroying organisms. From these general properties, the advantages of wood are high strength, low weight (strength to weight ratio), high resistance to chemical and electrical influences, sound, and heat insulation, etc. Meanwhile, the disadvantages of the wood itself are that it is less homogeneous and has defects (fiber direction, knots, etc.); some types of wood are less durable in certain circumstances, can expand and shrink with changes in humidity, and can become a source of food and shelter for wood destroying organisms. Indonesia has around 4000 species of wood, 200 of which are commercial timber, but there are problems in its procurement where high-strength grade wood is increasingly rare. The price is increasingly high and unaffordable.

Furthermore, affordable timber is low-strength grade timber derived from fast-growing species produced from industrial plantation forests or community forests; timber also has natural defects such as knots that can affect its strength. The current trend for lightwood is minimalist, modern, and affordable. Lightwood is also fast-growing and small in diameter, so it can play a crucial role in stabilizing the world's timber availability. To improve the quality and prospective use of lightwood requires innovation and technology. Currently, the Department of Forest Products of IPB University has produced various innovations and technologies to improve the prospect of using wood. Jabon Magnetic Wood (Istie et al., etc.) is a multifunctional magnetic wood that has the advantage of conducting heat, increasing thermal conductivity, absorbing electromagnetic wave radiation, and reducing health risks due to wave radiation. Then there are also Foamed Insulation Panels (Lukmanul *et al*.), namely the development of environmentally friendly products for insulation materials by utilizing palm trunk waste (BKS). Furthermore, there is also a Bamboo Sandwich Panels product (Naresworo Nugroho), which is a lightweight and strong panel product that utilizes the potential of bamboo in the form of reeds and slices / thin slices so that it is used as an earthquake-resistant material, multifunctional applications for room dividers, walls, roofs, ceilings, floors and as sound/sound insulation (impermeable) and good heat / thermal. The prospect of using wood can continue to be improved, and wood product innovation needs downstream and commercialization efforts in collaboration with strategic partners.

Prospects for Using Wood for Furniture to Encourage Domestic Wood Consumption

By: Dr. Indrawan S.Hut., M.M. (ASMINDO)

The use of wood for furniture has long been known in Indonesia. It is a hereditary culture indicated by the rapidly growing furniture industry centers in Java Island, where there are 1,849 companies with a capacity of 6.9 million tons consisting of various strata of companies. The furniture industry provides foreign exchange earnings with an export performance in 2022 of USD 2.81 billion. Also, it introduces local wisdom, namely products that are uniquely made from wood, rattan, bamboo, and natural fibers. Indonesia's furniture industry has great potential to be developed, starting from the human resources of Indonesia's skilled artisans, cultural wealth, and collaboration from government, academics, media, business associations, and communities. However, behind all this potential, some challenges need to be faced in developing the Indonesian furniture industry, namely the availability of raw and auxiliary materials, design and creation innovation, human resource competence, and appropriate technology for marketing and imported products entering Indonesia. Domestic market opportunities for furniture itself are influenced by the rapid growth of urbanization, which is one of the main drivers of furniture market growth in Indonesia. One of them is the development of IKN to become the epicentre of Indonesia's economic growth, which is expected to bring a multiplier effect to all industries, including the increasing need for furniture and handicrafts for the needs of housing construction, apartments, offices, etc. In addition, the increasing trend of sustainability is a significant furniture market trend in 2024. In 2024, the direction of the Indonesian furniture industry is to increase the use of sustainable materials in furniture production to encourage a green economy, adopt the latest technology for more effective and efficient production processes to produce functional and affordable products and improve management starting from supply chain mapping, factory sharing, technical education, and knowledge.

Processed Wood Product Innovation as a Modern and Minimalist Preference or Lifestyle

By: Ridho Barat Samudera (HIMASILTAN)

Wood-based furniture makes up most of the furniture produced in Indonesia and has the highest production value compared to other materials. Wood has advantages when made into various kinds of furniture, including being easy to process, having a good pattern and texture, and the surface being carved to increase its aesthetic value. According to the Ministry of Trade (2017), most of the furniture made from hardwood is produced by Small and Medium Enterprises (SMEs), which account for around 95% of total furniture production. Four pillars determine the competitiveness of Indonesian furniture products: Raw materials, production process, design and innovation, and marketing (AMKRI 2015). Related to raw materials, influencing factors are standardization of raw material quality, price stability, supply certainty, distribution chain efficiency, management technology, long-term sustainability, and infrastructure. The problem of processed wood products arises when the issue of deforestation and natural damage forms a mindset in the public that wood consumption is wrong, plus the emergence of various substitute products for wood competitors. Although the data obtained in the field, many people still prefer to use wood products. At present, young people's awareness of

back to nature is increasing, as seen from the back to nature movement, whose trend is getting higher, both in developing and developed countries tend to continue to increase so that in addition to innovation, adjusting to the needs of the community is the answer. Business actors of processed wood products need to have a distribution plan for marketing their products, starting from a clear and detailed target market that facilitates the marketing of processed wood products so that processed wood products remain the first choice for the intended target market. Furthermore, the marketing strategy to market and introduce current products is with two systems, namely paid and free. Paid promotion is carried out using paid advertising provided by well-known platforms and endorsing influencers following the target market, while free promotion is obtained by creating content on social media networks regularly; many business people often forget behavioural targeting. So, in this case, it can be concluded that in addition to product innovation, customization and something that is easily accessible are the answers to attracting the attention of young people and the public to adjust the use of processed wood products to modern lifestyles.

Asa for MSME Actor from the Village

By: Rachmat Mulyadi (UMKM actor of Rumah Kreatif Gembira)

Our team is a wood and bamboo waste craft business. It is like being a scavenger but is expected to contain its true meaning. The things we make from wood wastes are small, about 3-10 cm, but can be useful as key chains. Medium size 15-20 cm as an ashtray that children favor to adults. Starting from that craft, our team can continue to work on it so that it becomes part of MSMEs and can participate in exhibitions everywhere under the auspices of ANTAM Bogor. Although I was initially unfamiliar with this type of work, circumstances forced us to continue receiving orders such as plates, cups, and others. So far, if our team picks up existing wastes, they sometimes run out of stock, so we buy them. So, our condition when buying raw materials is an obstacle, so we must chase the demand. We utilize waste such as that washed up in the river so that it becomes an innovation. One waste can produce dozens of products. The various wastes that we use, whether they are still in good condition or even bad, can still be utilized. Cracked wood can still be repaired and improved into products rich in artistic value and favored by enthusiasts. Our team's marketing has so far received appreciation from the minister of KLHK and the minister of Tourism for buying our products. The artwork of our team expects millennials to take part, from being curious about the product to learning with us. The main activity of our business is drawing with wood and bamboo media, not on canvas, so there is no need to look far for materials. Buyers buy materials such as teapots and so on, and then our team teaches them to paint in the media. In the coming months, training will be held with the village head. We hope for encouragement and support so that our small businesses in the village can compete with those in the city. Even though the business is in the village, if it participates in a national-scale exhibition, the product will be recognized at the national level and has even previously reached other countries. The message is to let young people innovate and work so that waste or garbage can be valuable and useful, no matter how small it is.

The education organized has provided a clear and correct picture, as well as information, about processed wood products. The focus is to dispel misconceptions and provide the public with a deeper understanding of the positive contribution of wood products to the environment. Such accurate and clear information is key in shaping the right perception of wood products and supporting forest conservation efforts.

The importance of information lies in its ability to change the way people view engineered wood products. By introducing facts and reliable data, this education creates awareness that engineered wood can be a good choice for environmental sustainability. People are encouraged to see engineered wood as a resource that can be managed wisely to support forest conservation. The delivery of good information on the ecological and economic benefits of wise wood use has opened the eyes of many individuals to the positive contribution that the engineered wood industry can make.

It provides information on the sustainability of engineered wood products and highlights innovations in the industry. Information creates a strong foundation for innovation development, arousing curiosity, and interest in finding better solutions. With a better understanding of the innovation potential, the public can support the development of new technologies and practices in the engineered wood industry. As a result of this information, the development of innovation in the wood sector is expected to grow rapidly. The public becomes more open to engineered wood products that integrate the latest technologies and designs, fueling industry growth.

The importance of information in this context has also created changes in consumer mindsets and habits. Consumers' changing preferences towards engineered wood are creating a strong market share, driving the growth of the industry. With good information, the public can take a role in supporting the development of innovation and consumption, bringing a positive impact on the environment and the engineered wood industry. This creates an environment where the consumption of wood products becomes a choice that is increasingly valued and supported by society.

2. Educational Video Competition

In line with the educational objective, an educational video competition on wood products was also held. Participants were invited to design educational videos that could convey messages about sustainability, artistic value, and the benefits of wood products in a creative and informative manner. This competition involved participants in developing educational materials that could enrich the public's knowledge and understanding of the sustainability, artistic value, and benefits of wood products.

The educational video competition involved the active participation of six participants who focused on various aspects of forestry issues, particularly in the context of processed wood products. Each participant explored a different dimension to increase public understanding of the sustainability of the timber industry. In this competition, participants did not simply present information, but they detailed constructive solutions to the challenges faced by the forestry sector. From utilizing technology for forest management to educating consumers on timber certification, each presentation opened the horizons of view on various important aspects. The discussion of each participant in the educational video competition is asfollows:

Table 1 Video transcripts of educational video competition participants

Participant Name	Video Transcript
Ismawati	Welcome tree friends; in this video, we explore the world of eco-friendly engineered wood products. Products that are not only beautiful but also help protect the sustainability of our forests. Engineered wood products have their charms, but did you know that many of these products are now manufactured with sustainability in mind? Let us look at how these products not only benefit us but our planet. Each piece of wood has its uniqueness and characteristics. Engineered wood products bring a touch of nature into our homes; when buying engineered wood products, it is important to check for certification. One of the most popular is FSC, which is voluntary; the certification signifies that the wood comes from a well-managed forest. By choosing products that support sustainability, we help ensure that our forests remain balanced and provide long-term benefits. Not only that, innovation is also a part of engineered wood products. Many manufacturers are now using recycled wood to create products that are not only environmentally friendly but also reduce their carbon footprint. So, friends, we have seen how engineered wood products are not only beautiful but can also be part of the solution to keep our forests sustainable. Remember to support sustainability by choosing certified, engineered wood products and to understand their origins. Together, we can create a green future for generations to come.
Naufal A.	Did you know? Engineered wood products not only have functional value but also aesthetic and cultural value. In addition to having a unique carving motif, processed wood products also have a high durability value and are environmentally friendly. Can the use of processed wood products damage the forest? Wood is needed for industrial purposes, and it is supplied directly by production forests. Production forests are forests that are managed using sustainable principles so that there is continuity between the needs of the industry and the sustainability of the forest. Forest logging and forest utilization are regulated in Law No. 41 of 1999 concerning forestry, and regulations regarding wood forest product labels are regulated in the following Permen LHK No. 13 of 2017; this regulation discusses the efforts we will make for sustainable forest management as smart consumer and support forest sustainability, we should buy forest products with the following labels (LEI, PEFC, FSC). Here is an example of the production process of plywood products. Starting from the supply of raw materials, measuring, and recording of wood logs, stripping of log skins into veneer sheets, cutting veneers into short cores and long cores, drying using a steam machine or dryer, graining veneers, gluing, cold pressing, hot pressing, caulking then included in calibration standards, selecting, and packaging. The positive impacts of using processed wood products are protecting forests from deforestation, maintaining biodiversity, improving air quality, helping sustainable forests, and getting quality wood products. By using processed wood products wisely, you can help preserve forests in Indonesia. So, are you still hesitant to buy engineered wood products?
Ilham D.	Hudri Core is a family business engaged in woodworking. We can make wood or products that can be collaborated with wood. Hudri Core produces a variety of wooden crafts, such as saucepans, knife racks, kitchenware, plaques, and more. For raw materials, we currently do not produce our own, so we take it to a cutting place that is not illegal. Therole of sustainable business is to use wood where every piece of waste is not immediately disposed of. For example, there are pieces of wastethat we can use for other products, such as cutting boards made from modified teak wood waste. In addition, many products from waste wood pieces can be processed so that they have added value.

Chandra E.	You realize that we are always surrounded by forest products, one of which is wood. We often find processed products made from wood, but have you ever thought that products from wood itself can damage the forest? Kompas.com reported that products made from wood do not damage the forest. Is the use of wood products not going to reduceour forest land? If the production complies with sustainable forest management practices. An example is a table and chair. Even though many trees are cut down,the forest is not damaged if we follow or comply with sustainable forest management practices. One of the sustainable forest empowermentpractices is replanting and selective logging practices. So, how are your friends no longer curious about whether processed wood products damage the forest or not? If, for example, some think that products from the forest can damage the forest, we need to educate them.
Ditya K. P.	Did you know that sawdust waste can be processed into more useful items? Sawdust waste can be utilized not only as logs that are utilized into goods but, sawdust waste can also as block boards, which can then be used as tables or other products to increase their added value and income. The large demand for wood products while the growth of wood requires a long period as people who care about the environment, we can process sawdust waste into more valuable goods. How to process sawdust waste is by collecting sawdust, mixing wood particle glue with sawdust, putting the mixture into a mold, pressing using a press machine, drying the prints and, tidying up the prints, andgiving resin.
Syavina M.	Indonesia is a country with a million natural resources, and the potential of Indonesia's resources is the reason the world highlights Indonesia. Indonesia's natural resources include forests, seas, petroleum, and coal. Indonesia's forest wealth is a major factor in Indonesia's progress. Forests have various functions that are vital for the sustainability of ecosystems and human life; based on their functions, forests can be divided into several types, including conservation forests, protected forests, and production forests. These three types of forests show that forests not only provide ecological and environmental value but also provide economic benefits through theirnatural resources. One of them is the production forest, which is intended to produce natural resources. The use of processed wood products that do not damage the forest has been regulated in Government Regulation No.6 of 2007. Wood from production forests can be used to make various types of products such as construction wood, furniture, wood crafts, and so on. Several types of wood can be used for making furniture, namely meranti wood, keruing, mahogany, pine, sungkai, teak, and other woods. Then how is the furniture production process? It all starts with the design of the furniture design, the main raw material of round wood is selected, then sawn wood sorting is made, then the wood is dried, after drying the wood is shaved, then the wood is cut, shaped, and continued to the assembly stage until it becomes a furniture product. Then, the product is sandedand painted; rechecking must be done to ensure the product is guaranteed, and then packing and shipping are carried out. How about this, jungle friends? Indonesia's forest wealth is great, right? We mustrealize that we must maintain and preserve this wealth. From Forci, IPB quotes for what has a large state forest area, but the position and aspects of tenure are often forgotten; forest resources are more important than that.

Through this series of activities, public awareness of wood products will increase significantly. Involving speakers and holding an educational video competition is expected to create a positive impact on the public's perception of wood products while encouraging active participation in supporting the sustainability of the wood industry.

Speakers who are experts and competent in their fields are expected to deliver in-depth information, correct facts, and a broad perspective on the sustainability of wood products. Thus, the public can gain a better understanding of the benefits of using responsibly managed wood, as well as the positive contribution that the wood industry can make to environmental sustainability.

The educational video competition is expected to be a creative platform for the public to express their views on wood products and the sustainability of the wood industry. Participation in this competition is expected to stimulate creativity and public interest in conveying positive messages about wood products through the medium of video. Thus, information and understanding about wood products can be spread widely through social media and other online platforms.

Thus, this series of activities is expected to not only be a source of knowledge but also a driver of positive changes in people's views and actions towards wood products. Increased awareness is expected to have a positive impact on supporting the sustainability of the wood industry and environmental conservation more broadly.

4.1.5. Recommendation for public education in the future

In facing the future of the processed wood industry, the integration of social media, extension systems, and training is important to build further understanding among the public. Misleading slogans about forests, such as 'Use less paper to preserve forests' and 'Use less wood to preserve forests' must be rectified. In this context, these strategic recommendations are designed to create positive behavior change, promote environmentally friendly wood products, and inspire sustainability.

1. Social media as an agent of change

Social media has emerged as a major force that can change the paradigm in public education. Social media platforms can reach all levels of society, regardless of gender, occupation, or income. Using social media as the main tool for disseminating information and educational campaigns is a crucial strategy for reaching the public at large. Various platforms such as Instagram, Twitter, and Facebook can be used to shape public opinion and create awareness regarding the sustainability of the processed wood industry.

Social media platforms allow for two-way interaction between information providers and the public. Organizing quizzes, polls, and Q&A sessions on these platforms can increase public engagement. Engaging the public in conversations about sustainable wood products can create a deeper understanding. Social influencers have large followings on social media platforms. Building partnerships with them to support educational campaigns can increase message reach. Collaboration with social influencers who care about the environment can provide direct access to segments of society that may not have been reached.

Social media is not only a means of conveying information, but also a platform to build a community that cares about sustainability. Through focused and creative strategies, social media can be an effective agent of change in shaping people's behavior toward supporting a sustainable engineered wood industry.

2. Integrated extension and training system

Integrated outreach and training play a central role in creating a deeper understanding and positive behavioral change in the wood processing industry. This type of education is recommended for wood processing industry players. This approach ensures that education is not only informative but also involves the active participation of the community, creating a holistic learning experience.

Designing a comprehensive education program is key to the success of this system. Firstly, a curriculum needs to be developed that covers the various aspects of sustainability in the wood processing industry. This curriculum should be customizable to different groups of people, from students to industry stakeholders. Identifying the specific needs of the community will provide a strong foundation for designing counselling and training materials.

Involving interested parties, including producers, consumers, and local communities, in the development of educational programs can lead to richer and more relevant insights. Their involvement also ensures that the program can be implemented more effectively, as they have a first-hand understanding of the dynamics of the sector.

Training programs that focus on improving skills related to sustainable practices can help industry players adopt greener production methods. Involving workers in this process can increase the effectiveness of the training and ensure the implementation of new practices in the workplace.

A structured evaluation system needs to be implemented to measure the success of public education. This involves assessing public understanding, behavior change, and positive impacts on the sustainability of the processed wood industry. The evaluation data collected will form the basis for further program improvements.

Ensure the system is accessible to a wide range of people. Providing online access, and e-learning platforms can enable wider participation. An inclusive initiative that includes various layers of society will enrich discussions and ensure that sustainability messages can be delivered to all levels of society.

3. Productive workshops and seminars

Workshops and seminars are highly effective interactive platforms for designing public education recommendations for the future, especially regarding the environmentally friendly processed wood industry. This approach provides participants with a more in-depth, hands-on experience.

Workshops can be designed to engage participants directly in activities related to the processed wood industry. Eco-friendly product manufacturing, waste management, and wise utilization of natural resources can be the focus. The process of making products from forest to consumer can be explained interactively.

Figure 25 Poster of DKI Jakarta, West Java, and Banten Workshop

Figure 26 Documentation of West Java Workshop

Figure 27 Public Education in Banten Province

Figure 28 Poster of the Jakarta, Banten and West Java Competition Activities

Figure 29 Documentation of Educational Video Competition in Jakarta, Banten & West Java

Seminars can be held as a platform to discuss critical issues and solutions in the engineered wood industry. Inviting experts, industry practitioners, and stakeholders can provide in-depth insights to participants. Panel discussions and Q&A will enhance participants' understanding of the complexity of sustainability issues.

Seminars and workshops can serve as platforms to present the latest research results and innovations in the engineered wood industry. By sharing new knowledge, seminars, and workshops can foster discussion and collaboration to drive positive change in the industry.

4. Technology utilization

The technological revolution opens up new opportunities to design and implement effective public education on sustainability in the engineered wood industry. By utilizing technology, we can reach a wider audience, deliver information in innovative ways, and facilitate engagement on a larger scale, especially with the younger generation to enhance knowledge and engaging learning experiences.

Mobile applications can be an effective tool for delivering information to the public in real-time. These apps can include interactive learning modules, practical guides, and the latest news updates on developments in the engineered wood industry. With easy access through mobile devices, information can be disseminated quickly and reach various levels of society.

The use of games in the context of public education can create a fun and engaging learning experience. Educational games can be designed to convey sustainability concepts interactively. Players can engage in simulations of forest management, wood production processes, or the use of environmentally friendly wood products. Thus, understanding of sustainability can be enhanced more effectively. VR and AR technology can take the learning experience to a new level. People can experience first-hand the challenges and successes of the processed wood industry through VR simulations. The use of AR can provide additional information about wood products instantly through mobile devices, facilitating more sustainable consumer decisions.

Podcasts and webcasts on the sustainability of the engineered wood industry can be an easily accessible source of information. Involving expert speakers and entertainingly presenting content can increase appeal. Voice communication can also reach those who may prefer this medium.

4.2. Public education on the advantages of using wood products in Banten and DKI Jakarta

4.2.1. Characteristics of the target of public education

The study activity on the Development of a Variety of Enriched Wood ProductsSold in the Domestic Market in Banten Province and DKI Jakarta was carried out by collecting secondary and primary data by distributing questionnaires to the general public in Banten Province and DKI Jakarta. Respondent characteristics provide information on how responsive and adequate respondents are to answer and understand research questions. In general, respondents have five characteristics: age, class, gender, education, income, and type of work. Age and gender are considered not sufficient to represent the level of understanding of various research questions. However, with the existence of other respondent characteristics such as type of work, education, and income, understanding various research questions is expected to be easy, Roper (1940) argued that the classification of respondents for economic surveys is also determined by the type of occupation, level of education and income.

The Banten and DKI Jakarta provincial surveys have been conducted in 8 cities/ districts of 6 administrative cities. The areas include Cilegon City, Serang City, Serang Regency, Tangerang Regency, Tangerang City, South Tangerang City, Central Jakarta Administrative City, North Jakarta Administrative City, South Jakarta Administrative City, East Jakarta Administrative City, West Jakarta Administrative City. The total number of respondents in Banten Province and DKI Jakarta is 99 respondents.

1. Age

In terms of age, respondents were grouped into three age ranges: 17-25 years old, 26-45 years old, and 45-65 years old. The three (3) age classes represent potential consumers as users of processed wood products. The survey results show that the 26-45 year age class is the respondent who participated the most in the survey to find out consumer preferences in using processed wood products in Banten Province and DKI Jakarta; around 77.8% and 83% of respondents aged 26-45 years participated in answering survey questions.

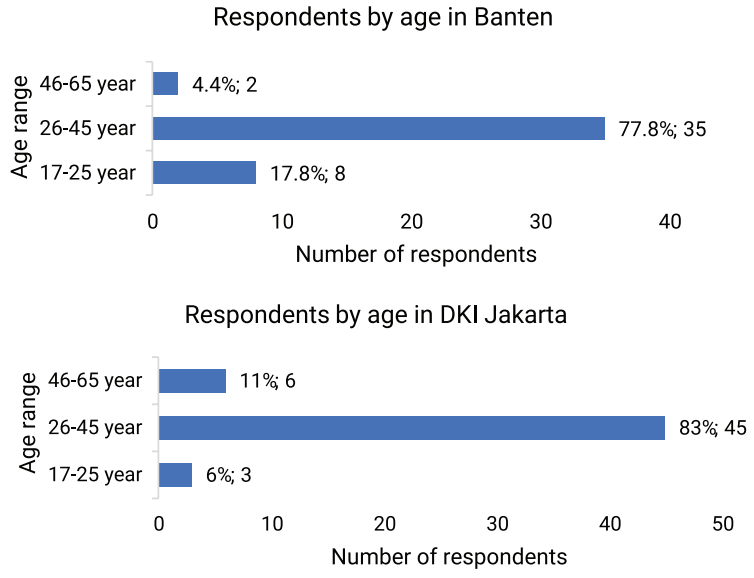


Figure 30 Respondent by age in Banten and DKI Jakarta

2. Gender

Female respondents dominated in filling out the survey in both Banten and DKI Jakarta Provinces. As in Banten Province and DKI Jakarta, female respondents were 53.3% and 56%.

