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Analysis of Coconut Coir Waste Utilization on Green Productivity-Based Plant Pot Crafting Planning (Case Study in Ice Coconut Water Pak Mamat)

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A B S T R A C T

Coconut (Cocos Nucifera L) is a versatile plant or has high economic value. All parts of the coconut tree can be used for human benefit, so this tree is often referred to as the tree of life. Coconut fiber can be used as a product that has high value and can increase farmers' income. It is processed to produce products from coconut fiber that can increase profits and maintain environmental sustainability. Processing of coconut fruit, especially its derivative products, still has considerable opportunities. The coconut fruit processing industry in general is still focused on processing fruit flesh as the main product, while industries that process by-products such as water, coir, and coconut shells are still processed traditionally. This coconut fiber can be developed into a variety of products. Waste from ice sellers is one of the coconut wastes that can be used to increase profits and preserve the environment. The research process was carried out using a case study of the ice business with Pak Mamat which was observed through a process of observation and interviews, the processing of the waste contained in this process was carried out by utilizing it into handicraft items, namely plant pots made from coconut fiber waste

Keywords: Coconut Fiber, Coconut, Handicrafts, Waste

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1. Introduction

The coconut plant (*Cocos Nucifera L*) is a versatile plant or has high economic value. All parts of the coconut tree can be utilized for human purposes, so this tree is often referred to as the tree of life because almost all parts of the roots, stems, leaves, and fruit can be used for daily life [1]. The coconut fruit consists of coconut water, young coconut, and old coconut. Coconut water is used for drinks, coconut sauce, coconut vinegar, young coconut juice, and sweeteners, while young coconuts are for candied coconut, coconut cakes, coconut salad, for old coconuts used as grated coconut, candy, cakes, coconut milk, cooking oil, hair oil, and cosmetics. Coconut trunks and leaves are used for building materials such as roofs, or bridges, coconut leaf sticks are made into brooms, coconut fiber for mats, and coconut shells are used for making charcoal and interior decoration [2].

The processing of coconut fruit, especially its derivative products, still has considerable opportunities. The coconut fruit processing industry in general is still focused on processing the fruit meat as the main result, while industries that process by-products such as water, coir, and coconut shells are still traditionally processed [3]. Coconut coir can be developed into various products, including cocopeat, coco-mesh, coco-pot, coco fiber board and coco-coir [4]. These materials are raw materials in the mattress, pot, dry compost and other industries. If you only focus on processing coconut fruit on the pulp alone, the highest coconut price is still a very low income for farmers to live properly. One of the efforts to increase the income of coconut farmers is to process all components of the fruit into high-value products, so that the value of coconut fruit will increase [5].

Based on the description of the problem above, coconut fiber can be utilized into a product that has high value and can increase farmers' income by depicting several diversification programs that produce products from coconut fiber that can be associated with appropriate and high-tech industries [6], [7]. Furthermore, this material is processed according to the quality and type of product that can be implemented in interior design to meet local and international markets and can have an impact on improving welfare for the wider community [8]. Based on the above background, several problems can be identified, including: the accumulation of coconut fiber from the remaining ice sales with several sellers, one of which is Pak Mamat, coconut fiber waste accumulates so that it can pollute the environment, coconut fiber waste has not been widely processed as a plant pot craft.

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2. Literature Review

2.1. Waste

According to [9], waste is waste generated from a production process, both industrial and domestic (household). Waste is better known as garbage whose existence is often unwanted and disturbs the environment, because waste is seen as having no economic value. The principle of waste management is a principle that provides guidance on the stages in waste management starting from those that are prioritized to those that are not.

2.2. Waste Management

According to [10] and [11], waste management is very important to achieve a clean and healthy environmental quality, thus waste must be managed properly in such a way that negative things for life do not occur. In environmental health science, a waste management is considered good if the waste does not become a breeding ground for disease seeds and the waste does not become an intermediary medium for the spread of a disease. Other requirements that must be met in waste management are not polluting the air, water, and soil, not causing odors (aesthetic aspect), not causing fires.

2.3. Coconut Coir Waste

According to Hanum [12], the chemical composition of coconut coir generally consists of cellulose, lignin, pyroligneous acid, gas, charcoal, tannin, and potassium. Each coconut grain contains 525 grams of fiber (75% of the coir), and 175 grams of coir powder (25% of the coir). A lot of coconut fiber processing has been done, both physically processed and by adding various types of solutions so that it can form new materials. There have been many products that have been produced from the use of coconut fiber materials such as mats, nets, and planting media and so on, but the processing has not had a major effect due to the lack of community ability and the lack of information received so that many researchers are trying various new breakthroughs regarding the utilization or even processing of coconut fiber into new products or materials so as to reduce the amount of coconut fiber that cannot be maximally utilized or processed.

3. Methods

This research method consists of a research approach, researcher presence, research location, data sources, data collection techniques, and research procedures.

