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Economic Aspects of Pandan Fiber Furniture from the Area of Sustainable Design Philosoph

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Abstract. In terms of sustainable design philosophy, the goal of this study is to describe the fulfillment of economic principles through furniture made from Pandanus fiber. Respecting the needs of current and future generations, energy efficiency, cost-effective and sustainable solutions, and easy product maintenance are all areas of sustainable design philosophy. The qualitative research method was used. The findings of this study show that chair furniture made from Pandan fiber satisfies both economic and philosophical principles of sustainable design, because the manufacturing and processing of waste do not incur high costs due to the lack of heavy equipment, machinery, or chemicals used in the management process. On the contrary, the resulting product is strong and long-lasting.

Keywords: Sustainable Design Philosophy Area, Chair Furniture, Pandan Fiber Material, Economic Principles

1. Introduction

Covid-19 virus's spread has had a significant impact on Indonesian economy [1]. The COVID-19 virus is expected to have a large economic impact and can cause a country's economy to slump as the number of poor people increases [2]. This occurred as a result of many companies going bankrupt, resulting in the layoff of many workers. As a result, in the context of economic recovery, the government implements a national economic recovery program that assists MSMEs (Micro, Small and Medium Enterprises). Even today, economic recovery in Indonesia begins with the rise of MSMESS, which begins with the smallest unit of society and works its way up by utilizing the natural potential that exists in their respective regions.

One of the characteristics of a sustainable system is the community's development of MSMEs by utilizing the natural potential around them. A sustainable system is one that, in theory, helps humans meet current needs while also considering future human needs. The financial aspect is one of them. Pandan fiber, derived from the leaves of the Duri Pandan (Pandanus Tectorius), is used not only for weaving bags and accessories, but also as a furniture material. Pandan fiber's elastic and strong nature is a factor in its selection as a chair furniture material.

The author conducted research on a sustainable design of chairs made of Pandan fiber. The author describes three primary areas of sustainable design in Pandan fiber furniture in this study, including the philosophical area of the product's economic aspect, but does not discuss them in detail from an economic standpoint [6]. Meanwhile, the principles of sustainable design in the philosophy area will be

linked to economic principles in this study, so that the economic value contained in this Pandan fiber chair product can be known in detail and can be a solution for economic growth from the MSMEs sector.

The philosophy area in sustainable design complies to the principle that a product in process or development must respect the needs of current and future generations, be energy efficient in natural resource management, have cost-effective sustainable solutions, and be simple to maintain. As a result, it is critical to integrate environmental knowledge in order to achieve sustainable production and consumption patterns [12]. Another critical component is increased efficiency in the use of energy and material resources, which must be achieved by the design process and product system design in order to be sustainable. Products developed as a result of local movements can then be developed as global productions [11].

Several authors have conducted research on the use of Pandan Duri fiber, including: "Application of Sustainable Design on Interior Materials in Green Villages in Bali (Garden Villa)" [3]. The application of sustainable design concepts to interior elements and furniture materials at the Green Village Bali inn is described in this study. The author applies the same theory to the three primary areas of sustainable design; however, in this study, the author focuses on the philosophical and economic aspects of chair furniture made from Pandanus fiber [2]. Conducted a study titled "Application of Sustainable Design Study in the Building Space of the Kaliandra Sejati Natural and Cultural Education Center in Pasuruan, East Java." The application of the concept of sustainable design in the spaces at the Kaliandra Sejati Center for Nature and Culture Education is examined in this studyc[4]. The applied analysis of sustainable design on the research object is described in three parts: social, ecological, and economic. The author uses the economic aspect as a detailed explanation of the theory of fulfilling the principles of sustainable design in the primary area of philosophy in this study [3]. The study, titled "Identification of Sustainable Materials in Outdoor and Indoor Office Buildings," was conducted [9]. This study examines the use of sustainable materials in the indoor and outdoor spaces of an architectural office in Bandung, taking into account the building's environmental impact. This research looks at the use of sustainable materials in the indoor and outdoor spaces of an architectural office in Bandung, while also considering the building's environmental impact. This article only discusses sustainable materials from an ecological standpoint, without delving into economic considerations.