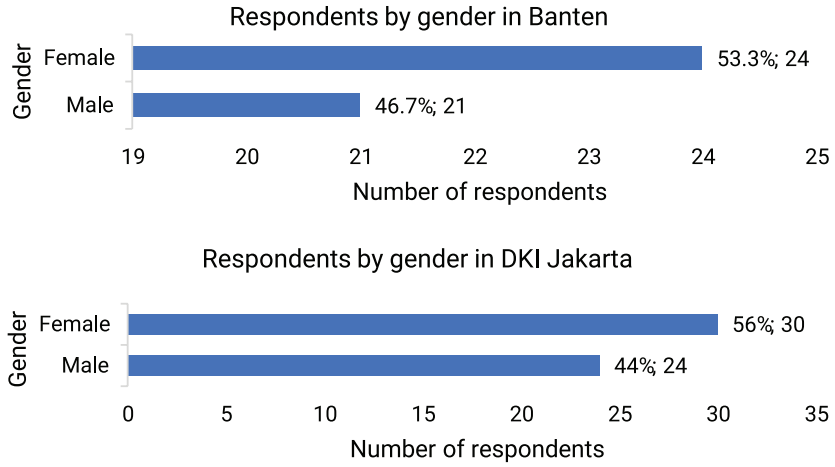


Figure 31 Respondents by gender in Banten and DKI Jakarta

3. Education

There are five variables of respondents' education level, namely respondents with education level from college, high school, junior high school, elementary school, and no schooling. In Banten and DKI Jakarta provinces, respondents with a high school education level dominated the survey participation at 51.1% and 52%, followed by respondents from tertiary institutions at 42.2% and 41%, and those with junior high schoolor junior high school had the lowest proportion at 6.7% and 7%, respectively.

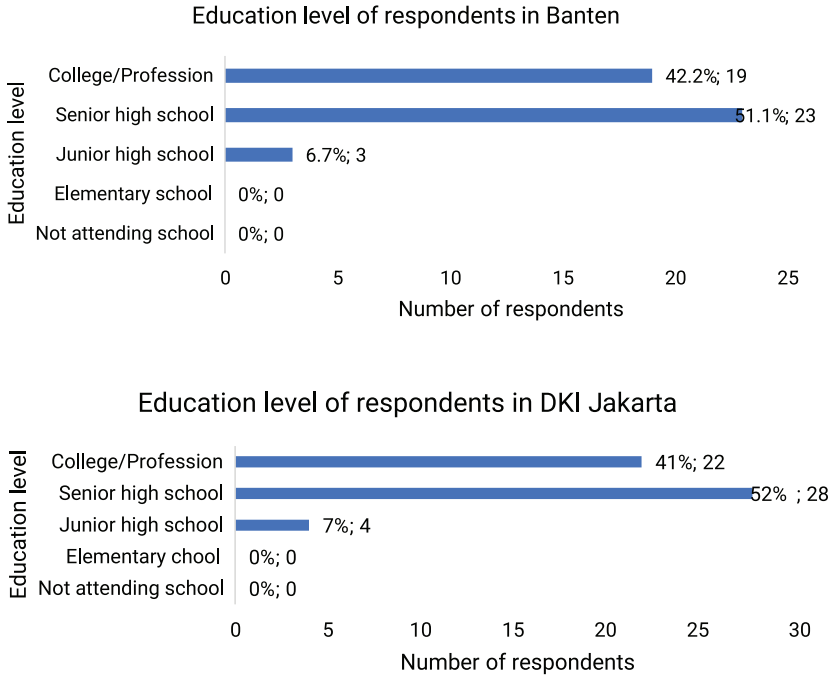


Figure 32 The education level of respondents in Banten and DKI Jakarta

4. Income Level

Respondent's income levels fall into five income ranges: less than IDR million per month, IDR 5-10 million per month, IDR 10-15 million per month, IDR 15-20 million per month, and more than 20 million per month. Figure 33 shows that the dominant respondents in Banten Province have an income of less than 5 million/month, reaching 48.9%, followed by respondents who have an income of 5-10 million/month. In DKI Jakarta Province, the majority of respondents have an income of 5-10 million per month at 56%, followed by respondents who have an income of less than 5million per month at 20%.

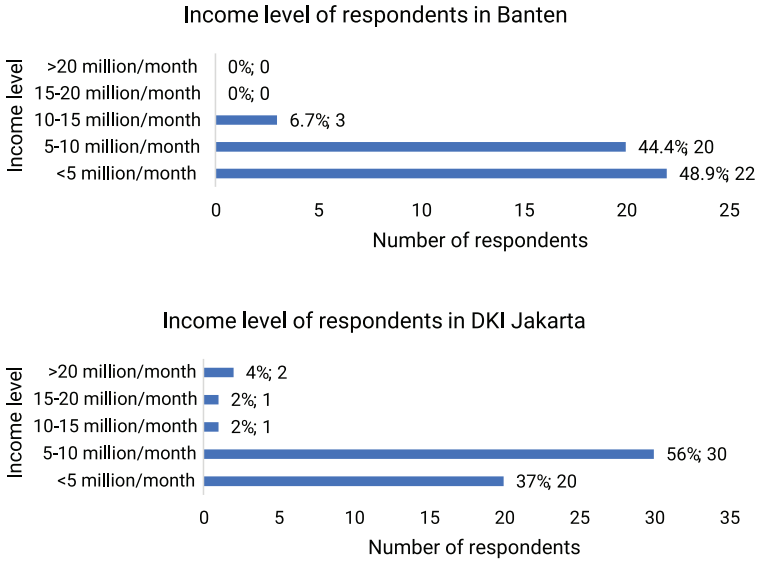
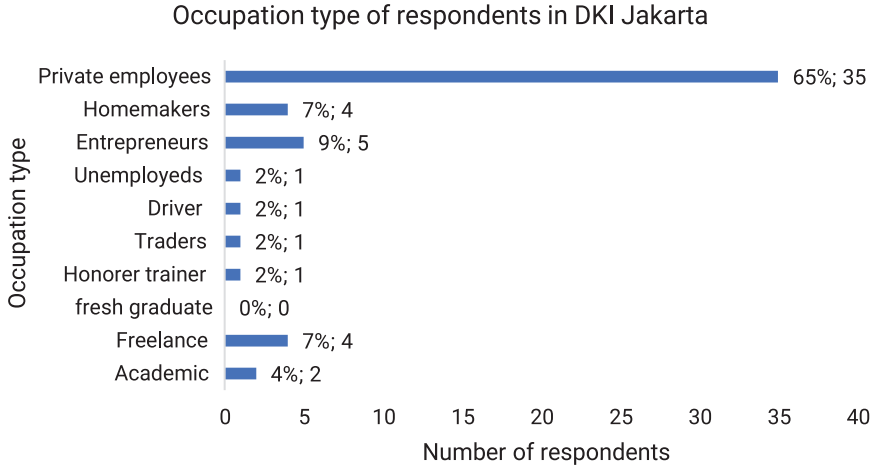


Figure 33 Income level of respondents in Banten and DKI Jakarta

5. Type of Work

14 types of respondent occupations are part of filling out consumer surveys, including, private employees, entrepreneurs / self-employed, homemakers, farmers, teachers, traders, laborers, *freelance*, *fresh graduates*, honorary trainers, *drivers,* BUMN, academics, and ASN. Figure 34 shows that the majority of respondents in Banten Province and DKI Jakarta work as private employees, 62.2% and 65%, respectively. This data provides a comprehensive picture of the demographic profile of respondents in the context of consumer preferences for processed wood products in Banten Province and DKI Jakarta.



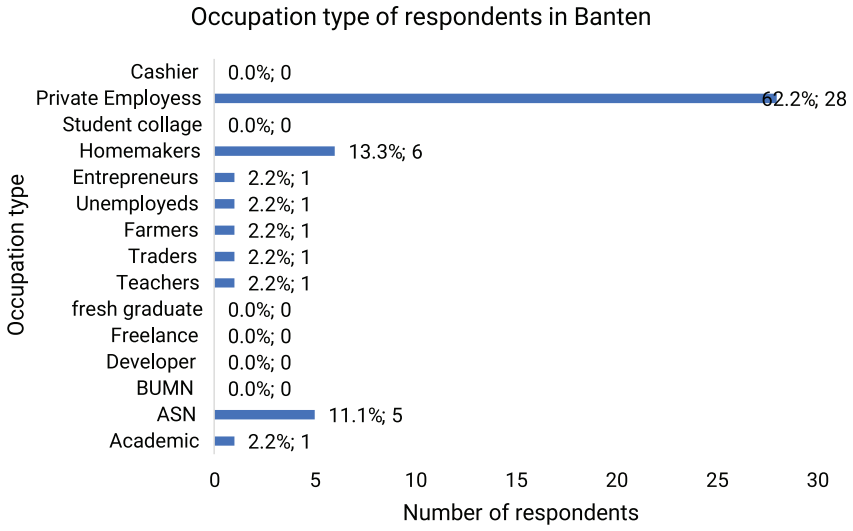


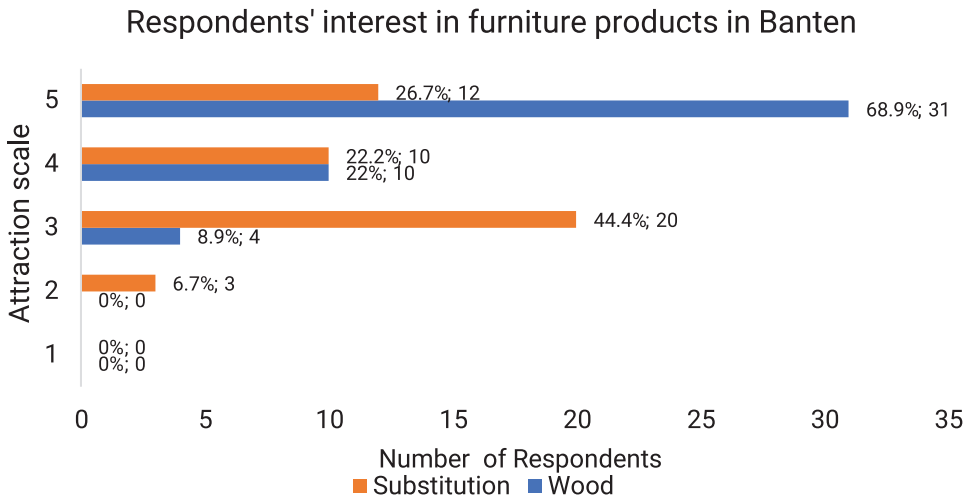
Figure 34 Type of occupation of respondents in Banten and DKI Jakarta

4.2.2. Consumers' preference for the product by type of consumers

The survey was conducted to determine consumer preferences for the use of processed wood products and substitute products. The use of processed wood products includes furniture, handicrafts, and construction. Consumer preferences for various processed wood products are described in the section below.

1. Respondents' interest in furniture products in Banten and DKI Jakarta

The survey shows that respondents in Banten still have a high interest in the use of wood products for *furniture*. The survey shows that respondents in Banten prefer wood products for *furniture* as much as 68.9%, while interest in substitute products is 26.70%. Meanwhile, in DKI Jakarta , the results show that respondents prefer wood products for *furniture* as much as 54%, while interest in substitute products is 37%.



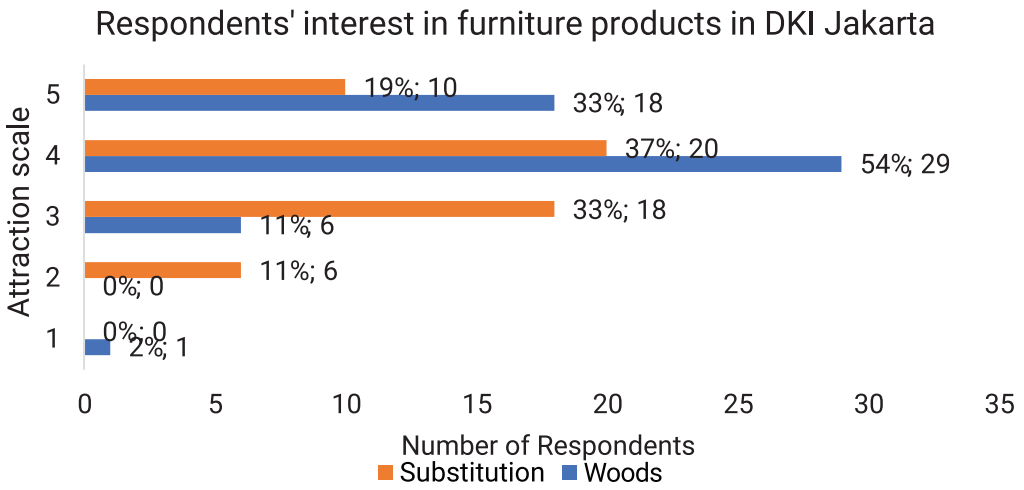
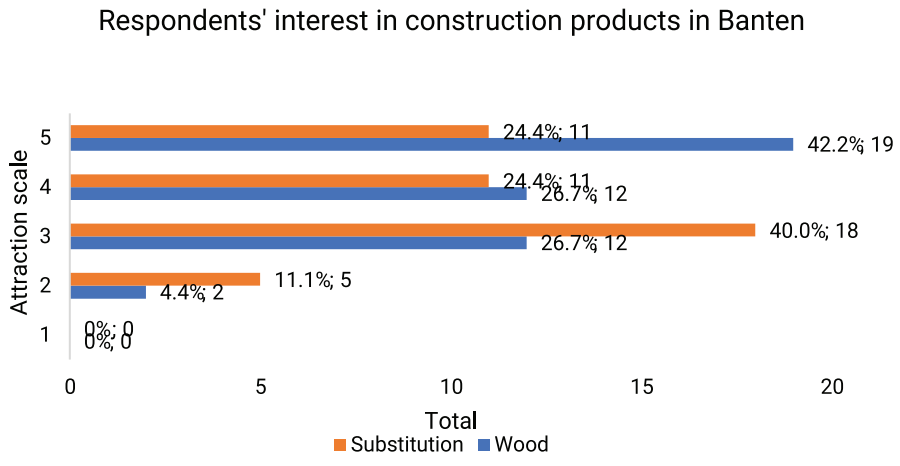


Figure 35 Respondents' interest in furniture products in Banten and DKI Jakarta

2. Respondents' interest in wood products as construction in Banten and DKI Jakarta

As with the use of wood for furniture, respondents in West Java Province also still have an interest in using wood for construction. The survey shows that around 44% of respondents are still interested in using construction timber with an interesting scale of 5, while for substitute goods, it has an interest level of 30%. Even on an interest scale of 4, the choice of using wood for construction is still high at 40%. The results of the survey with an interest scale of 1-5 for the use of wood as construction are presented in Figure 36. As with the use of wood for *furniture*, respondents in Banten Province and DKIJakarta also still have an interest in using wood for construction. The survey in Banten Province shows that around 42.2% of respondents are still interested in using construction timber, with an interesting scale of 5. In comparison, substitute goods have an interest level of 24.4%. For an attraction scale of 3, the choice of using substitutes for construction is also higher at 40%, while wood is at 26.7%. Meanwhile, the survey in DKI Jakarta Province shows that around 52% of respondents are still interested in using construction timber with an interest scale of 4. In comparison, substitute goods have an interest level of 48%. Foran attraction scale of 5, the choice of using wood for construction is also still high at 26%. The results of the survey with an interest scale of 1-5 for the use of wood as construction are presented in Figure 36.



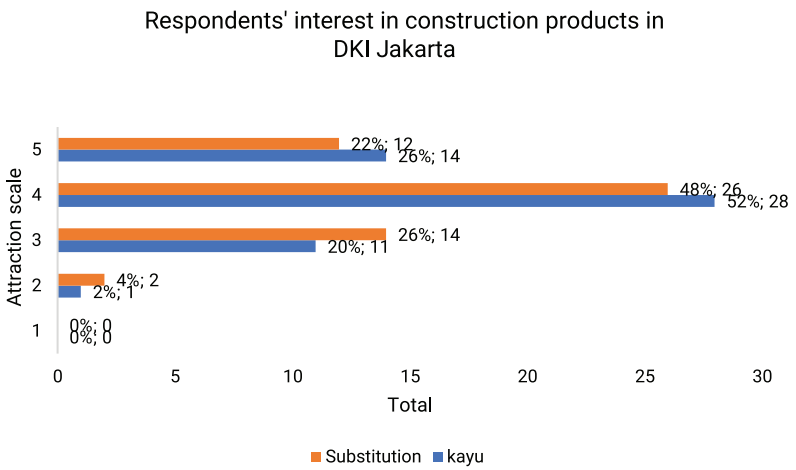


Figure 36 Respondents' interest in construction products in Banten and DKI Jakarta

3. Respondents' interest in wood products as crafts in Banten and DKI Jakarta

The use of wood as a craft product is also still in demand. The survey results in Banten Province show that respondents' interest in the use of wood as a craft has a high value with an interesting scale of 5, 56% of respondents, compared to substitute goods, 20%. An attraction scale of 4 shows that wood and substitute goods are at a similar level of attraction. Wood products were 28.90%, while substitute products were 17.8%. Meanwhile, the survey results in DKI Jakarta show that respondents' interest in the use of wood as a craft has a high value with an interesting scale of 5, 56% of respondents compared to 20% of substitute goods. An attraction scale of 4 shows that wood and substitute goods are at the same level of attraction. Wood products were 28.90%, while substitute products were 17.8%.

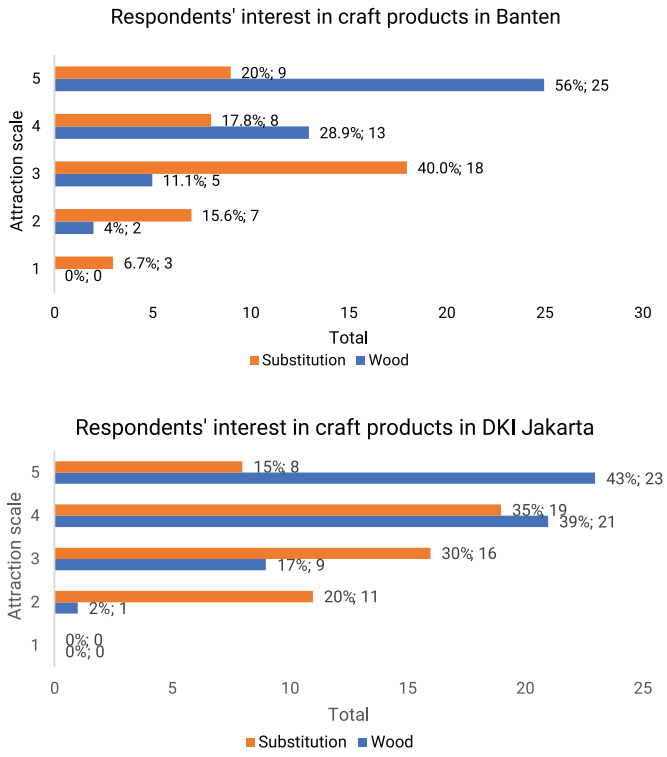


Figure 37 Respondents' interest in craft products in Banten and DKI Jakarta

4. Respondents' interest when faced with wood compared to substitutes

To assess the level of interest of respondents when faced with the choice to use wood or substitute goods, an assessment was made with the criteria of a 1-10 rating scale. The results of the assessment show that respondents in Banten Province are interested in choosing to use wood when compared to the option of using substitute goods. As shown in Figure 38, the interest in wood with a rating of 8 is 28.9%. Meanwhile, the highest rating of 10 is 24.4%. Meanwhile, in DKI Jakarta, the assessment results show that respondents are interested in choosing to use wood when compared to the option of using substitute goods. The interest in wood, with a rating of 9, is 22%. Meanwhile, the highest rating of 10 and rating of 8 have the same value of 19%.

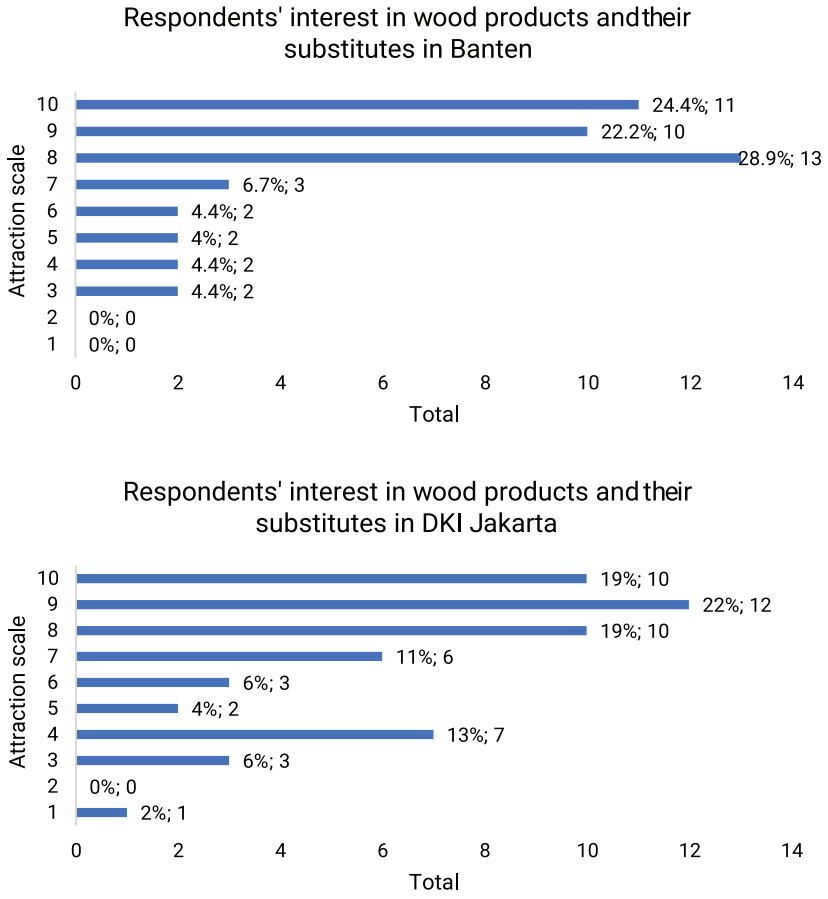


Figure 38 Respondents' interest in wood products and substitutes in Banten & Jakarta

5. Respondents' preferences on preferred wood products and substitutes

In addition to respondents' interest in wood products, there is also a choice of types of goods that respondents prefer. The survey results in Banten Province show that the types of goods with low prices and easy to find are favored by respondents for both wood products 48.9% and their substitute products 75.6%. Respondents also chose the type of product with discounts, which can be negotiated for wood products at 20% and substitutes at 16%. Meanwhile, the survey results in DKI Jakarta show that the types of goods with low prices and easy to find are favored by respondents for both wood products, 57%, and their substitute products, 56%. Not only that, respondents also chose the type of price that is quite expensive and not often purchased for wood products 22% and its substitutes 26%.

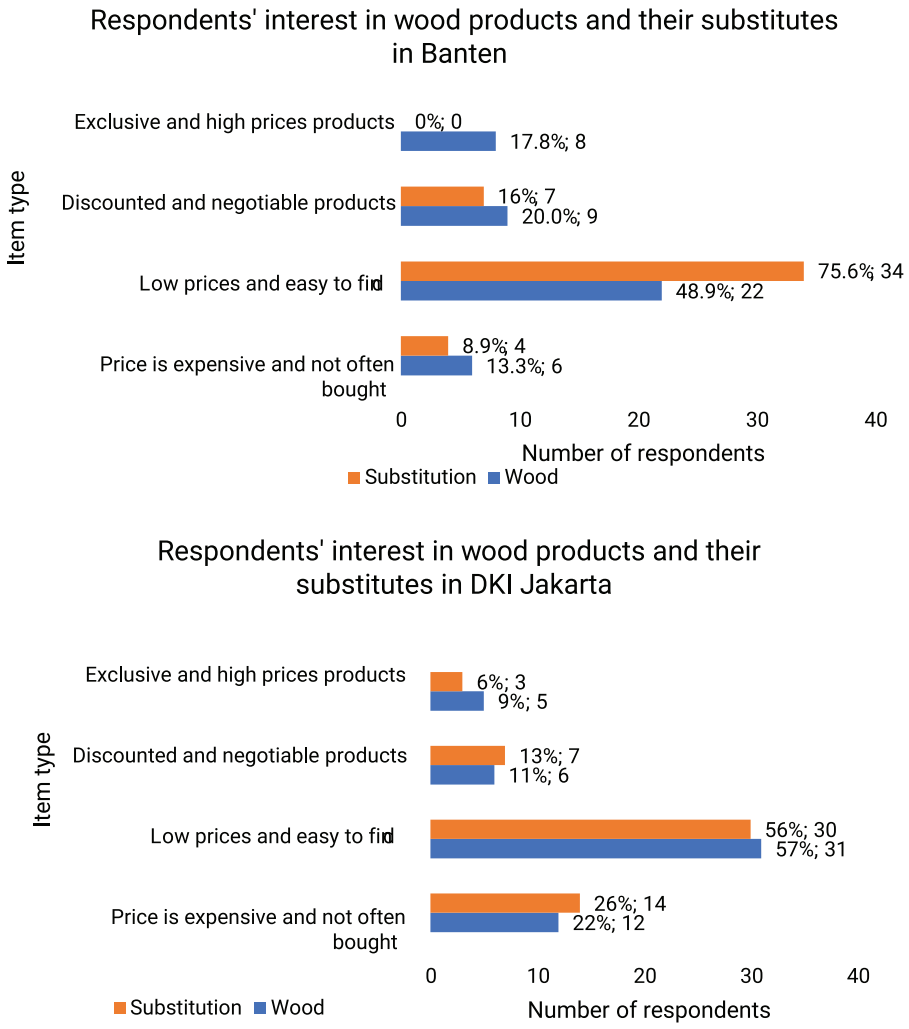


Figure 39 Respondent's interest in wood product types and substitutes in Banten and DKI Jakarta

6. Respondents' preferences on design for wood furniture products and their substitutes

Based on various designs, the survey results in Banten Province show that the design of wood furniture products that are in demand by respondents is whole furniture at 35.6%, then multifunctional furniture at 22.2%, and built-in furniture at 20.0%. Meanwhile, the preferred design options for substitute products are built-in furniture at 24.4% and built-in furniture at 22.2%. Meanwhile, in DKI Jakarta the design of wood furniture products that respondents demand, is intact furniture at 28%, followed by built-in furniture and built-in furniture at 20% each. In comparison, the preferred design choices for substitute products are installed furniture at 35%, unassembled furniture, and furniture with wheels at 17% each.

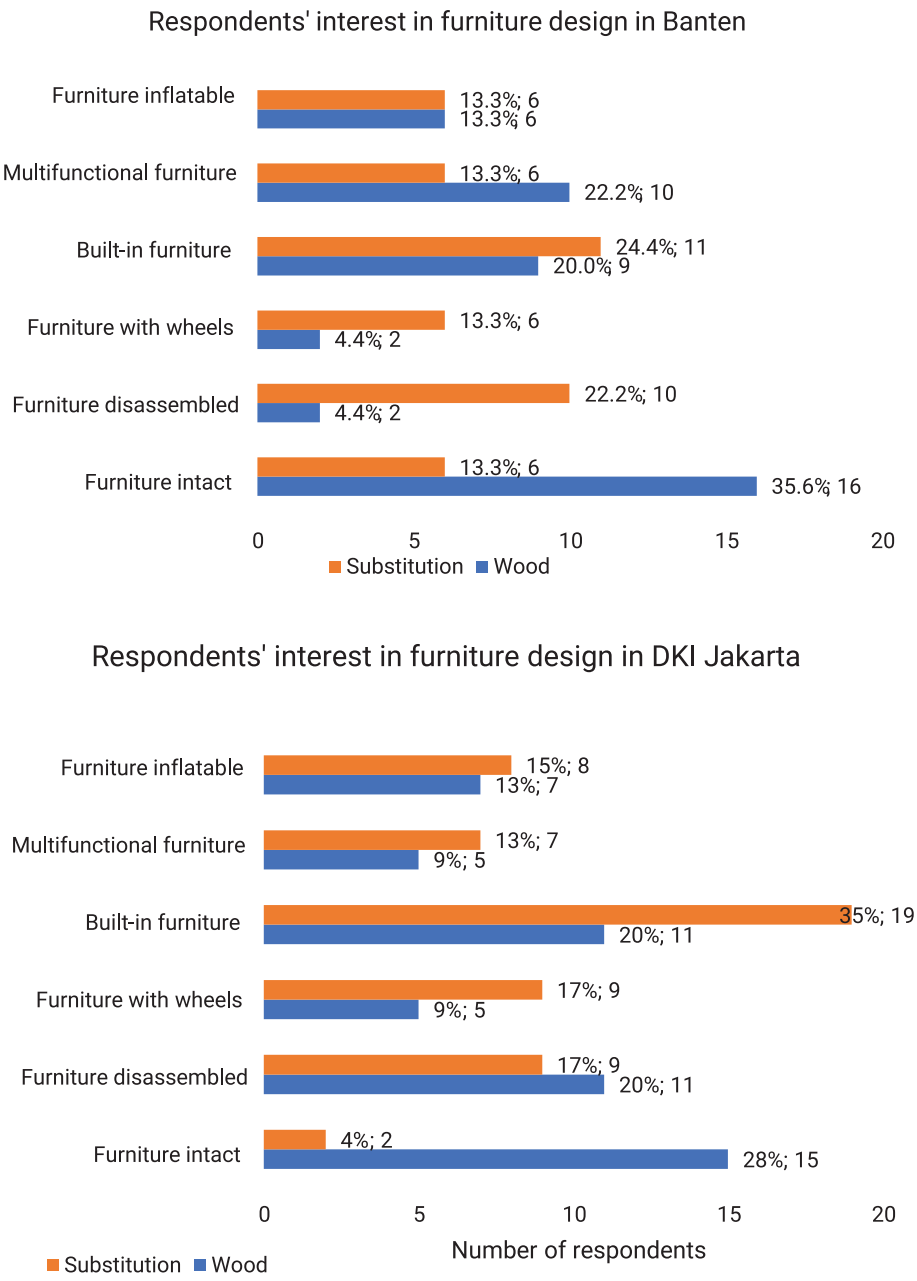


Figure 40 Respondent's interest in furniture design in Banten and DKI Jakarta

7. Respondents' preferences on design for wood crafts and their substitutes

The various craft designs that were of interest to respondents included *fashion*and *lifestyle craft* designs, artwork, home decoration, toys and others. In Banten, the choice of wood crafts that respondents are most interested in is artwork crafts, which amounted to 44.4%, and substitute products only amounted to 8.9%. Meanwhile, *fashion* and *lifestyle* substitute products were more popular at 42.20%, while wood products were only 6.7%. In DKI Jakarta, 41% of respondents were interested in home décor and 50% in substitute products. Meanwhile, for substitute products, wooden arts and crafts were more popular at 37% and substitute products at 20%. Respondents only chose substitute products for fashion and lifestyle needs at 26%.

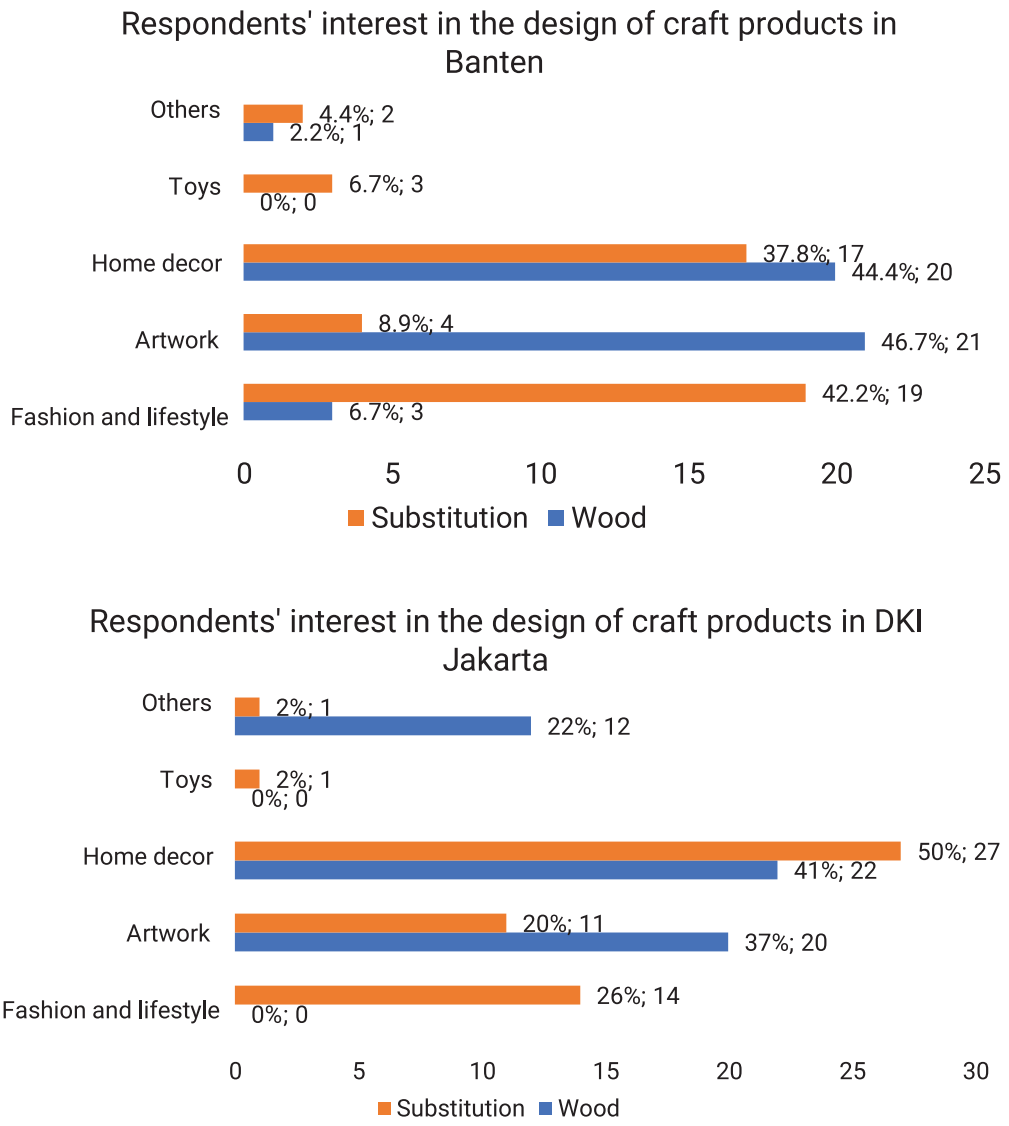


Figure 41 Respondents' interest in the design of craft products in Banten and DKI Jakarta

8. Respondents' preferences on the price of wood furniture and handicraft products versus its substitutes

The Banten Province survey results show that for the purchase of wooden *furniture* products, the cost that consumers can incur is in the range of IDR 1 – 3 million, with 37.8% of respondents. Respondents who chose to spend a range of IDR 3 – 6 million to buy wooden *furniture* products and substitutes amounted to 35.6% each. The survey results regarding the costs that can be incurred for wooden furniture products and their substitutes are shown in Figure 42.

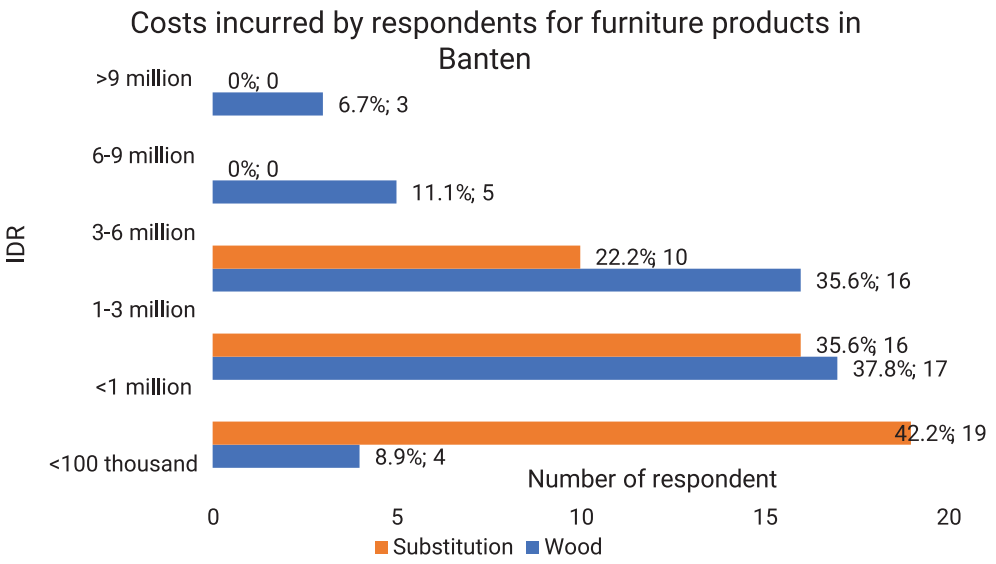


Figure 42 Costs incurred by respondents for furniture products in Banten

By looking at the figure above, consumers can spend much higher costs to buy wood products when compared to substitute products. Consumers are still willing to spend between IDR 6 – 9 million, even more than IDR 9 million to buy wood products for *furniture* purposes.

In addition to *furniture* products, 55.6% of respondents would spend less than IDR 1 million to buy woodcraft products. As for substitute goods, respondents who can spend IDR 1 – 3 million are more numerous, with 36% and 26.7%, respectively.

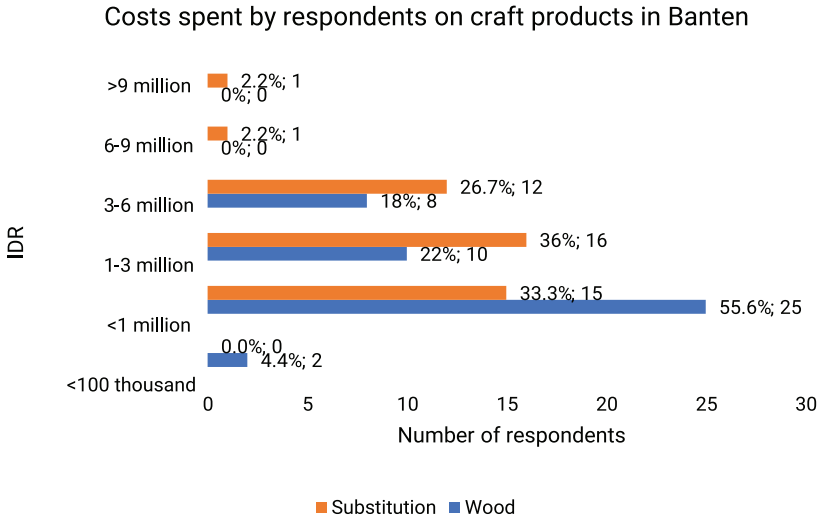


Figure 43 Costs spent by respondents on craft products in Banten

Looking at the figure above, the cost of buying handicraft products from substitutes is still higher than that of wood products. Meanwhile, the survey results in DKI Jakarta show that for the purchase of wooden *furniture* products, the cost that consumers can spend is in the range of less than IDR 1 million, with 39% of respondents. However, 35% of respondents were able to spend IDR 3 – 6 million to buy *furniture* from wood products. Respondents chose to spend a range of less than IDR 1 million to buysubstitute *furniture* products by 48%.

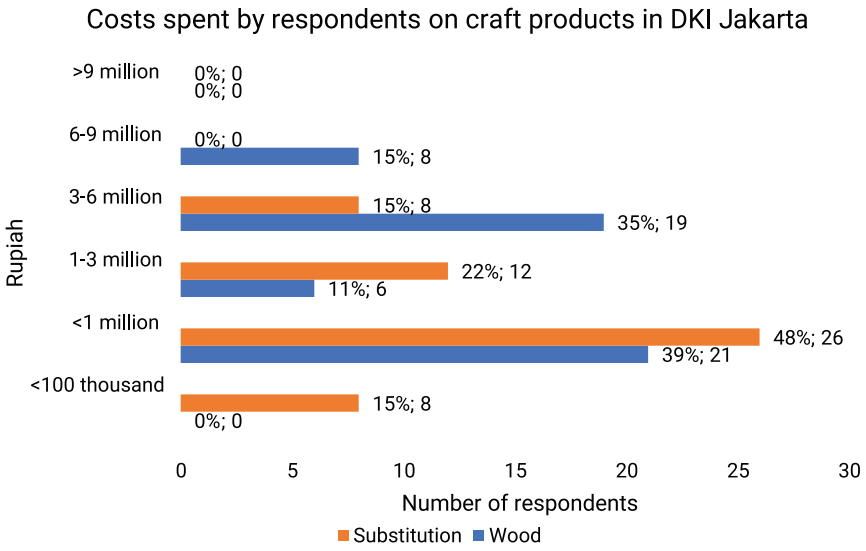


Figure 44 Costs incurred by respondents for furniture products in DKI Jakarta

By looking at the figure above, consumers can afford to spend much more on wood products than on substitute products. Consumers are still willing to spend between IDR 6 – 9 million buying wood products for *furniture* purposes. In addition to *furniture* products, the costs that respondents can incur to buy wood craft products are, on average, in the range of IDR 1 – 3 million, with 52% of respondents. As for substitute goods, respondents can spend around less than IDR 1 million with 43% of respondents. However, some respondents can spend IDR 6 – 9 million to buy substitute craft products, which is 4% of respondents. The results of the survey on the costs that can be incurred to purchase woodcraft products and substitutes in DKI Jakarta can be seen in the following Figure 45.

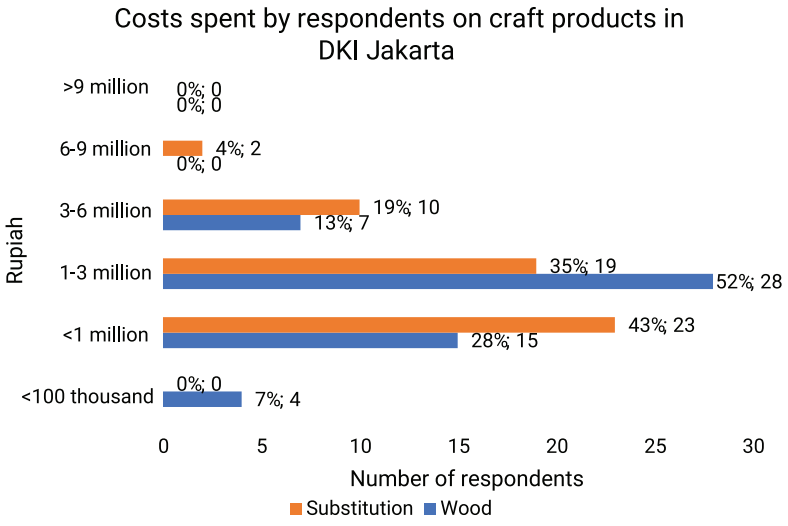


Figure 45 Costs spent by respondents on craft products in DKI Jakarta

9. Respondents' preferences on the quality of processed wood products

Respondents' reasons for using engineered wood products are also determined by their knowledge of the product's quality. How superior the product is determining the choice of respondents in choosing to use wood products or their substitutes. Respondents in Banten, as much as 34.5% chose a more beautiful wood appearance. This reflects that the aesthetic aspect is the main factor considered by respondents when choosing processed wood products. Meanwhile, the highest result fromrespondents in DKI Jakarta, as much as 28%, stated that the advantages of processed wood products are environmentally friendly. These results indicate that respondents in DKI Jakarta consider environmentally friendly aspects to be the main factor when choosing processed wood products, while the reasons respondents chose wood products based on other advantages can be seen in Figure 46.

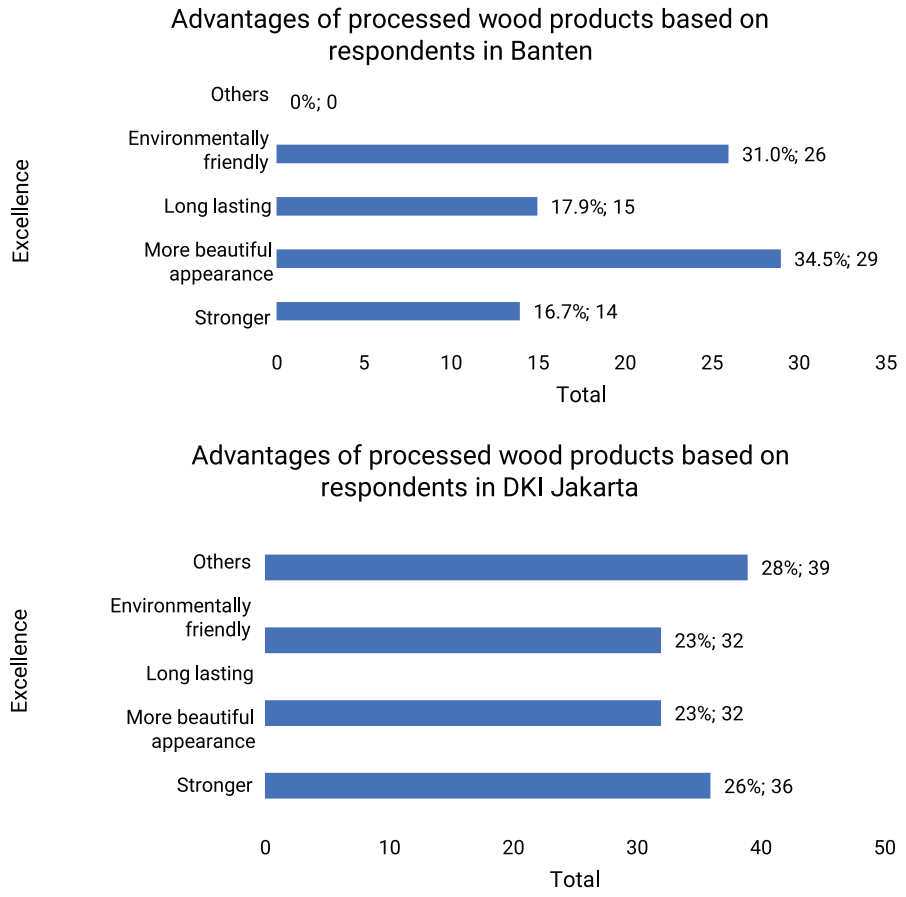


Figure 46 Superiority of engineered wood products by respondents in Banten and DKI Jakarta

In addition to processed wood products, respondents also chose substitute products. Based on the survey results, Banten respondents dominated choosing substitute products because of the advantage of relatively lower prices at 30.1%. Meanwhile, DKI Jakarta respondents chose substitute products with waterproof advantages of 25.9%. Survey results on other aspects of excellence can be seen in Figure 47.

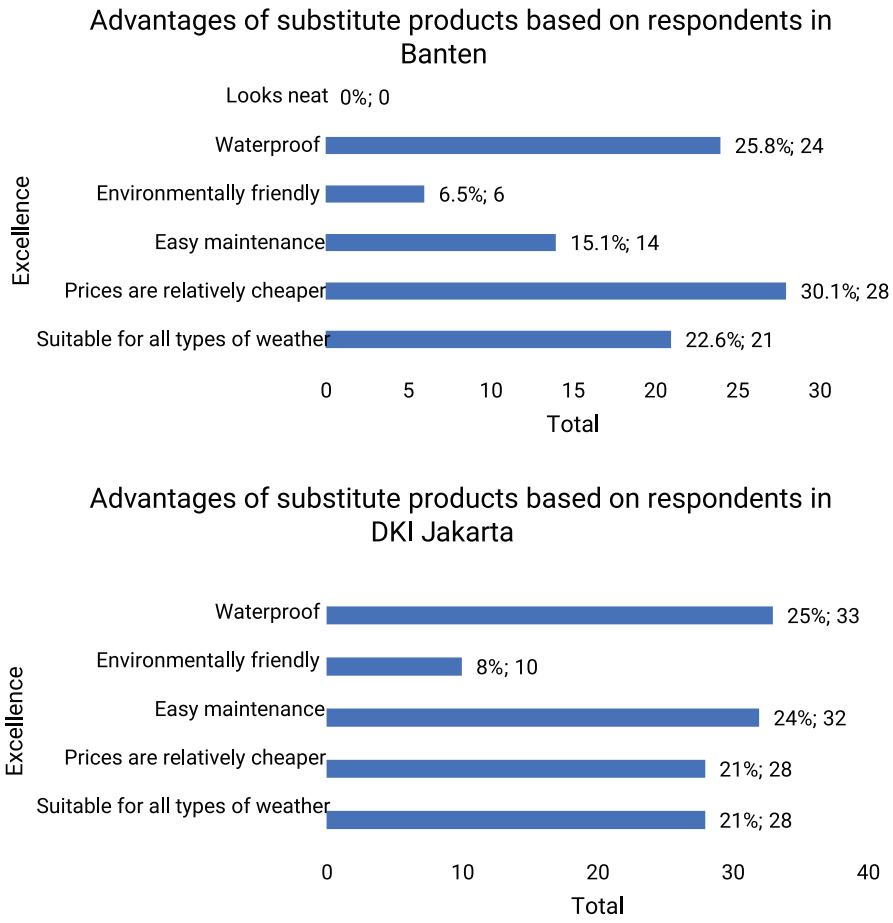
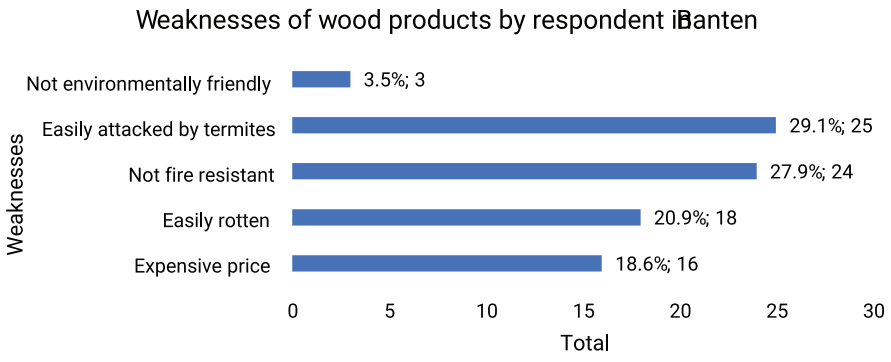


Figure 47 Superiority of substitute products by the respondent in Banten and DKI Jakarta

Meanwhile, there are also disadvantages to using processed wood products. Specifically, the most prominent weakness of wood, according to respondents in Banten and DKI Jakarta, is termite infestation, with 29.1% and 31%, respectively. The results of respondents' perspectives on the disadvantages of using wood products can be seen in Figure 48.