2. Method

This study employs qualitative methods, that is, research that is based on collecting, analyzing, and interpreting narrative and visual data (rather than numbers) in order to gain a thorough understanding of certain phenomena of interest [7]. In this study, the author discusses the economic aspects of Pandanus fiber furniture products in the context of the philosophy of sustainable design principles. The fulfillment of the economic aspect of the Pandan fiber chair product is then linked with economic principles. The author describes the economic aspects of chairs made of Pandan fiber material by using data from the literature and references related to the problem's topic. Furthermore, the authors process data from video documentation on the processing of Pandanus Tectorius fiber from other researchers.

3. Results and Discussion

3.1 Pandan Duri Fiber Material (Pandanus Tectorius)

The Pandanus Tectorius plant has several varieties, but the Pandanus Tectorius Soland type is used for processing into Pandan fiber as a furniture material. Pandanus Tectorius Soland (Figure. 1) belongs to the large Pandan species, reaching 4-5 meters in height with a trunk diameter of 9.1-14 cm, according to [10]. The length of the leaves is 112-199 cm, with a width of 4.5-5.8 cm, the tip of the leaf is pointed with a length of more than 15 cm, the entire edge of the leaf is sharp, and the upper surface of the leaf is green.

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Figure 1. *Pandanus Tectorius Soland*

Pandanus Tectorius grows naturally in Southeast Asia's coastal and coastal forest areas, including Indonesia. Pandanus Tectorius can be grown as a wild plant or intercropped (Figure. 2), saving land. This plant takes 6-10 months to grow, after which the leaves are cut and used for a variety of purposes. A good Pandan leaf for use as Pandan fiber should be at least 6 months old.

Figure 2. The process of planting *Pandan*us plants using the intercropping method

Pandan fiber used in furniture production, which is usually Pandan fiber that has been twisted into a mine, can be single or double twisted (figure. 03). A double helix twist was used for the chair material. Pandan thorns are easy to process from harvest to twist, and they can be processed without the use of heavy equipment or hazardous chemicals, making them suitable for small and medium-sized businesses for people who live in areas where this plant is widely distributed.

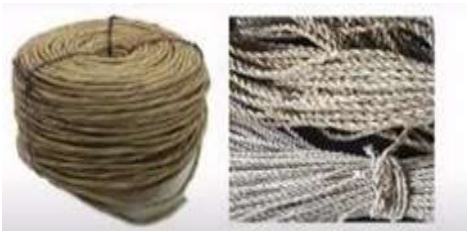

Figure 3. Twisted mine processed by the *Pandan*us thorn plant/ *Pandanus Tectorius*

The stages of processing the Pandanus thorn plant by craftsmen in the Pangandaran area (West Java) so that it becomes Pandan fiber material ready to be used for backrests and chair seats are as follows.

1. The first stage of collecting Pandan leaves

Pandan leaves are cut from the base of the leaf at this stage of picking. The Pandan leaf that was chosen is a tough Pandan leaf (see figure 4).

Figure 4. The process of taking *Pandan* duri leaves

2. Stage of removing *Pandan* Duri leaf

After picking the Pandan leaves, the thorns are removed by cutting them with a knife (Figure. 5). This thorn can be removed with simple equipment. To remove the thorns, some artisans use a knife, while others use kite thread.

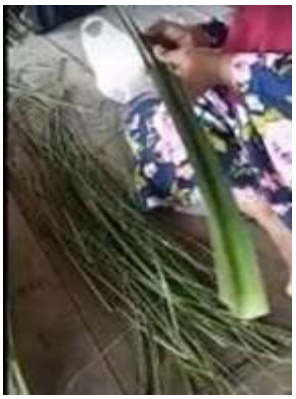

Figure 5. *Pandan* leaf thorn removal process

Stage 3 of Pandan leaf division

Pandan leaves are split into desired sizes during this process. Pandan leaf blades are typically 0.5 cm in length for weaving (see Figure 6).

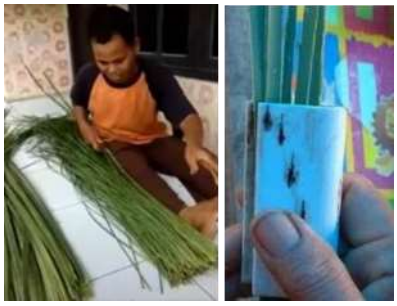

Figure 6. *Pandan* leaf splitting process

4. Pandan leaf blade refinement stage

The rubbing or polishing step (Figure. 07) is used to make the Pandan leaves more elastic. Pandan leaf blades are rubbed with flat wood until they are elastic and ready to boil.