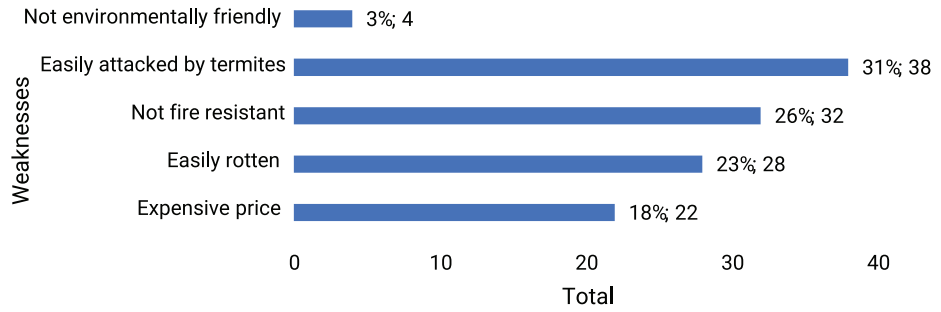


Figure 48 Weaknesses of wood products by respondents in Banten and DKI Jakarta

Various negative campaigns that accuse using wood products of not being environmentally friendly are things that need to be straightened out through education to consumers. Some of the weaknesses regarding product strength shouldbe answered through product innovations created by research institutions.

Substitute goods also have weaknesses. Respondents in DKI Jakarta rated limited design at 36% as the most dominant weakness, while Banten respondents rated the dominant weakness of substitute products as a poor appearance at 31.8%. The survey results are shown in Figure 49.

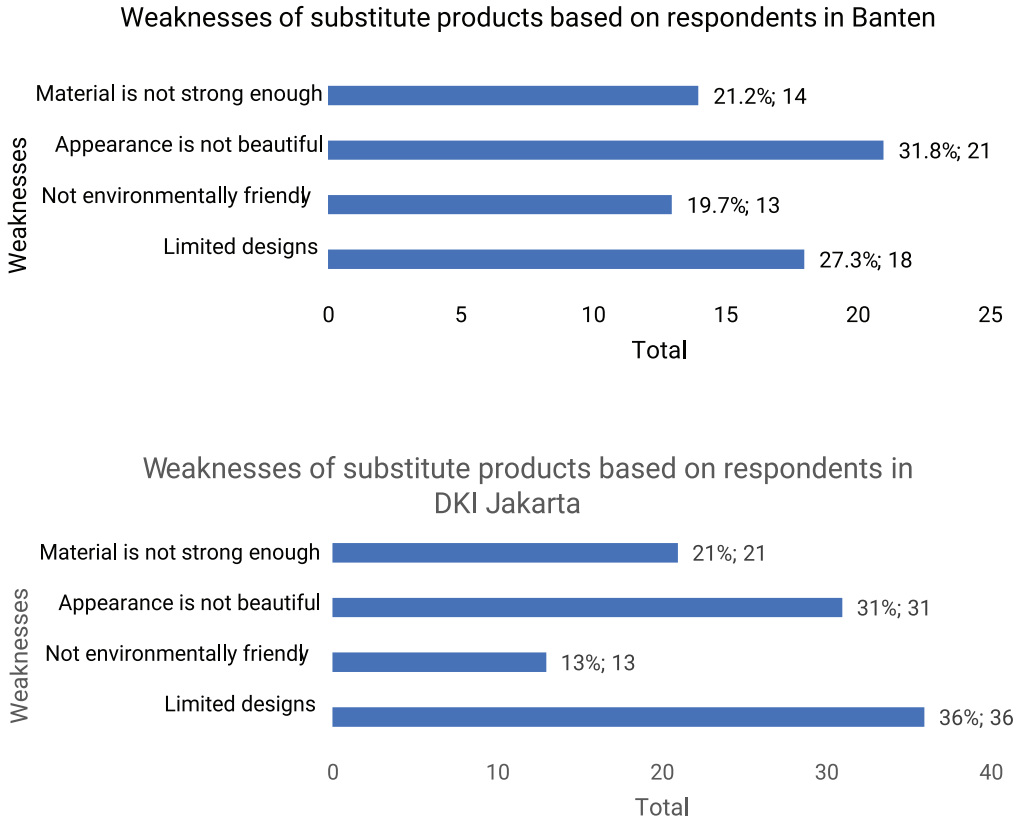


Figure 49 Weakness of substitute products by the respondent in Banten and DKI Jakarta

10. Respondents' preferences on type of payment for wood products

The payment method chosen by Banten and DKI Jakarta respondents in transactions to buy wood products and their substitutes is dominated by the *cash* payment method; this was obtained from 79.2% and 83% of respondents for wood products, 82.4% and 86% for substitute products, respectively. In addition to the *cash method,* there are also other methods such as *debit/e-money*, *online*, contract and credit payments. The survey results on payment methods are presented in Figure 50.

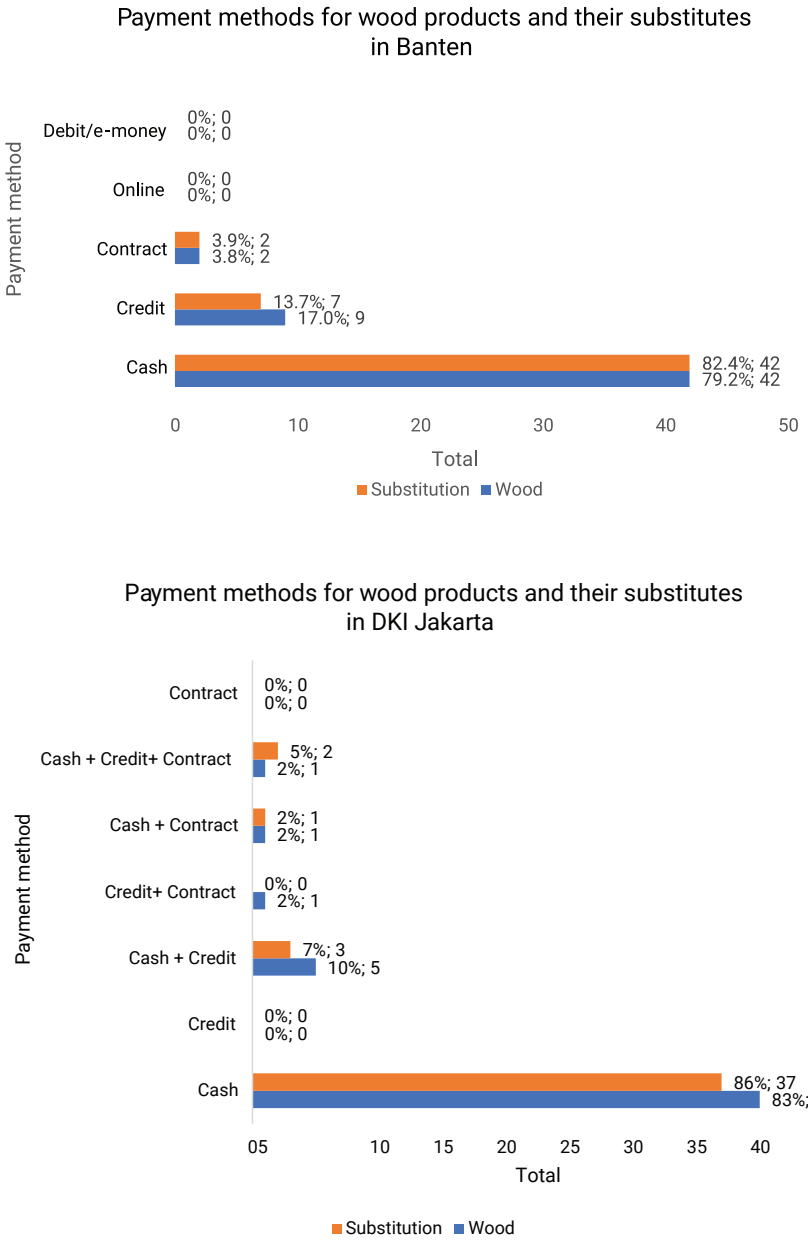


Figure 50 Payment methods for wood products and substitutes in Banten and DKI Jakarta

11. Educational facilities

Educational facilities are any form of facility or tool used to support and enhance the education and learning process. Educational facilities include various physical and non-physical elements designed to create an environment conducive to improving knowledge, skills, and understanding. Wood product education tools play an important role in shaping public understanding of wood products' sustainability, use, and benefits. Various options for educational tools can be implemented, and these choices depend on consumer preferences and behavioural trends.

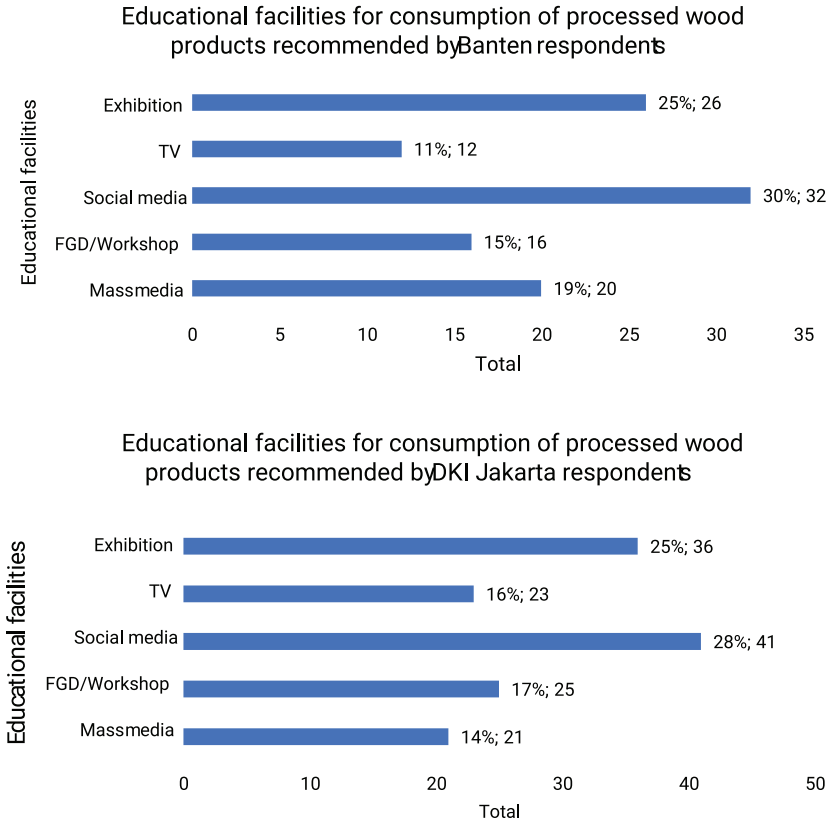


Figure 51 Educational facilities for consumption of processed wood products recommended by Banten and DKI Jakarta respondents

Figure 51 provides an overview of the preference for educational facilities for consuming processed wood products recommended by respondents from Banten and DKI Jakarta. There are five options for educational tools evaluated: exhibitions, television (TV), social media, *focus group discussions* (FGDs)/workshops, and mass media. The use of social media stands out as the most recommended educational tool by Banten and DKI Jakarta respondents, with 30% and 28% of respondents stating that they consider social media effective for understanding information about engineered wood products. This reflects a shift in consumer behavior that increasingly relies on social media platforms as a source of quick and easily accessible information.

The second highest choice was exhibitions, which received 25% support from Banten and DKI Jakarta respondents. Exhibitions provide an opportunity for consumers tosee wood products directly, touch them, and get direct explanations from experts or

manufacturers. This can be an effective means to increase consumer understanding and awareness of wood products. Meanwhile, TV educational tools showed a lower level of support in Banten Province, reaching only 11%, while in DKI Jakarta Province, mass media showed a lower level of support at 14%. Although TV and mass media are significant information channels, these results show that people prefer more.

Relates to the gender of respondents, where 53.3% and 56% in Banten and DKI Jakarta Provinces are women, the appropriate means of education is recommended through social media and exhibitions. In summary, the role of women in the household is very important in creating and improving the resilience and welfare of families and communities. Thus, one of the important educational targets is women, which can be done through social media and exhibitions. Through understanding these preferences, those involved in engineered wood product education can direct their efforts more effectively. The use of social media and exhibitions can be increased to provide easily digestible and affordable information for the people of Banten and DKI Jakarta, along with shifting trends in consumer behavior in seeking knowledge about wood products.

12. Type education

The type of treated wood product consumption education refers to the various methods and approaches used to provide consumers with information, understanding and awareness about treated wood products. Figure 52 provides an overview of the types of education on consumption of processed wood products recommended by respondents from Banten and DKI Jakarta. Respondents have six options to determine the type of education considered most relevant for educational activities: learning through the internet, role-play stimulation, counselling, training, open discussions, and others.

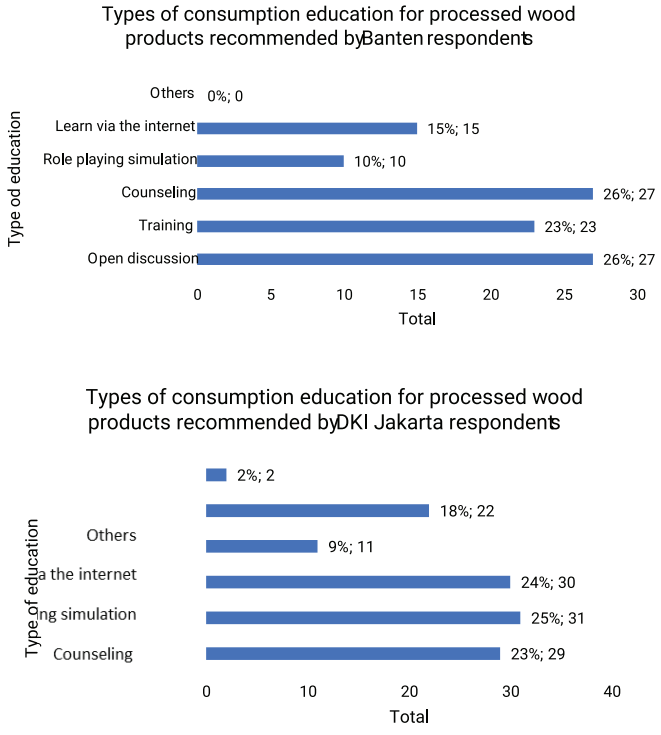


Figure 52 Types of education on consumption of processed wood products recommended by Banten and DKI Jakarta respondents

The survey results in Banten Province show that counseling and open discussions arethe most recommended types of education, with 26% of respondents stating that counseling and open discussions are most relevant. Extension provides information directly, including in-depth and interactive explanations, which can increase consumer understanding of processed wood products. Meanwhile, open discussions involve active participation from participants, delivering and providing information in a two-way mannerthat is often used in public meetings, forums or events that involve active participation from all participants. In DKI Jakarta, training is the most recommended type of education, with a score of 25%. Training shows that a hands-on and practical approach toteaching the use of wood products is considered effective by the community.

The second highest choice in Banten was training, which received 23% of respondents support. Training shows that a hands-on and practical approach toteaching the use of wood products is considered effective by the community. Meanwhile,in DKI Jakarta, counseling and open discussions were the choices that had similarvalues at 24% and 25%, respectively. Meanwhile, other options have a relatively small percentage of 1%. These options may include preferences or creative ideas from respondents that are not covered by the options provided.

Based on this information, the people of Banten Java and DKI Jakarta are more likely to recommend an educational approach that involves counseling and hands-on training. Extension is considered to provide in-depth knowledge, while trainingprovides practical experience, both aimed at improving consumers' understanding and skills related to engineered wood products.

4.2.3. Information delivered in public education

Educational information about processed wood products is important to understand their use, sustainability, and benefits. Misunderstandings related to the use of wood products that can damage the forest are still widely misunderstood, this needs to be straightened out so that the sustainability of the forest and the wood processing industry can continue. Engineered wood has a variety of applications in the construction, woodworking and furniture industries. Understanding the physical properties of wood can help consumers make wise choices in the use of this material. In addition, education about the sustainability aspects and environmental impacts of engineered wood production is also highly relevant. This information can encourage more environmentally friendly decisions in choosing and using engineered wood products.

Figure 53 illustrates the advantages of processed wood products in Banten Province,with the largest result; as many as 34.5% stated that the appearance of wood is more beautiful. This reflects that the aesthetic aspect is the main factor considered by respondents when choosing processed wood products. A beautiful appearance provides added aesthetic value to wood products in the context of construction, furniture, and wood crafts. Meanwhile, the highest result from respondents in DKI Jakarta Province, 28%, stated that the advantages of processed wood products are environmentally friendly. These results show that respondents in DKI Jakarta Province consider environmentally friendly aspects to be the main factor when choosing processed wood products.

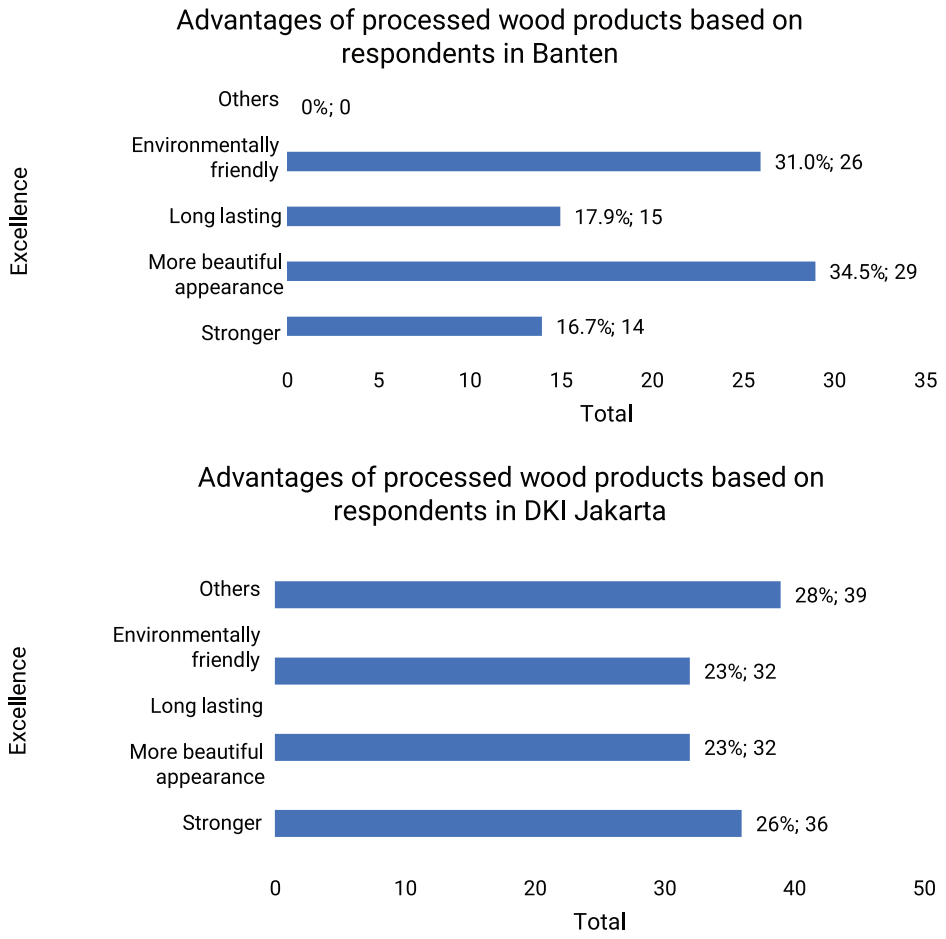


Figure 53 Superiority of engineered wood products based on Banten and DKI Jakarta respondents

In Banten, no respondents chose the "other" option, while the smallest respondent 16,7% stated that the advantages of processed wood products were "stronger." This "other" factor could include specific advantages, such as sustainability, durability, or innovation in engineered wood, that are not covered by the answer options provided. Respondents in DKI Jakarta who chose the options "durable" and "more beautiful appearance" were equally large, at 23% each.

From this data, people in Banten tend to appreciate the aesthetic appearance of processed wood as the main factor in choosing wood products. Meanwhile, DKI Jakarta respondents tend to appreciate environmental friendliness as the main factor when choosing wood products. This information can be useful in developing marketing and production strategies to emphasize further the aesthetic advantages of wood products in the region.

Figure 54 provides an overview of the weaknesses of processed wood products according to respondents in Banten and DKI Jakarta, with the largest results of 29.1% and 31%, respectively, stating that they are susceptible to termites. This indicates that problemsrelated to wood pests, such as termites, are a major concern for people in the region. Thiscondition may trigger concerns regarding the durability and longevity of wood products in an environment that may be susceptible to pest attacks.

Figure 54 Weaknesses of engineered wood products by respondent Banten and DKI Jakarta

The smallest result, according to Banten and DKI Jakarta respondents, was that of 3.5% and 3%, respectively, who stated that processed wood was not environmentally friendly. A small proportion of respondents still maintain the traditional perception that the use of wood contributes negatively to the environment. Many processed wood products from sustainably managed production forests can be considered environmentally friendly.

Research conducted by Lippke and Edmonds (2006) presents facts regarding comparing fossil fuel consumption in insulation and steelmaking to wood. The results showed that insulation and steelmaking require 82% more fossil fuels than processes involving wood. Along with this, it was found that the energy contribution from fossil fuels in the manufacture of basic materials such as wood is relatively small. However, further analysis of the use of steel in construction showed that 345% more energy was required for steel walls, while for concrete floors, the amount of energy required was even 150% higher than for wood floors. As a result, wood is not only a greener option due to its lower fossil fuel requirements but also its lesser impact on environmental pollution compared to the other two materials.

Paryoko and Rachman (2023) mentioned that engineered wood is the main furniture choice supporting development. Not only is it environmentally friendly due to the sustainable production cycle, but it is also more friendly to the source of raw materials. This type of material has raw dimensions, which can reduce the waste generated during the furniture production process and allow its waste to be easily reused in creating derivative furniture products or complementing other furniture components.

4.2.4. Implementation of public education

One of the main strategies implemented to increase public understanding and awareness of wood products was the organization of educational seminars. The event was designed to involve various parties by presenting prominent speakers from academia and wood industry practitioners and representatives from wood industry associations. The presence of prominent speakers is expected to provide in-depth insight into the sustainability and economic benefits of wood products. As part of a series of educational activities, there were workshops and educational video competitions.

1. Workshop

The workshop was geared towards providing participants with hands-on experience through panel discussions, case studies and Q&A sessions. By involving various elements in a series of activities, participants are expected to better understand the critical aspects of using wood products.

The workshop with the theme “High Demand for Growing Forests: Potential and Challenges for Processed Wood Products” was a discussion forum to explore the potential and identify challenges associated with the increasing demand for processed wood products. Growing forests plays a crucial role in meeting the needs of the timber industry, and the workshop aimed to discuss strategies that can increase the utilization of forest wood for furniture, wood crafts and construction. Below is the Rapporteur’s Report from the workshop:

EDUCATIONAL WORKSHOP

March 13, 2024

Introduction

The educational workshop with the theme "High Demand Growing Forests:Potential and Challenges of Processed Wood Products" was an initiative organized by FORCI Fahutan IPB University in collaboration with the Ministry of Environment and Forestry (KLHK) and the International Tropical Timber Organization (ITTO). The theme was raised in response to the complexity of challenges and opportunities faced in the processed wood products industry in an era of increasing demand. In this workshop, participants will be given an in-depthunderstanding of the potential of growing forest resources and various related aspects while identifying challenges that need to be overcome. The resource persons come from academia, furniture and handicraft industry associations, andMSME practitioners. This educational workshop aims to summarize themain points discussed during the activity.

Narrative of education and socialization activities

Prof. Sudarsono Soedomo (Professor of Forest Management IPB) and the Forci team (Center for Forestry Organizational Capacity and Institutional Studies) conducted educational and socialization activities for the community.

What: This activity is an educational agenda to the public, especially among students and educators, about putting the right perspective that using forest products does not damage the forest.

Why: This activity was conducted to educate students that processed wood products have high potential value. This product was created to increase public interest in using processed wood products. The increasing demand for processed wood products is expected to encourage the growth of raw material providers and processing with high innovation.

When: Educational activities with the theme "High Demand for Growing Forests: Potential and Challenges of Processed Wood Products" will be held on Wednesday, March 13, 2024, at SMA Negeri 4 Kota Serang, Banten Province at 10.00 - 12.00 WIB.

Who: This activity was attended by students of Grades 10 and 11 and the Biology Teacher of SMA Negeri 4 Kota Serang so that students and biology teachers benefit. *Educating the educators* is a strategy from the Forci team so that teachers caneducate their students again in other classes. The impact is that one school will be educated because of the teacher's presence.

How: The activity was opened by the host with prayer and singing Indonesia Raya followed by remarks from representatives of the Forci team of the Faculty of Forestry and Environment of IPB by Aswita Lewennusa, S.Hut, M.Si. She conveyed the importance of public education and fixing the perspective so that the consumption of processed wood products does not adversely affect the forest but increases demand andstimulates the growth of the wood industry. In the long term, it will have implications for sustainable forests and economic value for the community. Prof. Sudarsono Soedomo explained the material entitled "Caring for Forests Through the Use of Wood: Against Misleading Invitations." There are many misleading slogans about forests, andeven those are made by famous institutions with good intentions. For example, paper is made from cellulose,

the main source of which is wood. Wood comes from forests, hence the misleading slogans such as: Reduce the use of paper so that theforest is sustainable, and reduce the use of wood so that the forest remains sustainable.If analogized to agriculture, an increase in the consumption of products such asrice will stimulate the supply of these commodities to increase productivity.

Similarly, if forest products are increasingly needed, businesses related to the forest will also be increased. Prof. Sudarsono Soedomo closed the presentation of the material with, "Realizing good intentions requires understanding the correct science. Be alert toevery invitation, even those with good and noble intentions". The participants in the activity were very enthusiastic about hearing the explanation from the professor. The discussions between the participants and the speakers also proved that the participants were thinking until they finally conveyed their thoughts to Prof. Sudarsono Soedomo. The Forci team appreciated the school and participants in the activity by giving prizes to the questioners and mementos to the school in the form of wooden plaques whose materials also came from the forest.

Through this series of activities, public awareness of wood products will increase significantly. Involving speakers and holding an educational video competition is expected to positively impact the public's perception of wood products while encouraging active participation in supporting the sustainability of the wood industry.

Speakers who are experts and competent in their fields are expected to deliver in-depth information, correct facts, and a broad perspective on the sustainability of wood products. Thus, the public can better understand the benefits of using responsibly managed wood and the positive contribution the wood industry can make to environmental sustainability.

Thus, this series of activities is expected to be a source of knowledge and a driver of positive changes in people's views and actions towards wood products. Increased awareness is expected to positively impact supporting the sustainability of the wood industry and environmental conservation more broadly.

4.2.5. Recommendation for public education in the future

Based on the results of a survey conducted to respondents in West Java, covering 19 cities/districts out of 28 cities/districts in West Java, the majority of respondents were from the age group of 26-45 years, with the dominance of female respondents. The education level is mainly from the high school level; most have a monthly income below IDR 5 million. Based on the results of a survey conducted to respondents in 6 cities/districts out of 8 cities/districts in Banten province and six administrative cities in DKI Jakarta, it shows that the majority of respondents come from the age group of 26-45 years, with the dominance of female respondents. The education level is mainly from the senior high school level, and the majority in Banten Province have an income below 5 million per month. In contrast, the majority of DKI Jakarta Province respondents have an income of IDR 5-10 million/ month. The most represented type of employment in the three provinces is private employment. Respondents recommended social media as the primary education means, demonstrating the trend of consumers relying more on online platforms. In-person counseling and training were identified as the most

relevant types of education. Linking information on the weaknesses of wood products, especially termite infestation, can be a focal point for improving product quality and providing education on maintaining products. The use of engineered wood products is an environmentally friendly measure. Implementing public education through workshops and video competitions provides clear and correct information about engineered wood products. In addition, consumer awareness of the sustainability of engineered wood products can increase through good education and positive consumer preferences for engineered wood products can be a growth driver for this industry.

In facing the future of the processed wood industry, integrating social media, extension systems, and training is important to build further understanding among the public. Misleading slogans about forests, such as ‘Use less paper to preserve forests’ and ‘Use less wood to preserve forests’ must be rectified. In this context, these strategic recommendations are designed to create positive behavior change, promote environmentally friendly wood products, and inspire sustainability.

1. Social Media for Public Education on Sustainable Wood

Social media can be a powerful tool to educate the public about sustainability in the engineered wood industry. Social media platforms can be more efficient in reaching different layers of society. Platforms such as Instagram, Twitter, and Facebook can be used to raise awareness and spread information about sustainable practices. Social media allows for two-way communication, so people can ask questions and discuss these issues. Partnering with influencers can help reach a wider audience and promote messages to specific groups. Social media can be a tool to build a community of people who care about sustainability.

2. Integrated education and training

An integrated education and training system is another important way to promote sustainable practices in the processed wood industry. This system should provide comprehensive and informative education but should also be attractive and involve the active participation of the community. The curriculum should be designed to meet the needs of different groups, such as students, industry professionals, and consumers. Local communities, producers, and consumers should be involved in developing programs to ensure they are relevant and effective. Training programs can help wood processing industry workers learn new skills and adopt more environmentally friendly production methods. The program’s success should be measured through evaluation to track progress and identify areas for improvement. The system should also be accessible online to reach a wider audience.

3. Interactive workshops and seminars

Workshops and seminars provide a platform for in-depth learning and discussion about sustainable processed wood products. Workshops can involve participants in hands-on activities, such as learning how to make eco-friendly products or manage waste. Seminars can bring together experts, industry professionals, and stakeholders to discuss challenges and solutions. These events can also be used to share new research and innovations in the industry.

4. Technology for public education

Technology can be a powerful tool for public education on sustainability in the processed wood industry. Mobile apps can deliver information and educational modules to a wide audience. Educational games can make learning about sustainability fun and engaging. Virtual reality (VR) and augmented reality (AR) can provide immersive learning experiences and help people better understand the industry's complexities. Podcasts and webcasts can be a convenient way for people to learn about sustainability issues from experts in a format that is easy to access.

4.3. Public education on the advantages of using wood products in Central Java

4.3.1. Characteristics of the target of public education

To gain in-depth insight into consumers' needs and knowledge about wood products, the survey was conducted by offline and online mechanisms. The study included respondents from 16 districts in Central Java, which is around 10 – 25 respondents/district. The characteristics of respondents in the study were selected based on gender, education level, age, and occupation. Figure 55 shows the percentage of 230 respondents based on gender, comprising 78.7% male respondents and 21.3% of females.

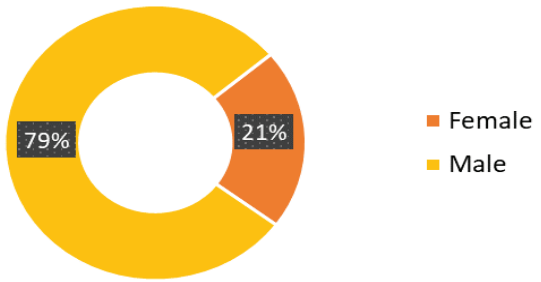


Figure 55 Characteristics of consumers based on gender

Based on age, it shows that 55.7% of responses are in the range of age 41 – 65, 32.2% of 25 – 40, 9% below 25, and 3% above 65%. The majority of the consumers were in pre-elderly age which represented the baby boomer generation, then followed by the productive age consumers that represented the millennial and Z generations. These two age groups are predicted previously to actively consume wood products due to their needs and/or their capabilities after earning some income.

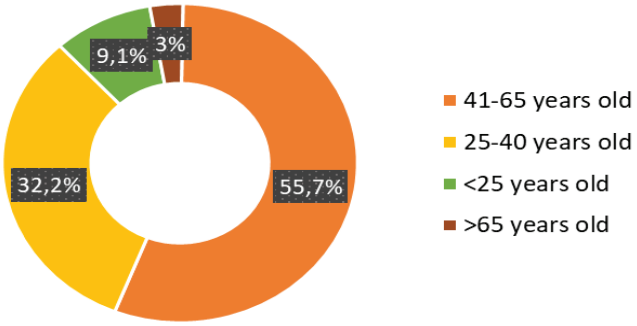


Figure 56 Characteristics of consumers based on age distribution

The educational background of the consumers was varied, ranging from primary education graduates (elementary school, junior high school, and senior high school) to higher education graduates (diploma, bachelor, master, and doctoral degree). The primary school graduates dominate the education background of wood product consumers in Central Java with 45%. Slightly below the primary school graduates, the higher education graduates with diploma and bachelor background was 38%, then master and doctoral degree background was 17%. This showed that this study was participated by consumers with some levels of education background that were quite evenly distributed.

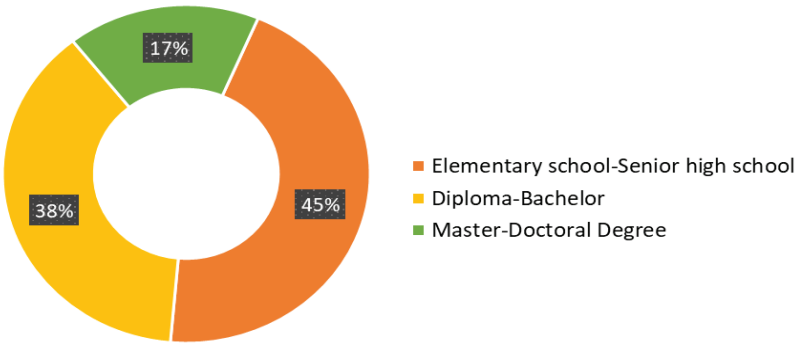


Figure 57 Consumers education background

For the occupation background, the respondent has various jobs, varying from agroforestry farmers, entrepreneurs, company employees, academic-related employee (civil-servant and non-civil servant) and civil servant with non-academic-related work. Consumers with entrepreneur background dominantly participate in the study with 46.5%, then followed by consumers with company employee jobs with 20.9%, academic related jobs with 13.5%, non-academic related civil servants 11.3%, and agroforestry farmers with 8.7%. The occupation background could correlate with the income of the consumers and the cost-related preference for wood products. Based on the occupation background, the consumers' respondents might have middle-high income mainly, meanwhile, a few have a low income.

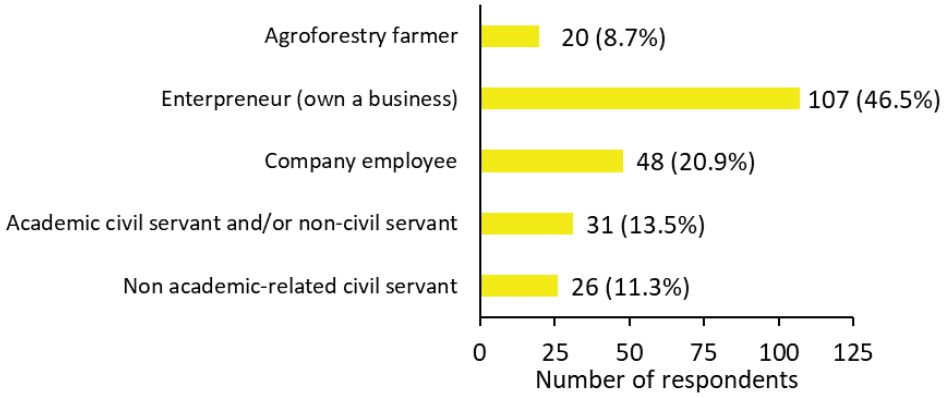


Figure 58 Consumers occupation background

4.3.2. Consumers' preference for the product by type of consumers

1. Type of product

The product type that consumers preferred in Central Java was classified into solid wood and wood composite. Wood composite is a panel or a beam that is produced by gluing small size wood (veneer, chip, flake, particle, fibre, etc.) in a certain pressure. Various wood composite types were produced and developed globally, i.e. cross laminated timber, glue-laminated timber, plywood, particle board, fibreboard, wood plastic composite, etc. Among those wood composites, consumers in Central Java specifically were familiar with plywood (triplex, multiplex), particleboard, oriented strand board (OSB), and medium-density fibreboard (MDF) as the material for construction, furniture, musical instruments, etc. It was due to the availability in the local market, either from local production or import products. Those wood composite was consumed mainly due to its cheaper price compared to solid wood.

Solid wood was generally used for building construction, furniture, craft, toys, household appliances purposes. Solid wood that was consumed varied in size and shape (log, lumber, and beam), as well as in wood species. Those were depending on its specific use. Building parts that held or supported a high load, such as wall, floor, beam, column required a big size of beam and lumber. Meanwhile, the wood composite was mainly used for furniture. Nevertheless, plywood was also used as a wall partition for cheap housing or government-subsidized housing.

The Central Java market was more focused on furniture. The consumption of wood product type showed the same results. Our study revealed that the highest purchased wood products of the consumers in Central Java were furniture (table, chair, cupboard, etc). Afterwards, house construction components (house roof, joglo traditional building, beam, door, etc), the home accessories, craft and decoration (beds, shelves, wall hanging, etc), as well as various types of toys. 90% of consumers were into solid wood. One district in Central Java, namely Jepara, has special features, i.e. cravings, on the furniture that was well known domestically and internationally. However, it was specially for furniture made of teak solid wood.

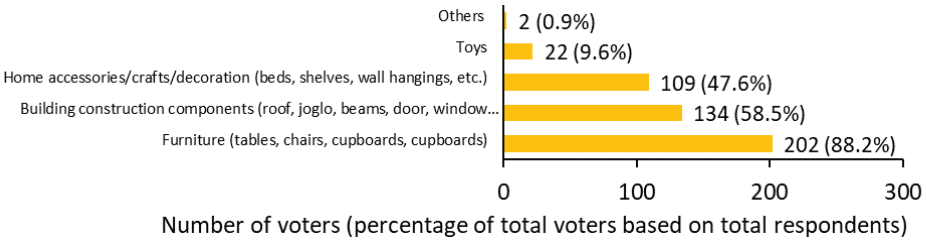


Figure 59 Wood product type purchased by consumers in Central Java

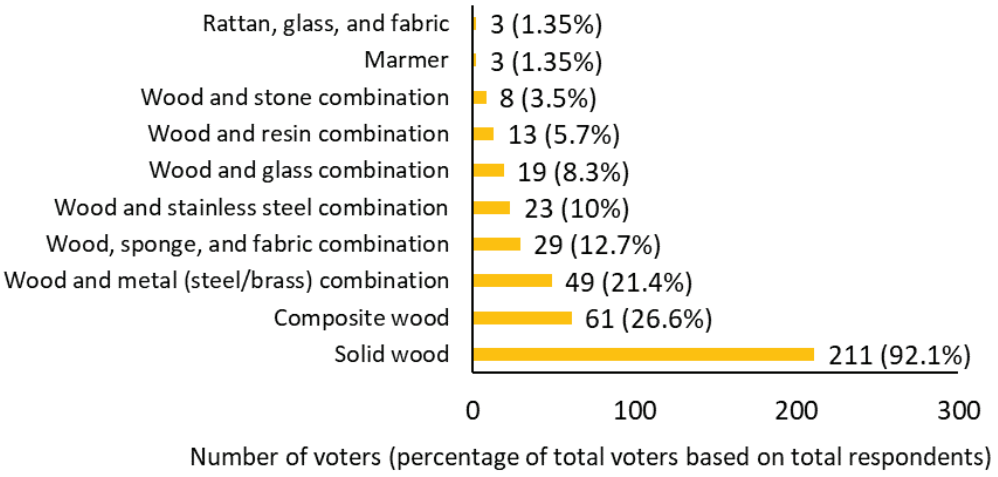


Figure 60 Material types that the consumers in Central Java were interested

2. Product design

Wood product design in Central Java was focused on furniture and craft. Furniture and craft design were essential factors in adding a functional value and aesthetic value of the products, delivering a nuance of the room, and supporting the ergonomic and safety aspects assessment. Furthermore, design (style) was the second aspect that consumers consider in buying wood products, followed by aesthetic aspects based on our study.

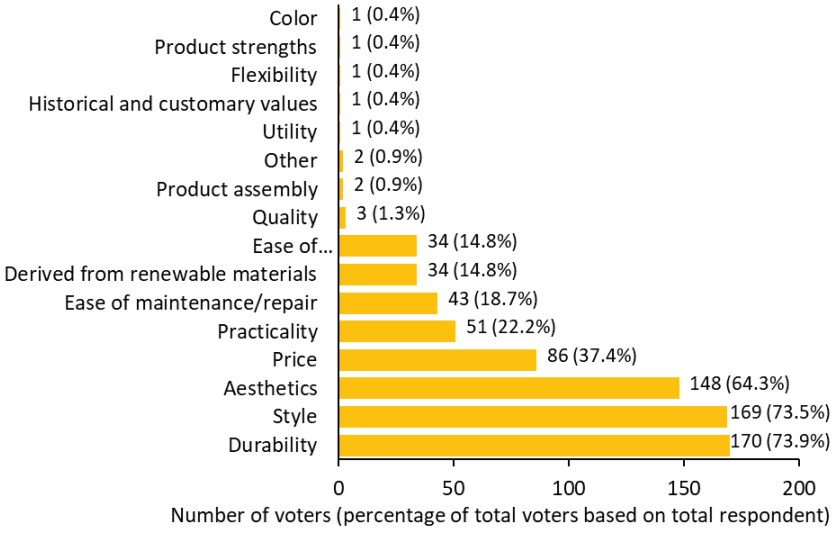


Figure 61 Consumer consideration in selecting the wood product

Design is a complex combination of shape (style), proportion and balance aspects, size, material and its constructions, feature, ergonomic and safety science, character, color, etc. For model/style, consumer preference design was classified as classic/ traditional and modern. Modern style points out minimalist design, meanwhile, the classic/traditional design refers to design that is culturally influenced, both European classic and Indonesian traditional custom. The wood product consumers in Central Java preferred minimalist furniture design with 59.5%, over a partial or slight craving design with 26.4%, the fully traditional craving design with 12.3%, and others (rustic,

industrial, seasonal, outdoor minimalist, and other consumer preference) with 1.8%. For the materials, consumer favor is fully made of wood, followed by wood composite (particle board, plywood, medium density fibreboard, finger-joint lamination, etc); wood and metal (steel and brass) combination; wood, sponge, and fabric combination; wood and stainless-steel combination; wood and glass combination; and others. A few manufacturers developed the unique combination of wood and resin, wood and stone, and wood and marble. Most customers prefer built-in (customized products), then manufacturer-developed products (fully finished and fully assembled products), and knockdown products.

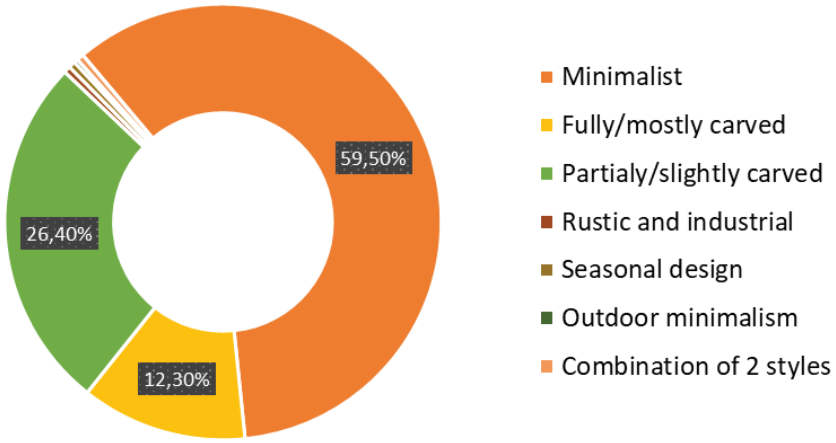


Figure 62 Wood product style preferred by consumers

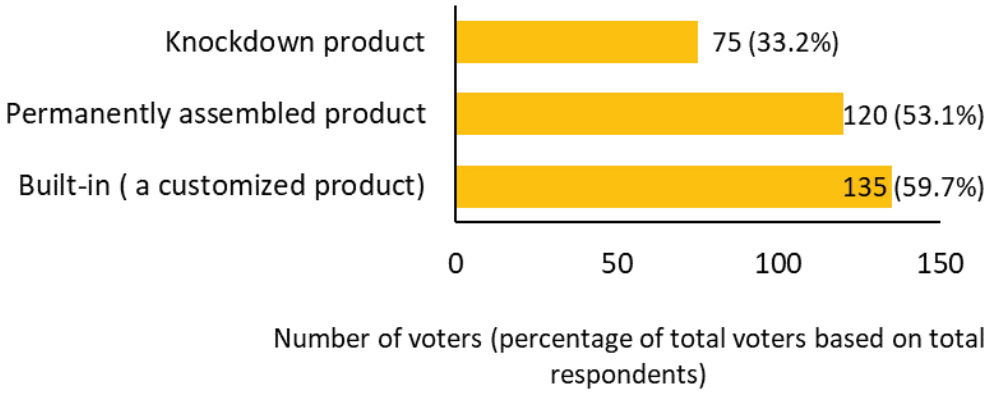


Figure 63 Wood material construction preferred by consumers

3. Type of wood species

The type of wood preferred and most consumed in Central Java was teak wood. Teak wood opted by consumers due to its high durability against termites and weathering, high strength, and beautiful pattern. Martawijaya et al. (1989) classified the teak wood as the durability level 1 that could be resistant for 8 years in the moist soil-contacted area, for 15 years in non-water-submerged area, or unlimited years in under roof and non-water-submerged area. Wood durability was the highest aspect of consumer consideration on wood and wood product selection based on our study, meanwhile the aesthetic aspect was the third aspect.

The second most preferred of wood species was mahogany. Mahogany wood has also high strength (belongs to the strength level 2 according to Martawijaya (1989), similar to teak wood) and specific appearances (red-color wood). Furthermore, the third most preferred wood was light wood, such as sengon (*Falcataria moluccana*), jabon (*Anthocephalus cadamba*), and balsa (*Ochroma grandiflorum*). Sonokeling (*Dalbergia latifolia*), kamper, keruing, bangkirai, merbabu, etc were subsequently preferred to be purchased.

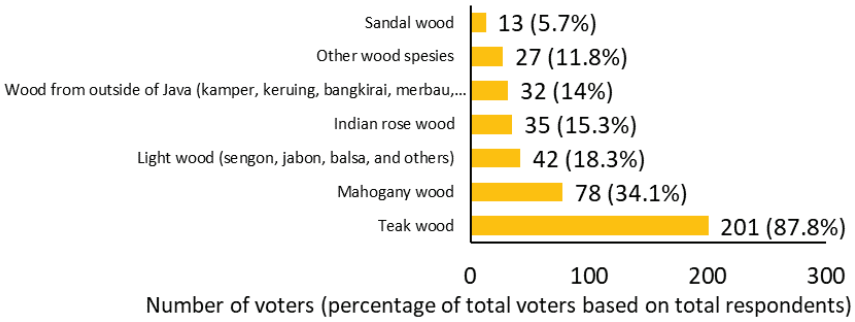


Figure 64 Wood species preferred by consumers

4. Price

Our study classified the wood product price into 5 groups, namely cheap price (under IDR 1 million), cheap to moderate price (IDR 1-5 million rupiah), moderate to expensive price (IDR 5-10 million rupiah), and expensive price (more than IDR 10 million). Most consumers in Central Java (40.1%) desire the cheap to moderate price. Afterward, 26% of customers choose the expensive price, 18.1% customers choose the low price, and 14.1% of customers choose the moderate to expensive price.