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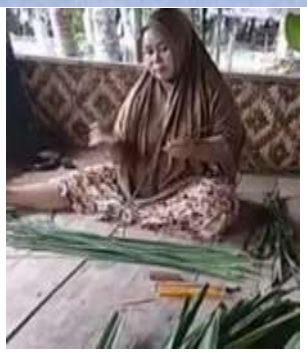

Figure 7. The process of making *Pandan* leaves

5. Pandan leaf boiling stage Pandan leaves were boiled for about 30 minutes in clean water (Figure. 08), Pandan leaves are wrapped in plastic while boiling.

Figure 8. *Pandan* leaf boiling stage

6. Drying

The Pandan leaf drying stage lasted three days in the sun (Figure. 09), Pandan leaves, boiled

Figure 9. *Pandan* leaf drying stage

7. Pandan mine twisting stage

The dried Pandan leaves are twisted together by means of manually splicing (Figure. 10), then the two strands are made one by a simple manual twisting technique.

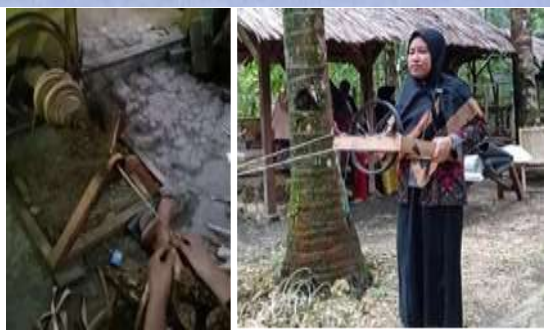

Figure 10. *Pandan* Mine Twisting Stage

3.2 Pandan Fiber Chain

The evolution of materials used in the manufacture of furniture can be used as a barometer of technological progress, particularly in the nineteenth and twentieth centuries. According to Jamaludin (2014), this development can be seen through two distinct lenses: craftsmanship and technique, or the discovery of manufacturing methods. Similarly, cultural industries based on local cultural wealth must be developed (Bahren et al., 2014). One of them is a chair made of Pandan fiber, a locally produced product from the community where this plant lives. Pandan fiber processing is so simple that people can continue to develop products with Pandan fiber material in their own unique way, giving each region a distinct identity. The chair sample used in this study was a Husen Hendriyana lounge chair made of Pandan leaf fiber (Fig.11). Pandan fiber material is used on the back and seat of the lounge chair. Because the Pandan fiber used is a double twisted fiber, it can withstand human weight in a sitting position. Pandan fiber is derived from the Pandanus tectorius plant, which grows in the Pangandaran region of West Java.

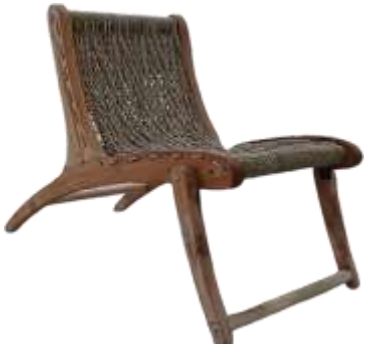

Figure 11. Lounge Chair Made of *Pandan* Fiber

Pandan fiber material that has been twisted or mined is woven as a backrest and seat after it has been processed. Pandan leaf fibers were woven using a weaving and tumpal technique (Figure. 12), with resistance to load up to 75 kg of human body weight in a sitting position tested. According to the findings of Hendriyana's trials [6]. Pandan fiber material processed into twisted mines is suitable for use as chair furniture material due to its elastic, strong, and durable properties.