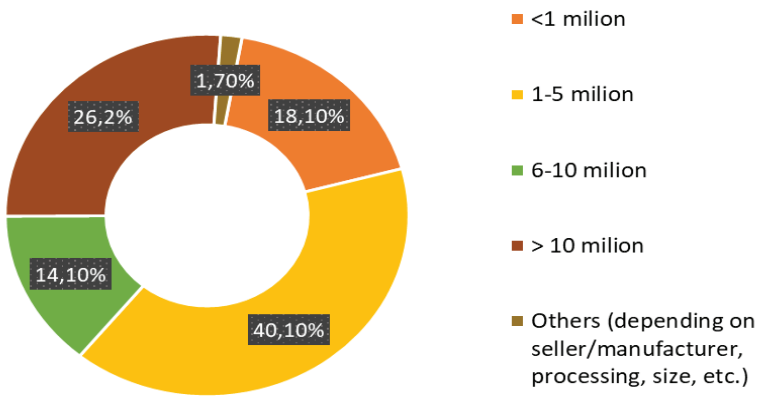


Figure 65 Price list of wood products preferred by consumer

The cheap to moderate price preference on wood products consequence of the wood material selection, namely the wood composite and light wood/low-quality wood usage that has a cheap price. Without extra maintenance, its wood product has a short service life. This is also supported by our data on the latest time of furniture and house decoration (craft) purchased by consumers in Central Java (< 1 year). More than 50%

of respondents purchased their latest furniture within 1 year, meanwhile, 43.4% of our respondents purchased their latest home decoration and craft in 1 to 5 years. The design tends to be a minimalist design without any craving. The moderate and expensive price of wood products tend to use a high quality of wood in solid wood form, and/or a highly processing technique (e.g. craving).

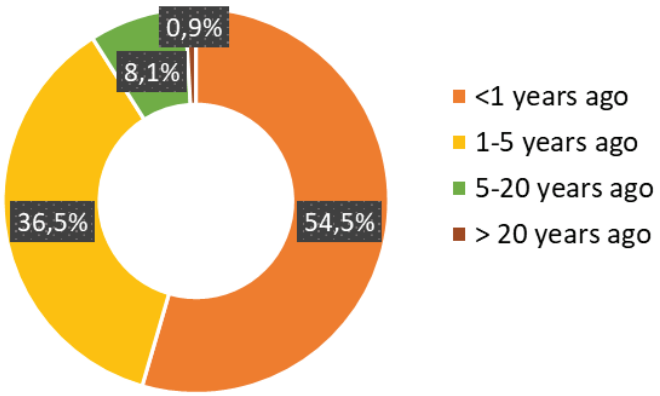


Figure 66 The last time furniture was purchased by consumers

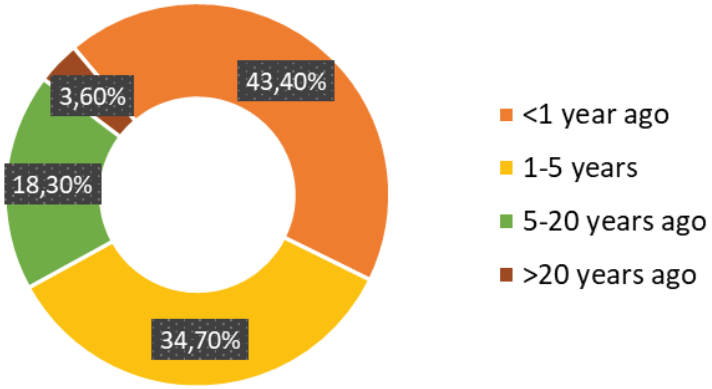


Figure 67 The last period home decoration and craft was purchased by consumers

5. Quality

Wood product quality is influenced by several factors, including material selection (solid wood or wood composite), wood species utilization, as well as proper processing and utilization, ultimately affecting the service lifetime. Figure 68 describes the customer opinion towards wood products in Central Java. Approximately 43.5%, 39.6%, 10.4%, and 6.1% of consumers state that the domestic wood product has moderate, good, very good, and not good quality respectively. According to some respondents, the quality of domestic wood products can be improved by increasing the durability and the convenient practical assembly in line with international standards, such as IKEA.

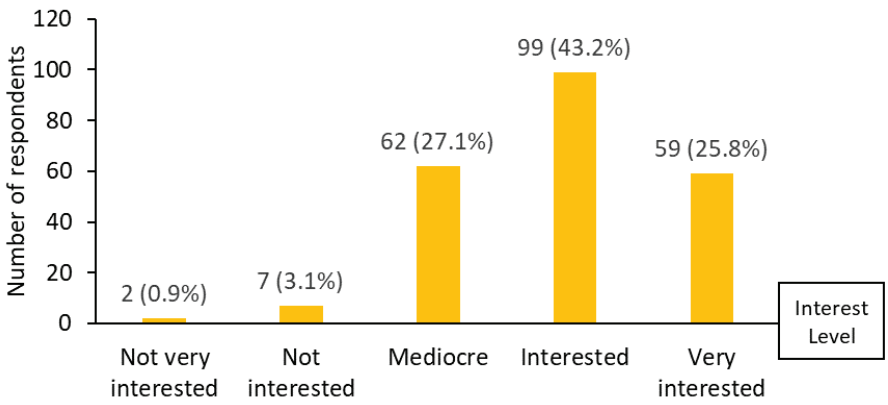


Figure 68 Consumers opinion toward wood products in Central Java

6. Payment type

According to this study, 67.8% of respondents had experience buying in person, 23.8% buying from online sellers, and 7% buying via e-commerce. However, the study also showed that to increase buyer convenience, respondents who expect online payment (non-cash). This phenomenon shows that all-in-one online payment can be a solution for increasing business, such as the wood industry. Consumers can do the payments online, on any device, anywhere in the world.

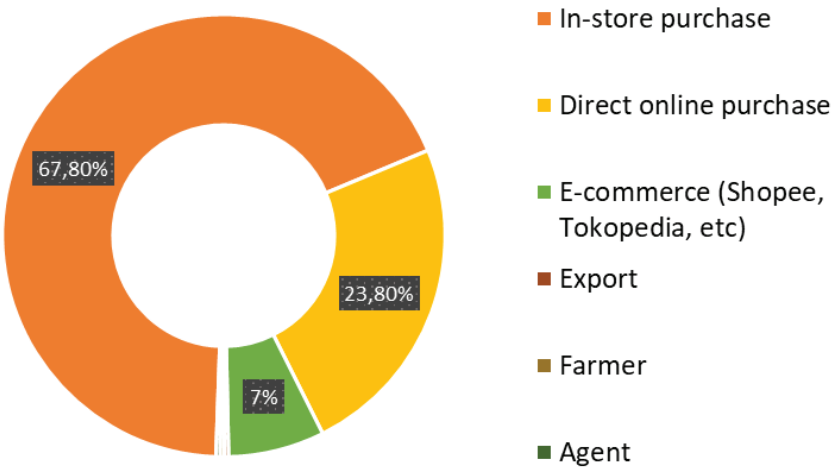


Figure 69 Purchasing mechanism used by consumers in Central Java

4.3.3. Information delivered in public education

Public education regarding the developments, opportunities, threats, and challenges of the wood industry is essential for sustainable growth both in the current and future conditions. The domestic market is a great opportunity for the wood industry, specifically furniture. The challenge that must be faced is the existence of similar industries that use cheaper materials, such as plastic and synthetic rattan. In this condition, the public needs to be educated on the use of wood as an environmentally friendly material.

Consumers need to also be constantly informed about the development of wood-based products as well as innovative and creative designs. By providing knowledge regarding various types of wood and natural fibers, including the advantages and disadvantages, industry actors can foster innovation and creativity. This information was presented on the talk show of Furnicraft 2023 on November 17, 2023, featuring three speakers from academics and HIMKI (Indonesian Furniture and Handicraft Industry Association). The first topic was "Green materials for a sustainable future" which covered aspects related to the sustainability of natural materials and industries, the concept of green industry, and the opportunities of wood composites as materials to fulfill future demands. Other aspects covered include various types of composites including cross-laminated timber (CLT), and the importance of collaboration among various stakeholders to support the development of bio-composites as future materials. Another topic presented was the various types of natural fibers in Indonesia and their potential, followed by the different collaborations between HIMKI and other institutions in developing Indonesian furniture and crafts.

Aside from product innovation, design also directly influences the consumers decision-making on product purchasing. Therefore, product designs need to be developed and adapted to the properties of raw materials and consumer preferences. For example, when designing furniture from CLT, the unique characteristics must be taken into account. A variety of CLT utilization could be conducted from construction to non-construction, such as furniture. Products for furniture purposes, particularly those built to carry heavy loads, are not widely known by the public. Therefore, the workshop held on December 21, 2023, was designed to enhance understanding of CLT products, advantages/disadvantages, as well as the principles of ergonomic furniture design. In this event, two main themes were considered, firstly, CLT products as furniture raw materials were discussed, including general descriptions, as well as manufacturing and application. During this session, several aspects of CLT manufacturing were discussed, including the purpose of production, wood raw material properties, adhesive features, and the production/adhesion process. Secondly, the workshop discussion focused on the creation of effective, efficient, and ergonomic furniture designs. This session covered general design introductions, key aspects of furniture design, and an overview of materials.

4.3.4. Implementation of public education

1. Talkshow of Technology for Overcoming the Wood Scarcity to Support "*Sustainable for Better Living*"

The talk show was one of the events in the Furnicraft 2023 series that was organized by the Furniture Industry and Wood Processing Polytechnic on November 17, 2023. This event was held at the Creative Industry Gallery Building in Kota Lama, Semarang. Three speakers were featured, including Prof. Dr. Agr. Sc. Ir. Ragil Widyorini, S.T., M.T., IPU (Faculty of Forestry, Universitas Gadjah Mada), and Dr. Ir. Retno Widiastuti, M.M. (Furniture Industry and Wood Processing Polytechnic) as academic figures, along with Nurul Muslimin, S.Ag as a representative from HIMKI (Indonesian Furniture and Handicraft Industry Association). The participants of the talk show are from the government, industry actors, academics, students, and the general public.

In this talk show, the first presentation is about topics related to the sustainability of natural materials and industries, the concept of the green industry, the opportunities

of wood composites as green materials to fulfill future demands, various types of composites (including cross-laminated timber/CLT), and the importance of collaboration among various stakeholders to support the development of bio-composites as future materials. Other presentations are the various types of natural fibers in Indonesia and its potentials as well as the various collaborations between HIMKI and other institutions in developing Indonesian furniture and crafts. During the session, Prof. Ragil Widyorini delivered a presentation titled “Green materials for a sustainable future” which covered topics related to the sustainability of natural materials and industries, the concept of the green industry, the opportunities of wood composites as green materials to fulfill future demands, various types of composites (including cross-laminated timber/CLT), and the importance of collaboration among various stakeholders to support the development of biocomposites as future materials. Dr. Retno Widiastuti delivered a presentation about the various types of natural fibers in Indonesia and its potentials, while Nurul Muslimin, S.Ag., presented the various collaborations between HIMKI and other institutions in developing Indonesian furniture and crafts.

During the discussion session with the audience, several points were raised, including concerns about the sustainability of solid wood supply and the vulnerability of wood as raw materials for furniture and crafts, despite the continued high interest in wooden furniture and crafts. Wood composites, the use of natural fibers, wood breeding, wood processing technology, and good forest management, especially in ensuring the success of planting, can be crucial solutions to address these concerns.

Figure 70 Talk show of technology for overcoming wood scarcity in support of “*Sustainable For Better Living*” in Furnicraft, Semarang, Central Java

2. Workshop and Creative Innovation Competition for Functional Wood Products based on Cross Laminated Timber (CLT)

Creative innovation competition for Functional Wood Products based on CLT (Cross-Laminated Timber) was conducted as a form of public education activity. This activity is open to the public and can be participated in by students and individuals alike, where participants are required to submit creative ideas for the use of CLT in the form of product sketches. Idea submissions are accepted from December 9th to December 19th, 2023. From the various ideas received, three winners will be selected to present their concepts during the workshop scheduled for December 21st, 2023. A total of 11 creative, innovative, and functional ideas have been registered. Based on the participants who submitted these ideas, it is evident that some participants still do not fully understand the differences in CLT products, particularly regarding their advantages.

The workshop held on December 21, 2023, was designed to enhance participants' understanding of CLT products, its advantages/disadvantages, and the principles of ergonomic furniture design. Therefore, the workshop comprised two main themes. Firstly, CLT products as furniture raw materials were discussed, including general descriptions of CLT characteristics and properties, as well as its manufacturing and application, presented by Prof. Dr. Agr. Sc. Ir. Ragil Widyorini, S.T., M.T., IPU., and Ir. Greitta Kusuma Dewi, S.Hut., M.Sc. Secondly, the workshop discussion focused on the creation of effective, efficient, and ergonomic furniture designs that were led by Rafli Evansyah, S.T. (Practitioner of Furniture Product Design). This session covered general design introductions, key aspects of furniture design, and an overview of furniture materials. Product design heavily relies on the properties of raw materials; therefore, the workshop concluded with an exercise on creating CLT-based furniture designs by workshop participants, followed by evaluations from the speakers.

The participants of this workshop were from diverse backgrounds and were limited in number. There was a total of 40 participants comprising students from the Faculty of Forestry UGM, Faculty of Engineering UGM, Postgraduate Program in Biotechnology UGM, Postgraduate Program in Sustainable Development Technology UGM, Yogyakarta State University, and Sebelas Maret University (UNS), and also there were representatives from the industry, namely PT Tresna Kasih Indonesia and PT. Trijaya Sumber Semesta. Alongside the workshop, several products were exhibited for learning purposes, including mahogany-sengon wood CLT and its furniture products (from activity 1.3), as well as other CLT products developed by the team from the Faculty of Forestry UGM. From the outcomes of this workshop, it was evident that participants gained a better understanding of CLT product applications for furniture. This was observed through the furniture design ideas generated after attending the workshop. Various furniture design ideas using CLT were obtained through workshop activities and competitions. The designs were diverse for different types of furniture. From the exercise and design competition results, it was noted that furniture designs favored by the productive-age community tended towards minimalism, practicality, and functionality.


UNIVERSITAS GADJAH MADA
FAKULTAS KEHUTANAN
WORKSHOP AND CREATIVE INOVATION COMPETITION
FUNCTIONAL WOOD PRODUCTS BASED ON CROSS LAMINATED TIMBER (CLT)
Apa itu CLT?
CLT adalah panel papan berukuran besar yang dibuat dengan cara merekatkan minimal 3 lapis papan dengan arah serat kayu yang tegak lurus antar lapisannya
WORKSHOP
Workshop pengenalan CLT yang dibuka untuk umum
Narasumber:
1. Prof. Dr.Agr.Sc. Ir. Ragil Widyorini.
2. Ir. Greitta Kusuma Dewi, S.Hut., M.Sc.
3. Rafli Evansyah, S.T. (praktisi desain furniture)
21 Desember 2023
09.00 - 10.30 WIB
Auditorium Fakultas Kehutanan UGM
Free snack dan sertifikat untuk peserta workshop peserta terbatas 50 orang pendaftar
Pendaftaran melalui link:
Free entry!
bit.ly/WorkshopCompetitionCLT
CP : +62 857 4093 9090 (Greitta)
+62 853 6041 9547 (Riska)
HADIAH SENILAI JUTAAN RUPIAH!
COMPETITION
• Kompetisi desain produk inovatif berbasis CLT
• Dapat diikuti individu dan tim (max 3)
• Kriteria penilaian; kreativitas dan inovasi, produk fungsional, dan produk berbasis CLT
Periode pendaftaran workshop dan kompetisi
9-19 Desember 2023
Juara 1: Sertifikat + Rp. 1.000.000
Juara 2: Sertifikat + Rp. 750.000
Juara 3: Sertifikat + Rp. 500.000


FAKULTAS
KEHUTANAN


Workshop and Creative
Innovation Competition
FAKULTAS
KEHUTANAN

Figure 71 Workshop and Creative Innovation Competition for Functional Wood Products based on Cross Laminated Timber (CLT)

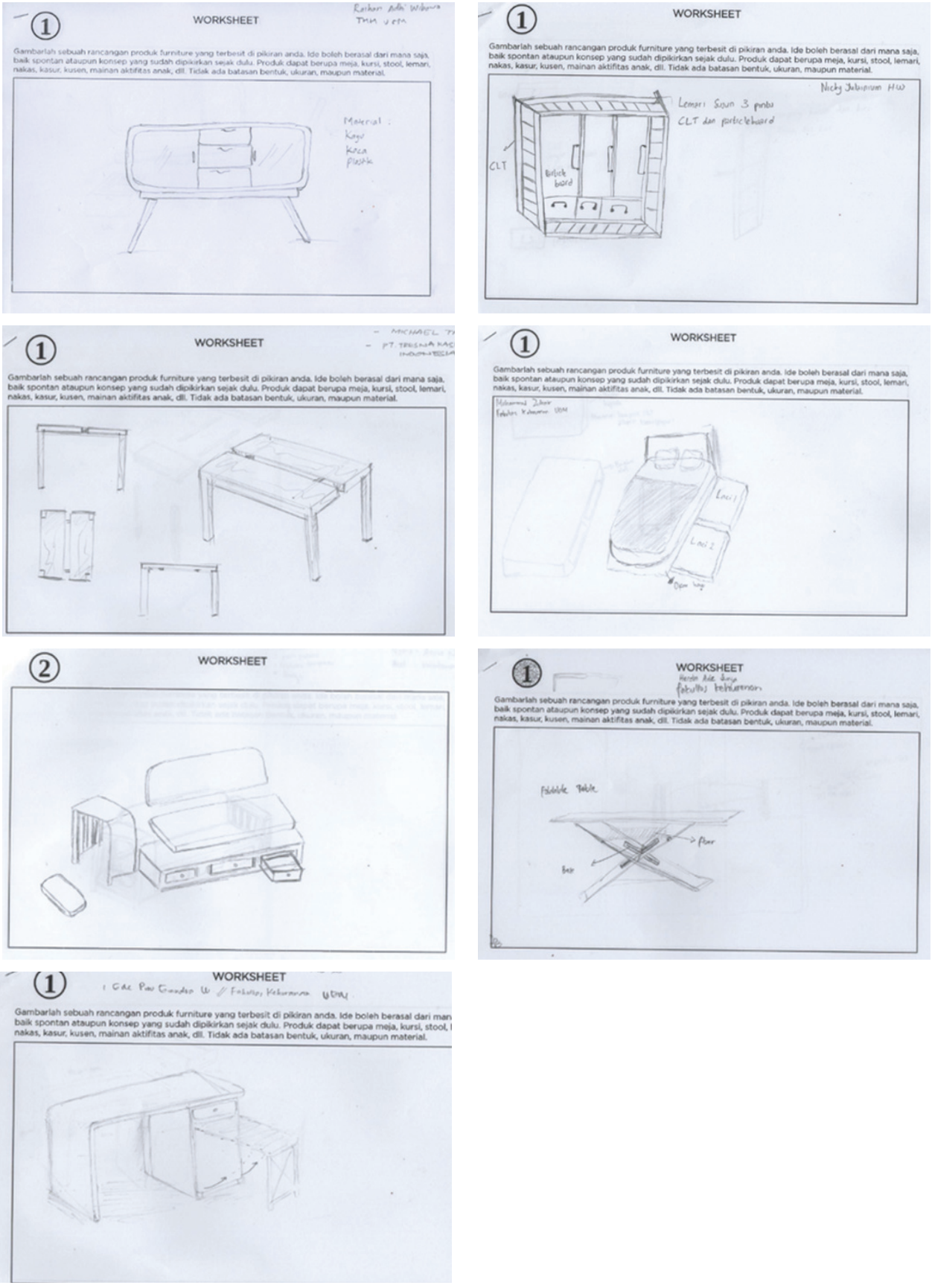


Figure 72 Invented designs of the furniture using CLT

Thirty-five designs of furniture were obtained during the Workshop and the Creative Innovation Competition of Cross-Laminated Timber (CLT) applications that participated in personal or group. All the invented furniture designs have high suitability between the product function and the properties of the raw materials (CLT) in some furniture types manufacturing. The invented furniture designs mainly contained multifunction, easy set-up, adjustable, customized size/space maximization, ergonomic, and minimalist concept products. Some examples of that furniture are foldable tables, foldable beds, 3 in 1 TSB (table, shelf, and bench), 3 in 1 BSS (bed, sofa set, and shelf), etc. The foldable table required a steel jointer/other jointer and might be a little complicated to design due to the thickness of CLT. However, it offered high strength for furniture. The foldable table was assigned to the camping table and study table for the boarding house. Furthermore, an invented study table was made and completed by some compartments, such as book shelves, laptop area, drinking bottle area, shelf, and stationary area. Then, a dressing table was invented and equipped with a shelf for skincare and cosmetic products, table, mirror, as well as a chair that stored under the table. For shelves, a design tried to combine a stand clothes rack and shelves for photos, displays, and accessories for the wall interior. A two-in-product was combining stairs and shelves that were placed in the tread part (the vertical area) of the rung without knop to avoid some foot stumps. A toddler learning tower combined with a toddler chair was invented using CLT and equipped with a sponge and leather. A mix and match of wood furniture and other materials such as glass, plastic, sponge, and wheel were added in the furniture design to optimize the aesthetic appearance, comfort, and function, as well as minimize the price of the furniture that will be produced. This was in line with our research result in Activity 1.2 about consumers' preference in wood products, specifically in furniture.

4.4. Public education on the advantages of using wood products in East Java

4.4.1. Characteristic of the target of public education

Gathering aspirations related to public education using a questionnaire distributed and completed by 112 respondents is an important step in gaining in-depth insights into the needs and expectations of the public towards the education system. The results of the questionnaire reflect the diverse views and experiences faced by respondents in the context of public education. By analyzing the data collected, areas that require further attention can be identified, so that efforts to improve and enhance the quality of education can be carried out more precisely and effectively.

Respondent characteristics are divided into gender, education level, generation, and income level. Respondent characteristics are characteristics or traits possessed by respondents. The characteristics of wood utilization respondents in East Java Province based on gender consisted of 45% women and 55% men.

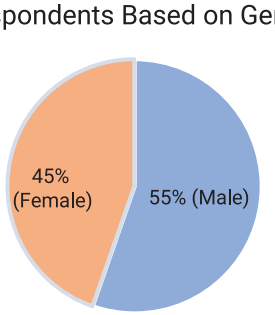


Figure 73 Respondents Based on Gender

In analyzing the data on the absorption of aspirations related to public education through questionnaires, the characteristics of respondents based on gender are important factors that provide different perspectives on public education. In addition to gender. Respondents were identified based on education level. The education level is divided into 4 classes, namely elementary school/ equivalent, junior high school/equivalent, high school/equivalent and college. As many as 84% of respondents were dominated by college graduates, followed by high school/equivalent education as much as 14% and the remaining junior high school and elementary education as much as 2%.

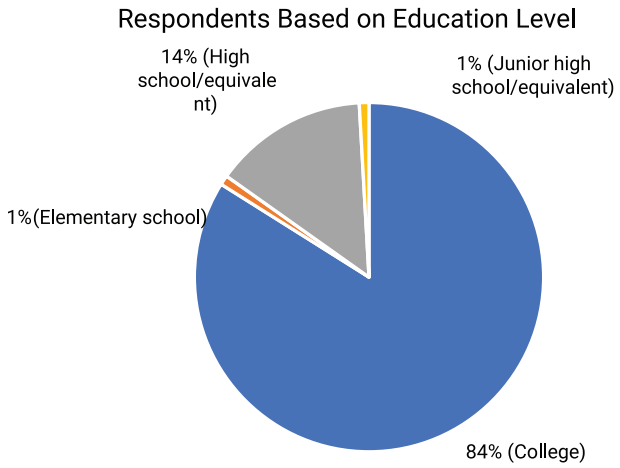


Figure 74 Respondents Based on Education Level

Respondents based on generation consist of 3 generations, namely baby boomers (43-77 years), Millennials (27-42 years) and Gen Z (11-26 years). The characteristics of respondents by generation are as follows.