Figure 12. Weaving of *Pandan* fibers in a chair construction

3.3 Fulfillment of Economic Principles on Pandan Leaf Fiber Material

This study analyzes the economic aspects of Pandan fiber material using economic principles. Economic principles state that: a. to obtain certain results, the costs incurred must be as small as possible; b. At a certain cost, you must produce the maximum possible product. To analyze the economic aspects of this chair made of Pandanus fiber, there are several points that must be met [1]. The points are described using the table below (table. 1):

Table 1. Table of Analysis of Economic Principles Based on the Principles of the Sustainable Design Philosophy

No	Sustainable Design Principles philosophy area	Pandan Duri Plant Natural Resources Management Process	Process of making pandan fiber material	Pandan fiber material waste	Fulfillment of Economic Principles
1	Respect the needs of present and future generations	-*Pandan duri* plant grows endemic to almost all coastal areas in Indonesia, there are many and can grow wild - To get pandan leaves, you don't have to cut down the tree or lift the roots, so the tree can continue to grow and produce pandan leaves, with a harvest period of 6 months to be used as pandan fiber material -without having	-In the manufacturing process, starting from the leaf harvesting process to the twisting process of pandan fiber, there is no use of heavy equipment or chemicals that can damage nature, so the environment is safe and not polluted	-In waste pandan fiber that has been damaged, pandan thorn fiber can be used as an absorbent for liquid waste containing heavy metals (Witono, 2013)	a. Pandan Duri plants are spread and grow endemic, it does not require large capital to grow this plant, besides that, this plant can be planted intercropping, so it does not require new land. b. no heavy equipment and chemicals are needed, meaning that there is no expense for the cost of the machine. c. After the pandan fiber

		to clear land for pandanus cultivation, *Pandan duri* can be planted intercropping, so as not to damage forest habitats			material is damaged in its twist, it can be reprocessed into absorbent material, for sale or for own use.
2	Energy efficiency in natural resource management	-In the management of *Pandan duri*, from the process of planting, harvesting to making disposable products, it is hoped that the surrounding community will manage it, so that it can minimize the use of energy for distribution of materials.	-In the process of making pandan fiber material, the tools used are simple tools with manual processes, so they do not require a large amount of electrical energy to power heavy machines.	- To be used as an absorbent, pandan fiber must be crushed first. In the milling process, you can use a milling machine or grind it manually, using simple tools	-In the material distribution process, if it fulfills the principles of sustainable design, namely processing materials where the natural resources are obtained, then it will fulfill the economic principle, namely reducing material distribution costs. -The tools used to make pandan fiber material are very simple, and can be made yourself, without manufacturing. Residents can make it from household objects.
3	Cost-effective sustainable solutions	The pandan leaf extraction process does not require heavy equipment to do it, only a cutting knife is needed to manually cut the pandan leaves from the tree trunk, and the pandan leaves will grow back for the next 6 months of	-In the manufacturing process, from leaf extraction to mining gyre process, it only requires simple manual tools, to dry pandan leaves it only requires sunlight energy and for the boiling stage, you can use used wood as fuel.	-Pandan fiber waste can be reused as an adsorbent in a simple way, namely grinding and filtering it into powder form	-From the process of growing pandanus thorns to the process of twisting and processing the waste, it does not require heavy tools/machines so that it can save costs

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		harvest.			
4	Easy maintenance	-	-	-	When it is twisted and used as furniture material, pandan fiber does not require special care, because in the manufacturing process, it has gone through sufficient heating and drying stages.

Based on the description of the analysis above, it can be concluded that the use of pandan fiber for chair furniture can fulfill economic principles while meeting the principles of a sustainable design philosophy. Processing of natural resources that grow endemically must be accompanied by awareness of the surrounding community to manage the natural resources that exist in the vicinity so as to reduce production costs and material distribution costs. With the description from the initial process to the manufacture of pandan fiber mining gyre, it can be concluded that, it only takes a simple tool with manual processing at low cost, but the results obtained are maximum, the durability of the chair using pandan fiber material can withstand a large enough load when used as a sitting facility. In addition, pandan fiber waste can be used as an absorbent to filter liquid waste containing heavy metals.

4. Conclusion

The Jatiwangi Art Factory community is an arts and culture community that focuses on discussing local rural life. Terracotta is the pride of this community, where initially the soil was only used as a source of livelihood for the community. Land that was only used as land until finally succeeded in becoming an idea that the surrounding community could develop and be proud of. Lack of literacy about the Jatiwangi Art Factory community makes the surrounding community not know for sure about this community, they only know that they are attending an event without knowing who is organizing the event. The design of digital media as a medium of information about this community is very much needed, especially for people who are in the region and outside the region. The majority of the people speak Sundanese and are generally Indonesian. Through digital media with the use of appropriate language and visuals, information on community activities is intended for the surrounding community so that they know more about what is in their area. (belum ada)

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