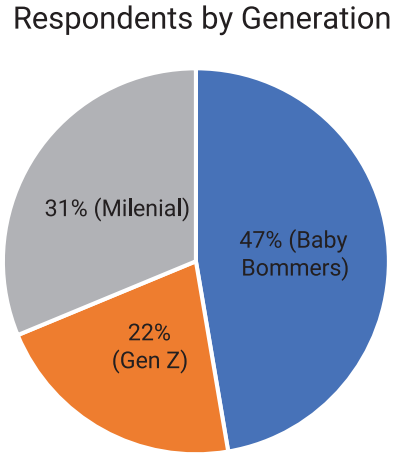


Figure 75. Respondents by Generation

Income classification based on BPS RI (Rakasiwi & Kautsar 2021) is divided into 4 classes of income consisting of very high (more than IDR 3,500,000/month), high (IDR 2.5 – 3.5 million/month), medium (IDR 1.5 – 2.5 million/month), low (less than IDR 1.5 million/month). Respondents were dominated by very high-income levels at 59%, high at 12%, medium at 14% and low at 15%.

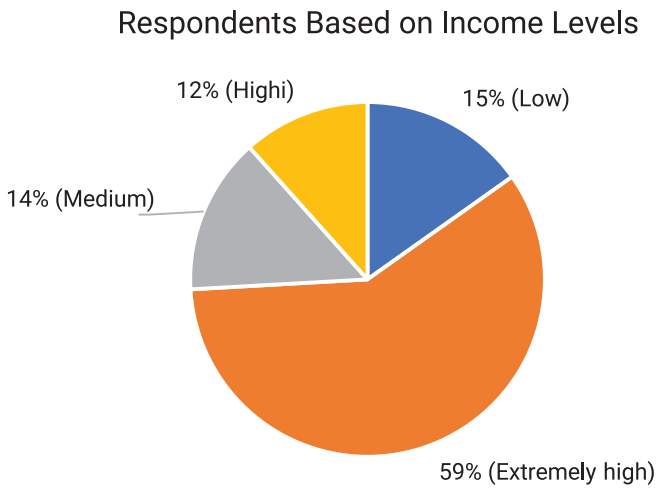


Figure 76. Respondents Based on Income Levels

4.4.2. Consumers' preference for the product by type of consumers

1. Type of products

East Java province produces various types of wood used by the community for various furniture needs, such as solid wood, Plywood, particle board and others. One of the most commonly used types of wood is solid wood, which is often used to make household furniture, such as wooden floors. Solid wood is also frequently used to create structures like beams and poles. In addition to its strength, solid wood has a beautiful natural appearance, making it a top choice. However, solid wood has some weaknesses, such as its higher price than other types of wood and a high likelihood of exposure to wood pests. Therefore, for solid wood to remain stable and durable, it is very important to take good care of it.

Plywood is a strong wooden sheet made of thin layers that are placed side by side and provide good stability. Plywood has become popular in construction and interior design because of its cheaper price than solid wood. However, the weakness of Plywood is its less beautiful appearance compared to solid wood and can look more "sharp" or "layered". Nevertheless, with proper care, Plywood can remain stable and function well for many wood projects. Plywood has several advantages compared to solid wood, including the strength of shrinkage of wood and size. The width of the length is greater than with solid wood (Yunus et al., 2018).

Wood lamination is another wood processing product usually used as a surface layer on furniture or decorative material. Laminate is highly resistant to scratches and water, making it ideal for environments often exposed to water. In addition, lamination is available in various colors and textures that can be selected to meet the design needs. According to Sucipto and Ruhendi (2012), laminated wood has several advantages compared to solid wood or hardwood. Among others, laminated timber is easier to use, more efficient as a raw material, has aesthetic value, and is easy to maintain because it can be tempered or coated with anti-fire material. However, it should be remembered that lamination is less strong than solid wood and can break if exposed to strong pressure or impact. Therefore, use lamination carefully according to the use and environment where it is used. This will protect objects or surfaces from additional damage.

A wood processing product made of compressed wood powder is called a Medium Density Fiberboard (MDF). MDF has a high density and is often used to make furniture.

Due to its smooth and flat surface, the surface can be laminated, which improves the appearance of the furniture and protects it from damage and water. Lamination on MDF is highly recommended to increase the durability and beauty of furniture made of this material, as lamination prevents scratches, stains, or even damage caused by water, which can damage the wood powder. Like other types of board, MDF has weaknesses, such as not strong nails like solid wood, poor surface glue, and screws on thick sides that are less strong (Hakim et al. l, 2011)

Particleboard is a wood made of wood powder mixed with adhesives such as resin or adhesive. (Andini et all, 2019). Though lighter than MDF, the particleboard remains robust for lightweight constructions such as cabinets or tables. Another advantage of particleboards is that they are cheaper than the MDF.

Based on the questionnaire results of the type of product selected for furniture as the main material in the manufacture of wood processing products, the majority of respondents (63%) chose solid wood, particleboard (10%), and the rest (27%) chose other materials or did not have a particular preference. However, although solid wood and particleboard are the primary options, there are still some factors to consider in choosing materials for wood processing products. One important factor is the sustainability of the wood used. In an age of increasing environmental concern, timber from well-managed and recycled resources is becoming more of a priority. Based on the results of the research, Puspita et al. (2016) stated that the choice of solid wood for raw materials is increasing, so other alternatives are needed. The lack of solid wood for furniture, among others, requires a lot of components, connections, and hardware to make it stand alone (Hartanto, 2022). Depending on the design, dining chair components include heels, front feet, rear legs, plywood, heel frame, backup, and others.

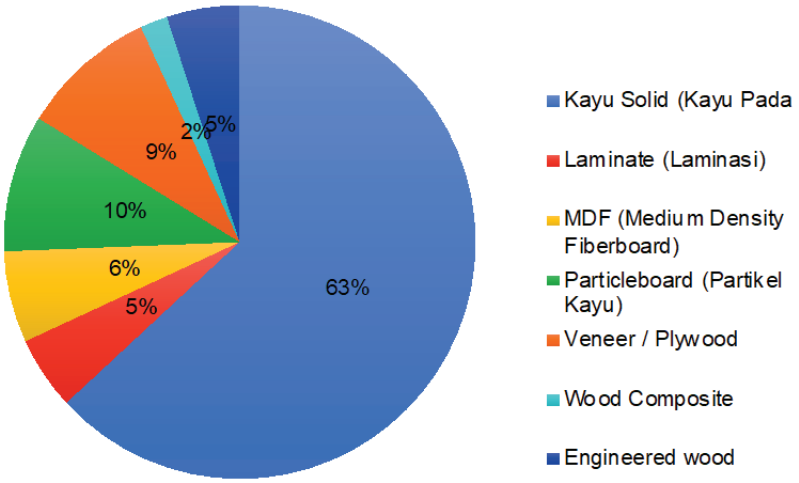


Figure 77 Wooden processing material is preferred for furniture raw materials.

In addition, the strength and durability of the material are important considerations in choosing the material for wood processing products. Solid wood is generally stronger and more durable than particleboard, but particleboard can be cheaper and easier to process. Based on the results of research by Sulaeman and Yoza (2010), particleboards are more suitable for making children's toys, and sound absorbers do not require such high power. However, solid wood may be more recommended if wood-processed products are to be used outdoors or in humid conditions due to its strength and resistance to extreme weather. In addition, aesthetic factors also need to be considered when choosing

materials for wood processing products. Solid wood usually looks more natural and beautiful, while particleboard may look plain and less visually attractive. Considering all these factors, the right material selection will ensure that wood-processed products are good quality and fit the user's needs.

2. Product design

Public preferences in determining furniture based on design, among others: (1) custom design, (2) classic and traditional design, (3) modern and stylish design. All these factors become important considerations for choosing furniture that fits their needs and tastes. According to Harto (2014), designers and furniture manufacturers need to undertake research or research to design and make products that are market-acceptable and meet the needs of prospective buyers. In designing designs, designers must consider and pay attention to some basic rules: (a) function of furniture, (b) proportions of shape and aesthetics, (c) materials, (d) construction, and (e) user anatomy. Custom design allows consumers to choose the size, material, and color that suits their space and style.

Figure 78 Product design examples

For example, a consumer who wants to decorate their living room with unique furniture to suit their tastes can order chairs and tables with custom designs. They can choose the size that suits their living rooms, choose durable materials such as wood or leather, and choose colors that match the colors of the walls and other furniture in their

living area. It will give satisfaction and pride to the consumer because the furniture will be unique and personal. Besides, custom design also provides flexibility for consumers in adapting furniture to their needs and changing their room style in the future. By choosing custom design, consumers can have furniture that truly fits their wishes and needs.

Classic and traditional designs are attractive for those who want an elegant and timeless look. For example, a couple who just got a new home decided to book a living room sofa with a custom design. They wanted to combine modern and traditional elements in their sofa designs. After discussing with the interior designers, they chose a neutral-colored fabric with traditional batik motifs on the backup and pillows-pillows as a classic touch. They also chose solid wooden frames with detailed engravings that add a traditional touch to the sofa. As a result, they managed to get a living room sofa that depicts their uniqueness and personality and fits their wishes and needs. The sofa became the centre of attention and an elegant and timeless fashion statement in their living room.

Modern and stylish design suits those who want a fresh and contemporary look. For example, the couple chose a white sofa with traditional batik motifs on the backup and pillows. They also chose a wooden frame with detailed engravings that add a traditional touch to the sofa. As a result, the sofa became the centre of attention in their living room and depicted their uniqueness and personality. All this shows that people's design preferences are very diverse and important in buying furniture. It also suggests that furniture design can reflect the identity and characteristics of the individual or family that owns it.

Based on the questionnaire, results from respondents showed that the most sought-after are modern and stylish designs at 45%, classical and traditional designs at 33%, and custom designs at 22%. Thus, interesting and unique furniture design is crucial in attracting consumer interest. Modern and stylish designs are the main favourites because of the fresher and more contemporary impressions. However, it cannot be ignored that some consumers still prefer classic and traditional designs, probably because they want to depict the values of tradition and eternity. Finally, custom design also has a significant market share, suggesting that people value the uniqueness and personalisation of their furniture.

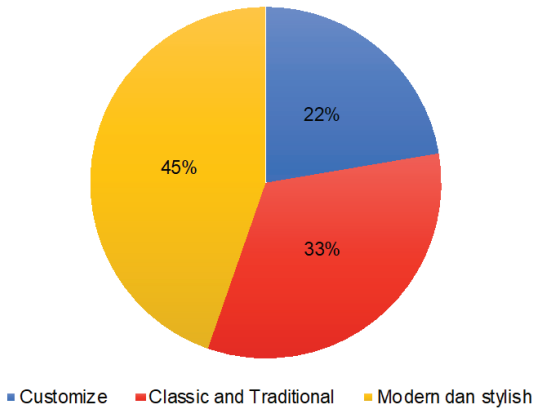


Figure 79 Preferred Furniture Design

The results of Trumansyahjaya's (2015) research stated that, before choosing and arranging the interior element of the house, it is very important to consider the concept of its inhabitants. The choice of furniture, furniture, or furniture must be tailored to the needs, size, and function. Choosing furniture with excessive designs or sizes for a small

house with limited space will make its aesthetics and functions suboptimal and obscure. Instead, choose furniture that is adapted to the daily activities of the family to maximize the amount of limited space.

Furniture companies must pay attention to the designs the public wants to increase sales and satisfy customers' needs. Customers who need furniture for the convenience of work or office space must also be equipped for personal use. Wardani (2010) stated that the purpose of office furniture design is to enhance the creativity, productivity, interaction, and spontaneity of human work. The furniture must be adapted to employees' needs to improve the quality of expression of the workspace, the comfort of work, and the optimization of work. Consider the important relationship between the interior environment and human productivity during the design process. Considering these diverse design preferences will help furniture companies to present products that match consumer tastes. Besides, companies also need to keep up with the latest design trends and innovate to remain relevant in a competitive market. By understanding the wishes and needs of customers, furniture companies can create effective marketing strategies and increase their sales.

3. Type of wood

The type of wood chosen for the furniture can be customized to the needs and style of the desired design. Furniture is made of pine, mahogany, and other kinds of wood. Some people choose wood for its natural strength and beauty, while pine is often chosen for its lower price and coloring ability. Mahoni wood, on the other hand, is often chosen because of its long durability and attractive appearance. In addition, other types of wood, such as walnut, acacia, or limestone, can be used for furniture, depending on people's needs and preferences. According to Rochyat (2013), the wood used for furniture should be medium-weight, stable in size, and decorated with accents. Besides, wood should be easy to squeeze, fold, screw, dilemma, and various other ways. Woods like sonokeling, Ramin, mahonia, jati, and meranti are recommended for furniture.

Every kind of wood has its advantages and disadvantages. For example, if someone wants to make a dining table out of wood, they might prefer wood because of its strength and beautiful natural appearance. However, if they have a smaller budget and want to have the color they want, the dining desk of pine may be more suitable. Others may use mahogany wood for their desks because of its rich color and insect resistance. The acacia wood is popular for its strength and weather resistance. Limestone is often used to make outdoor furniture because of its resistance to water and its soft fiber. Lastly, walnut wood is often used for furniture because of its dark color and beautiful fiber, which makes it look luxurious. As a result, users have various wooden options that can be customized to their style and needs.

Based on the questionnaire results, the majority chose wood for furniture by 70%, and 28% did not choose any wood that could be used for the furniture. Hardwood has become a popular furniture material due to its extraordinary strength and durability. Besides, the wood looks luxurious because of its fibres and beautiful colours. However, it is important to remember that personal preferences and the room's conditions influence the choice of wood for furniture. Therefore, customers should consider utility and aesthetics when choosing wood for furniture. Plywood is a wood that is suitable for use as a raw material for furniture because it has characteristics such as artistic patterns, medium to smooth texture, moderate strength and toughness to make it easy to work, high enough natural durability (Class Awet I-III), good precision and finishing, and stability (Wahyudi, 2013). Old timber is of very good quality, but fast-growing timber is also very good to use as a raw material for furniture.

Anggraini et al. (2023) stated that fast-growing wood could be used as a raw material for furniture because it has superior properties to other types of wood at the same time. Fast-growing wood has superior qualities compared to other types of wood, such as Gmelina (Gmelina arborea), Mindi (Melia azedarach), Mahoni (Swieteniaspp.), Akasia (Acacia mangium), Pinus (Pinus spp.), and Sungkai (Peronema cases) at the same time of harvest.

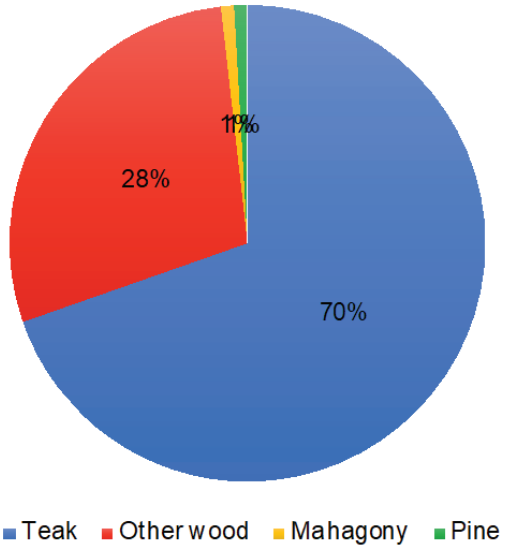


Figure 80 Preferred wood for raw material furniture or household appliances

4. Price

For some people, choosing cheap furniture is a top priority because they want to save money. However, some prefer to invest in more expensive furniture for better quality and durability. Ultimately, the choice of furniture from the price depends on each individual's value and personal preferences. Based on furniture preference based on

price, most consumers choose 57% moderate 34% expensive, 5% very expensive, and 4% cheap. According to the furniture preferences, most choose 57% of the price, 34% of that price, 5% of that cost, and 4% of that value. Only a small % of consumers choose furniture with a very high price, only 5% of the cost. This is probably because the vast majority prefers furniture at a fairly affordable price (moderate), 57%. However, some consumers still prefer furniture of a high price to 34%. Only 4% of the customers are looking for very cheap furniture.

In terms of the relationship between the price and the purchase decision, the buyer is influenced by their choice to buy the goods. If the price is higher, the purchaser will make a lower choice, and vice versa; if the prices are lower, the buyers will make higher choices. (Kotler, 2009). Customers make monetary expenses called prices when they buy goods or services. The main factor that influences consumer decisions to make transactions is price. (Kusuma et all, 2018). Customer behavior is heavily influenced when evaluating and assessing the price of a product.

Another factor that affects the preference of furniture choice is the style and design desired. Some people may prefer cheap furniture but have designs that fit their taste. Meanwhile, some prefer expensive furniture with exclusive and luxurious designs. In addition, the material's quality and the furniture's durability are also important considerations in the selection. Thus, the choice of furniture from the price depends on the combination of these factors.

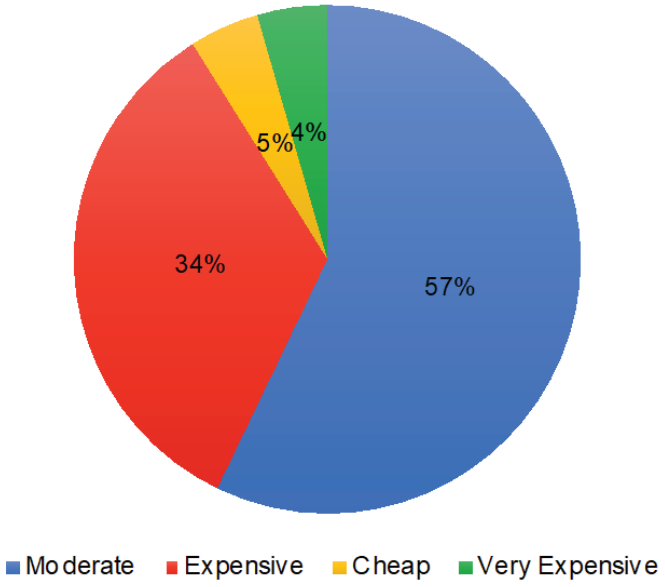


Figure 81 Price of wood furniture available in East Java market in 2023

5. Quality

People's preferences in choosing furniture can be seen from its quality, ranging from bad to enough, good to excellent. Good quality furniture becomes a top choice for a society that looks forward to comfort and durability. They tend to choose furniture

with high-quality materials and aesthetic design. In addition, good quality furniture also guarantees safety and hygiene for users, thus becoming an important factor in meeting the needs and preferences of the public in choosing furniture. For example, a newly married young couple chooses high-quality home furniture. They buy sofas with high-quality leather materials and modern designs that fit their home's interior style. By choosing good quality furniture, the couple can enjoy the comfort and beauty of their home while guaranteeing safety and hygiene. They do not have to worry about the rapid damage or weariness of their furniture because of the good quality of the material. In addition, good quality furniture also gives confidence to the user because there is no need to be worried about potential health problems such as allergies or skin irritation that may arise from poor furniture material. The couple has met their needs and preferences by choosing good quality furniture to create a comfortable, beautiful, safe, and clean home.

Based on the questionnaire, 53% chose good quality, and 34% chose enough. However, not everyone understands the importance of having good quality furniture. Some people may prefer to save money by buying cheaper furniture, although they realize such furniture may only last for a while. They may think they can replace such furniture if it is damaged or as quickly. However, they may not realize that the long-term cost of replacing often corrupt furniture or aus can be much more expensive than buying good quality furniture from the start. Besides, they may ignore the potential health problems from poor furniture materials, such as allergies or skin irritations.

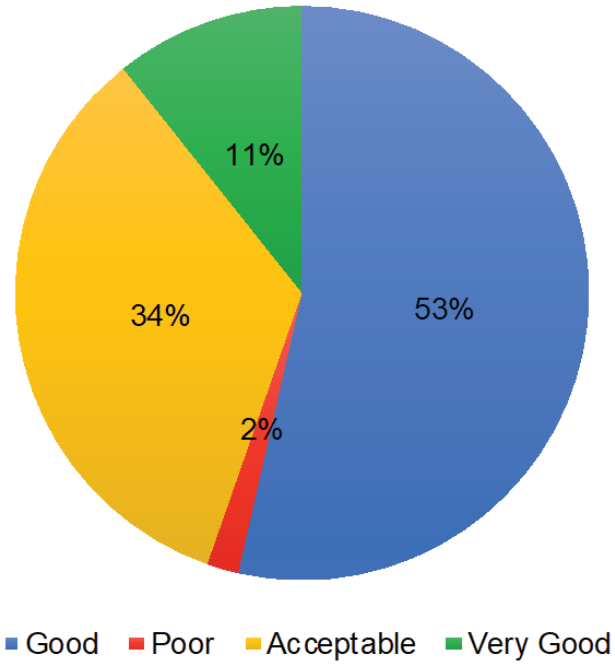


Figure 82 Price of Wood Furniture Available In East Java Market In 2023

6. Innovation

Furniture innovation in the eastern Java Province continues to flourish with environmentally friendly design and safe materials for health. Companies in the East Java province is becoming increasingly aware of the importance of providing quality and durable furniture to consumers. Thus, consumers can save long-term costs and also maintain their health.

Besides, innovation is also done in terms of environmentally friendly furniture design. Many companies in the eastern Java province are starting to use environmentally friendly materials, such as wood obtained from sustainably managed forests. It not only has a positive impact on the environment but also provides benefits for consumers who care about environmental issues. In addition, these companies also take care of consumer health by using safe ingredients that do not contain hazardous substances. Thus, consumers do not have to worry about health problems such as allergies or skin irritation when using the furniture. For example, a furniture company uses wood from a sustainably managed forest. Thus, they reduce excessive deforestation and ensure that their raw materials do not damage the environment. It is attractive to consumers who care about preserving forests and the environment. They also use environmentally friendly paints and coatings that do not contain harmful chemicals such as lead or mercury. In addition, the coating is also free of harmful substances such as formaldehyde or VOC. (volatile organic compounds). By using safe and environmentally friendly materials, the furniture companies assure consumers that their products are high quality and not harmful to health and the environment.

Based on the questionnaire results, most of the respondents judged that innovation in furniture products in eastern Java was already innovative (48%) and moderately innovative (38%). The results of the questionnaire also showed that most respondents believed that furniture companies in Eastern Java had successfully introduced innovative products. Furthermore, the high ratings of innovation of furniture products in East Java also indicated that the company has successfully created products that meet the needs and wishes of consumers. However, a small proportion (14%) still believes that the innovation in furniture production in Eastern Java is still less innovative.

Anshory research results (2021) show that consumers want to buy furniture and design innovation elements will be the main focus. Consumers see this directly or visually through the entire product packaging, which displays various design elements such as material usage, function, attractive colour quality, and size. The results of these reviews can help customers understand the phenomenon that has occurred in the last few years and the impact of the furniture product business in the future. These results can also meet the community's needs for quality products that meet society's standards.

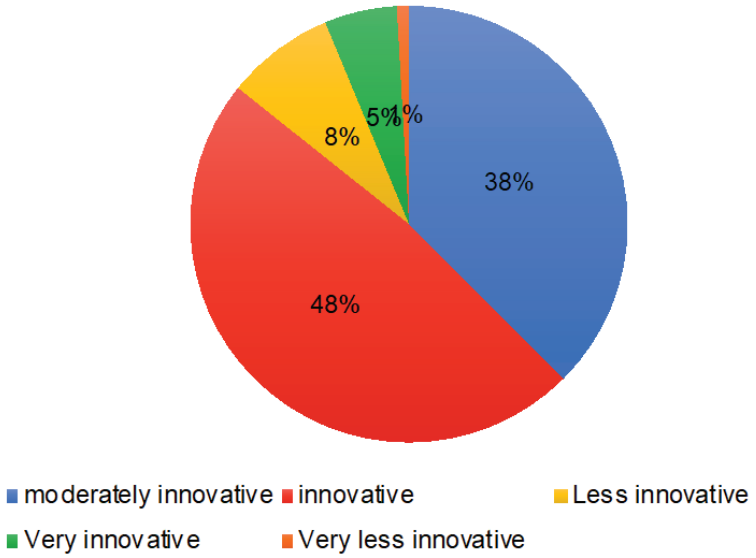


Figure 83 Innovation for quality product

7. Innovation strategic

Furniture innovation strategy helps companies to remain relevant and compete in an ever-expanding market. One of the furniture innovation strategies that companies can use is to develop new designs and technologies. Companies can research and develop more functional, ergonomic, and environmentally friendly furniture products. In addition, companies can also leverage new materials and more efficient production techniques to produce more quality and value-added furniture. By implementing these innovations, companies can attract consumer interest and distinguish themselves from competitors in the market. This will help companies gain a competitive advantage. For example, furniture companies can undertake research and development to create seat designs that can automatically adjust the user's posture. Using sensors and special technology, these seats can automatically change their position to provide maximum comfort and reduce the risk of postural injury. In addition, companies can also use environmentally friendly materials to make these chairs. It will attract the interest of consumers who care about the environment and provide a competitive advantage for companies in markets that are increasingly aware of environmental issues. Thus, companies can create added value for consumers and distinguish themselves from competitors.

Based on the questionnaire, the majority of respondents stated that innovation strategies for furniture were highly needed at 44%, needed at 38%, and quite needed at 15%. In an increasingly fast-growing industry, innovation strategies are the key to staying competitive and meeting ever-increasing consumer needs. With a high percentage of respondents saying that innovative strategies for furniture are important or necessary, this suggests that industry players need to pay serious attention to the innovation aspects of their products. The importance of innovation strategies is also becoming

increasingly clear, given the increasing competition and changing consumer needs. Therefore, companies need to continue to implement effective innovation strategies to ensure the growth and sustainability of their business in the future.

For example, a furniture company that manages to survive and grow amid tight competition is a company that continues to develop innovative products. For example, the company designs a chair that can change shape according to the user's needs. With this feature, consumers can easily adjust their seat position to suit their comfort and preferences. It gives customers a unique experience and can increase customer satisfaction. Furniture companies can remain relevant and attract growing consumer interests by continuing to produce innovative products like this. In addition, effective innovation strategies can also help companies position themselves as leaders in their industry and distinguish themselves from competitors. Thus, companies can ensure the growth and sustainability of their business in the future.

4.4.3. Information delivered in public education

The public education information presented is related to the challenges, opportunities, threats and potential of wood product development in the domestic market. In this case, it is important to realize that the domestic market has great potential for the development of wood products. However, the challenge faced is the increasing competition from cheaper imported products or products made from plastic. Therefore, it is necessary to improve the quality and innovation of wood products in order to face these threats, while still taking advantage of the opportunities that exist. In addition, it is also important to educate the public about the sustainable use of wood in a responsible manner, so that the development potential of wood products can go hand in hand with environmental protection. Despite increasing competition from cheaper imported products or products made from plastic, the development potential of wood products remains large as many consumers prefer environmentally friendly and high-quality wood products. In this case, it is important for producers to continue to develop technology and innovation to increase power.

Information related to challenges, opportunities, threats and potential for the development of wood products in the domestic market was presented in the Focus Group Discussion. In addition, to increase education, product innovation exhibitions and product innovation competitions were opened. The purpose of the Focus Group Discussion was to gain a deeper understanding of the challenges faced by the wood industry in the domestic market, as well as the opportunities and threats that may exist. In addition, the Focus Group Discussion activity also held an innovation exhibition and product innovation competition. Through the product innovation exhibition and product innovation competition, it is expected to increase participants' knowledge

and understanding of the latest developments in the wood industry and encourage the development of more innovative products.

The purpose of the product innovation exhibition is to show the general public the potential and advantages of innovative products that have been developed by the wood industry. Through this exhibition, it is expected to create greater awareness and interest in using innovative wood products and encourage the growth and development of the wood industry as a whole. In addition to the product innovation exhibition, a product innovation competition was also held to encourage wood industry players to continue to innovate and create higher quality products that are relevant to market needs. The product innovation competition aims to recognize and reward wood product developers who have successfully created unique and useful innovations. This competition also aims to motivate other wood industry players to continue to innovate and create products that can increase the competitiveness of the wood industry globally. With the product innovation competition, it is hoped that the wood industry can continue to grow and become one of the sectors that make a significant contribution to the country's economy.

4.4.4. Implementation of public education

The FGD was attended by a number of institutions comprising representatives of the Tropical Timber Organization (ITTO), the Ministry of Environment and Forestry (KLHK), the Forestry Service of East Java Province, Department of Industry and Commerce Province of East Java, PT. Kutai Timber Indonesian and the East Java Regional Division of Forestry (Perhutani) and Students.

The educational activities of FGD are related to the development and challenges of processed timber products in East Java Province from various perspectives of both the government, industry actors, academics and the general public. The event will take place on Wednesday, December 13, 2023 from 08.00 to 16.00 PM with two discussion sessions.

1. Educational activities exhibition

An exhibition is an activity aimed at providing information about the tasks and functions and the results achieved by the institution organizer or exhibitors. Exhibitions can be an effective means of public education because they provide in-depth information about technology and innovation in various fields. Through exhibitions, visitors can gain a complete understanding of existing technology. through exhibition activities, it allows for an interactive process between visitors and exhibition guides. The interaction between exhibition guides and exhibition visitors produces direct understanding and knowledge for visitors, while exhibition guides will receive feedback that can be useful

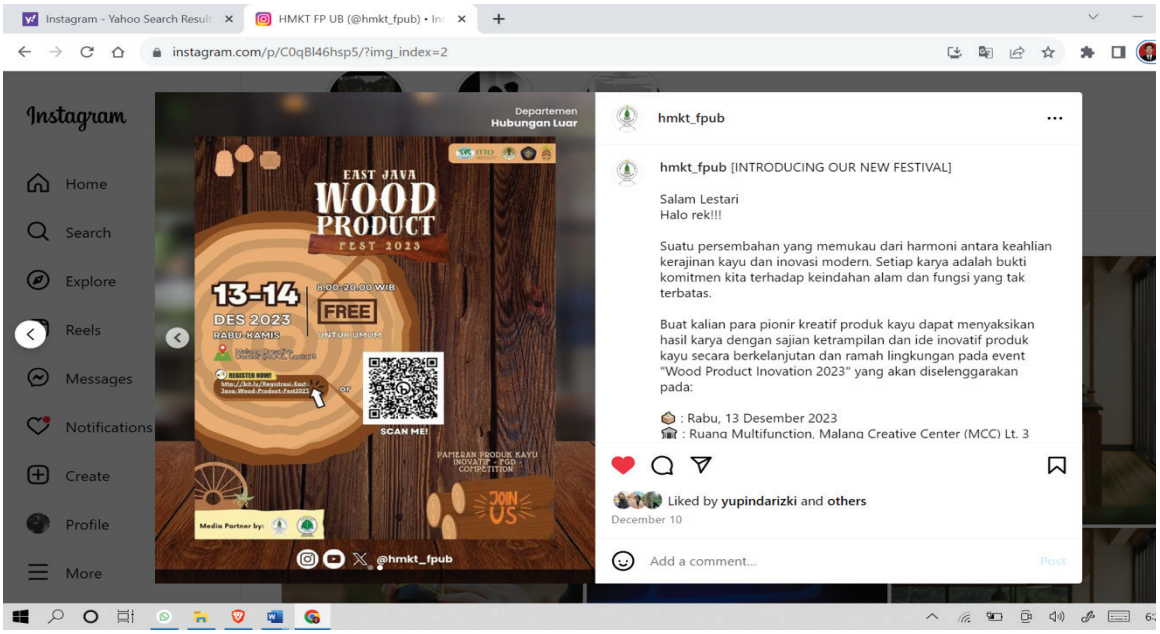
for the development of future innovations.

Choosing an exhibition as a form of public education is a strategic step in conveying information about innovations and also the market for processed wood products in East Java in particular. It is hoped that by holding the exhibition, various industries involved in the management of wood raw materials can be involved as participants in the exhibition that will be held, so that there will be interaction between visitors and exhibitors. This interaction can increase visitors' understanding regarding the wood processing industry in East Java which has great potential. Apart from that, this exhibition also displays wood product innovations from exhibitors and also from participants in wood product innovation competitions, thus adding to Visitors' knowledge is related to how innovations can be made in processed wood products and also discussions that occur between exhibitors and visitors will provide feedback and input for the wood processing industry in East Java.

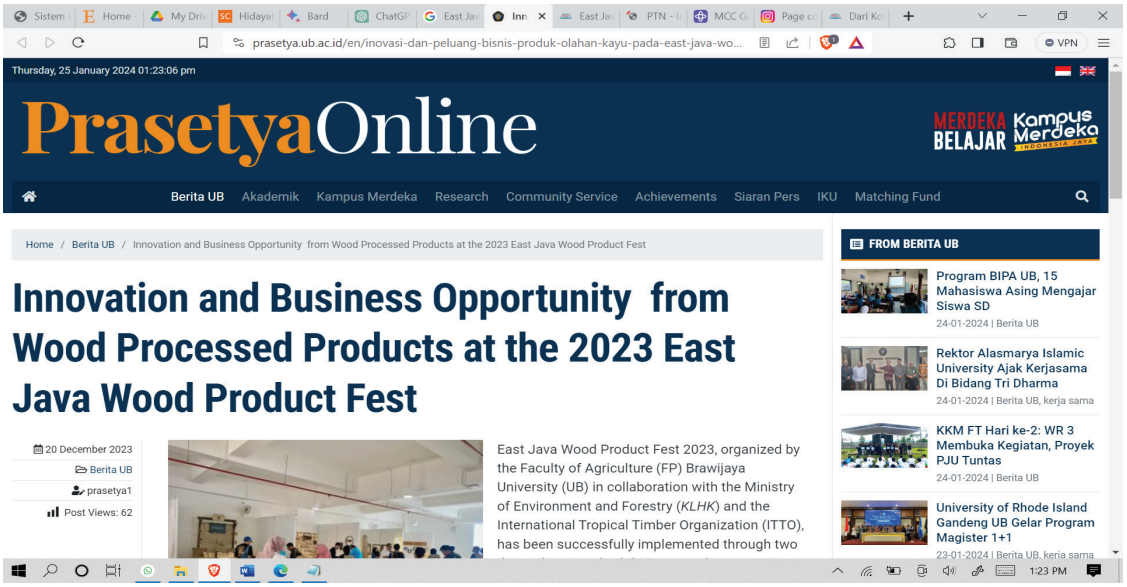
This activity presents exhibitions, innovative ideas and various processed wood products. Participants who take part in the activity have the opportunity to see various stands to search and make choices to find out preferences for the wood products used and use quality processed wood products with high selling value. The exhibition can be an interaction between processed wood product makers and participants to open up opportunities for processed forest products to grow day by day. Community development and creative economy can be done through exhibitions oriented towards public education in Indonesia. Exhibition activities to provide education for wood waste products, such as INA Craft activities on an international scale for wood entrepreneurs, have proven to be effective as a means of public education.

Figure 84 Public education through East Java Wood Product Fest 2023

2. Education through time media and social media



Public education through mass media and social media is a modern approach that leverages the power of information and digital connectivity to spread knowledge and raise public awareness. The public can easily access the information, form opinions, and take action based on the knowledge acquired. Meanwhile, social media has become an increasingly dominant platform in disseminating public education. Through various platforms such as Facebook, Twitter, Instagram, and YouTube, individuals can share and consume educational content quickly.



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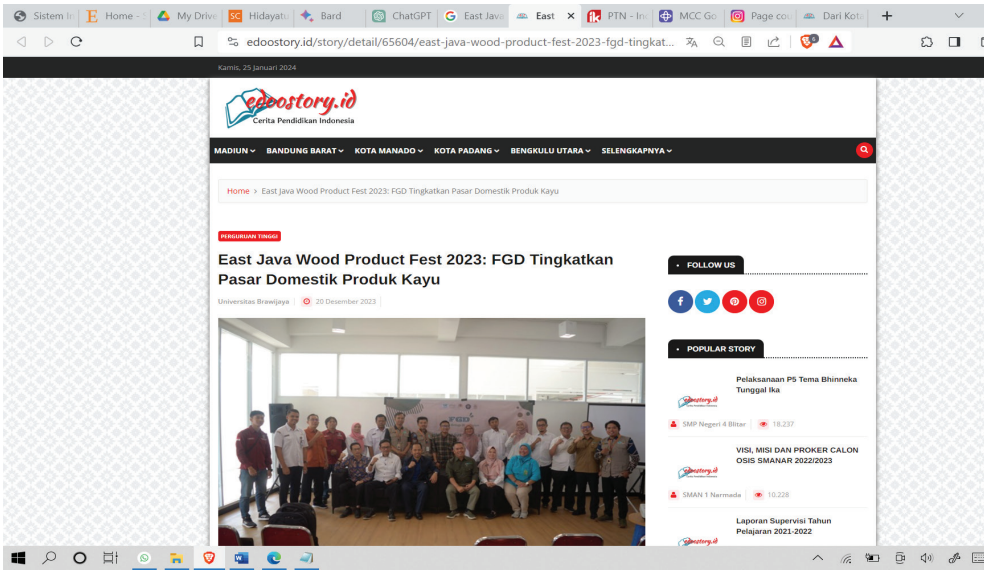

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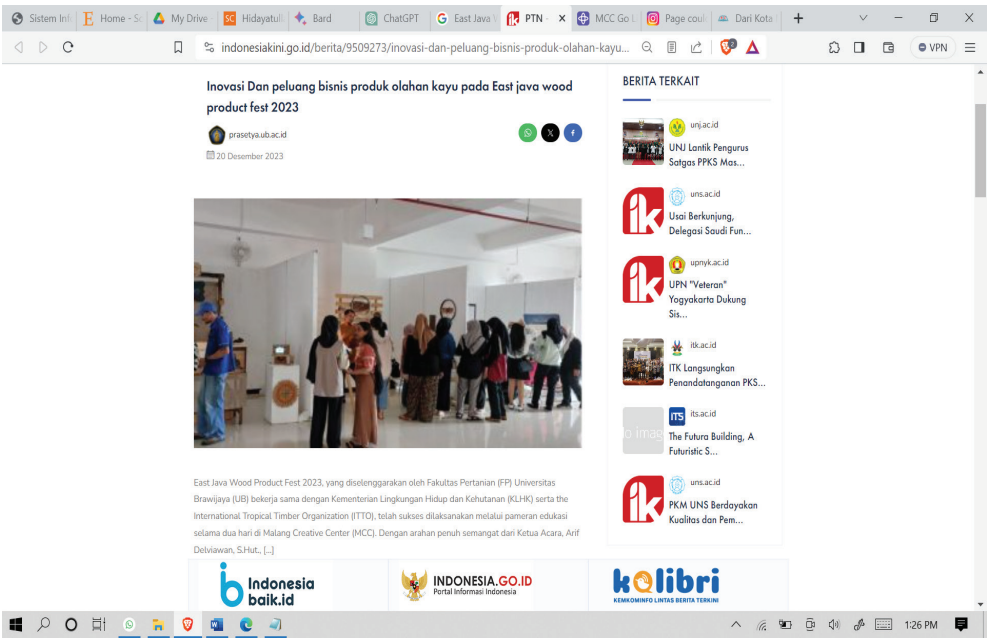

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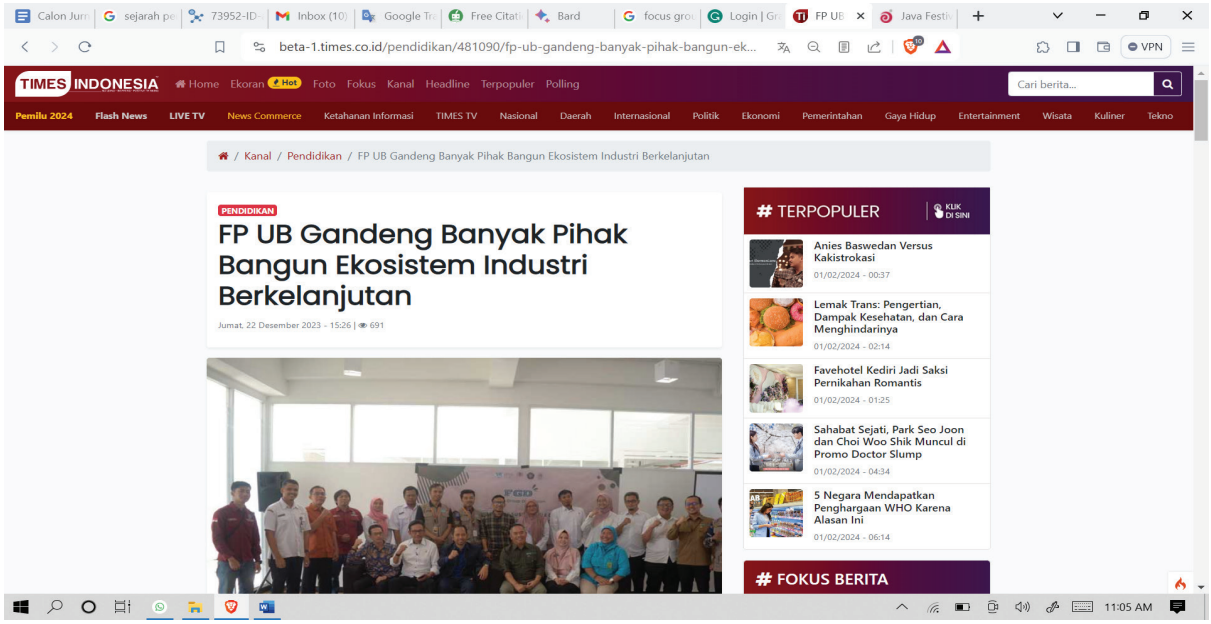

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4.4.5. Recommendation for public education in the future

Public education aspirations reflect people's hopes and desires for an ideal wood utilization public education system. In this context, people express their aspirations through various channels, including participation in surveys, public meetings and group discussions. These aspirations can include a variety of elements, such as expectations for improved utilization quality, innovation and more. The analysis of public education aspirations provides an in-depth view of community needs and priorities related to public education in timber utilization.

Respondents' aspirations related to delivery materials in public education activities starting from the most recommended consisted of (1) the advantages of wood products, (2) local market opportunities, (3) positive impact on the environment, (4) utilization of wood with consideration of environmental and (5) design innovation, job creation and economic growth, business opportunities in wood processing, business opportunities in wood waste processing, availability of wood species, and culture and ethics.

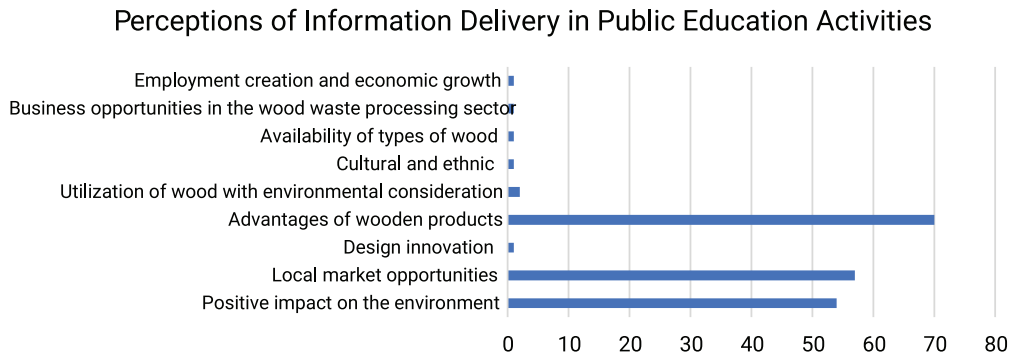


Figure 85 Perceptions of Information Delivery in Public Education Activities

While the suggestions for public education activities recommended by respondents starting from the most recommended consist of (1) wood product exhibitions and festivals, (2) workshops and training, (3) socialization through mass media, (4) cooperation with schools and universities, (5) development of online educational materials, (6) discussions and seminars, (7) combination of online and offline, innovation competition and environmentally friendly market policies.

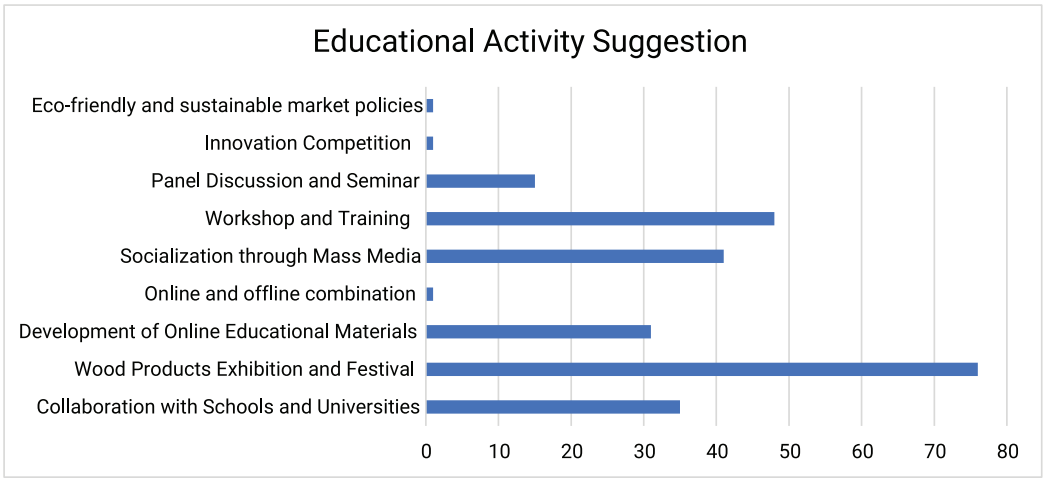


Figure 86 Educational Activity Suggestion

V. CONCLUSIONS AND RECOMMENDATION

5.1 Conclusion

Education on the variety of wood products is important for the public (both users and producers) to develop the domestic wood product market. The initial public education was focused on introducing wood product diversification and its superior traits. Education on innovative wood products is necessary for both students and the public/industry (users and producers) to expand their knowledge, particularly on wood products and business development. This public education could introduce innovative products as a new business idea, as well as national product diversification as an effort towards business resilience.

Respondents recommended social media as the primary education, meaning, demonstrating the trend of consumers relying more on online platforms. In-person counseling and training were identified as the most relevant types of education. Linking information on the weaknesses of wood products, especially termite infestation, can be a focal point for improving product quality and providing education on maintaining products. The use of engineered wood products is an environmentally friendly measure. Implementing public education through workshops and video competitions provides clear and correct information about engineered wood products. In addition, consumer awareness of the sustainability of engineered wood products can increase through good education and positive consumer preferences for engineered wood products can be a growth driver for this industry.

Public education plays a crucial role in ensuring updated knowledge regarding the latest developments in the wood industry. The activities can include a wood product exhibition, seminar/talk show/workshop (online or offline), training, socialization through social media, and innovative competition. The topics are not only limited to product innovation and designs but also market policy. The target of public education includes wood industry actors including manufacturers and consumers of all generations. Future public education can be organized in collaboration with government, industry actors, and academic/institutions for comprehensive discussion and learning.

Public educational activities consisting of focus group discussions, exhibitions, social media, and the media have effectively educated the public regarding the use of raw wood materials. To improve, it is necessary to consider the location of the activity to be more representative or have a large number of people visited so that the community that gets education can be more. In addition to adding attractiveness, it is necessary to add workshop activities and training to add attractivity.

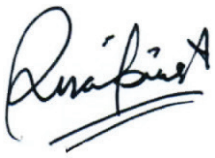
5.2 Recommendation

Four main activities recommended by public education respondents are (1) exhibitions and festivals of wood products, (2) workshops and training, (3) socialization through time media, and (4) collaboration with schools and colleges. the four main materials most recommended are (1) excellence of wood products, (2) local market opportunities, (3) positive impact on the environment, and (4) use of wood with environmental considerations.

Involve more respondents from various segments of society to ensure a diversity of views and understanding of processed wood products. Implement a more intensive marketing and education strategy through social media and technology to reach a wider audience. Increase counseling and hands-on training initiatives and encourage product innovation with environmentally friendly concepts. Involve the industry in preparing recommendations and implementing educational activities so that the information conveyed is more relevant and can be applied in industrial practice. Conduct periodic evaluations of the effectiveness of educational activities and update the information presented by consumer and industry trends developments. Ensure that the conclusions and recommendations generated can be implemented in industry practice and policy.

Jakarta, December 31st 2024

Responsible for the Report



Dr. Rina Kristanti
Project Coordinator

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