3.1. Research Approach

The research approaches used are quantitative and qualitative approaches.

- According to [13], the Quantitative Research method is one type of research whose specifications are systematic, planned, and clearly structured from the beginning to the creation of the research design.
- According this research [14], the Qualitative Research method is a research method that emphasizes the aspect of in-depth understanding of a problem rather than looking at problems for generalization research.

The type of research used by researchers is case study research, which is a comprehensive description and explanation of the aspects of an individual, a group, a program or a social situation. The subject matter studied is the analysis of the Utilization of Coconut Coir Waste in the Planning of Making Green Productivity-Based Plant Pot Crafts (Case Study: Es Degan Pak Mamat).

3.2. Researcher Presence

The presence of researchers in the field is very important and needed optimally, in accordance with this research approach, namely quantitative and qualitative approaches[15]. The presence of researchers is a stage of determining and exploring data related to the focus of this research. While the researcher is a key instrument in capturing meaning and at the same time a data collection tool. Therefore, the presence of the researcher is known by the object or informant.

3.3. Research Location

The location of this research is Pak Mamat's degan ice stall at Jl. Veteran No. 76, Kec. Lamongan and coconut coir crafts in Sekaran village, Pucuk, Lamongan Regency. Researchers use exploratory research, which includes field orientation or the location setting studied about the extent of the detailed data obtained or available.

Figure 1 Iced coconut stall location

3.4. Data Sources

The data sources used in this research are primary data sources. Primary data sources are several coconut coir handicraft industries located in Pak Mamat's iced coconut water stall on Jl. Veteran No0 76, Kec. Lamongan and coconut coir handicrafts in Sekaran village, Pucuk, Lamongan Regency.

3.5. Interview Method

The interview method is carried out by selecting informants who know or recognize the circumstances of the sale of iced coconut, and coconut coir crafts, one of which is Mr. Mamat.

3.6. Observation Method

Data collection techniques by observation are used when the research is related to human behavior, work processes, natural symptoms and when the observed respondents are not too large. Data collection is done by visiting the location of making plant pots.

Figure 2 The location where the pot crafts are made

3.7. Documentation method

Research is able to influence new studies to be carried out, so documentation is easily accessible data for the continuity of research.

3.8. Research Procedure

The research procedures used by researchers are as follows

1. Observing the place of sale of ice degan pak mamat.
2. Taking waste from selling degan ice.
3. Processing coconut fiber waste into plant pot crafts.
4. Counting the number of plant pot crafts.

4. Result and Discussion

General Description

This research was conducted at Pak Mamat's ice degan stall on Veteran Street No. 76, Lamongan sub-district and coconut husk handicrafts in Sekaran village, Pucuk, Lamongan sub-district. Along with the many enthusiasts of ice degan drinks, many ice degan traders are confused about disposing of coconut shell waste. One of them was experienced by Mr. Mamat, a degan ice trader on Jl. Veteran No. 76, Kec. Lamongan. Along with the many enthusiasts of degan ice drinks, many degan ice traders are confused about disposing of coconut shell waste. One of them was experienced by Pak Mamat, an ice degan peddler on Jl. Veteran No, 76, Kec. Lamongan. It encourages to utilize coconut waste by making handicrafts from coconut coir waste.

4.1. Iced Coconut Water Sales Data

Data on the sale of iced coconut water is done by direct observation and interviewing Mr. Mamat at the location of Mr. Mamat's degan ice sales. The number of sales of ice coconut water Mr. Mamat and the calculation of gross profit obtained by Mr. Mamat per one coconut is calculated as follows each 1 coconut can be processed into 4 packs of iced coconut water with a price per pack of IDR 5,000. The profit from one coconut is IDR 20,000. Weekly sales of Mr. Mamat iced coconut water shown on table 1.

Table 1. Weekly turnover Pak Mamat iced coconut water

Day	Coconut Sales (piece)	Sales of Iced Coconut Water (pack)	Turnover (IDR)
1	110	440	2,220,000
2	111	444	2,220,000
3	103	412	2,060,000
4	101	404	2,020,000
5	100	400	2,000,000
6	101	404	2,020,000
7	106	424	2,120,000
Total	732	2928	14,640,000

The table above represents weekly sales, and monthly sales require 3,165 coconuts. From the cocnut needs, Mr. Mamat's iced coconut water shop can sell 12660 packs of iced coconut water. So that in one month it generates a turnover of IDR 63,300,000.

4.2. Data on the Amount of Coconut Waste

Based on coconut water, amount of coconut fiber waste produced after the grinding process, so it can be seen that every 1 coconut or 2 pieces of coconut waste produces 0.4 kg of coconut fiber or it can be known that each 1 piece of waste weighs 0.2 kg of coconut fiber.

4.3. Data on Waste Generated for Weekly

The table above is data on the weight of fibers produced during the week, after the coconut milling process. Based on the data above, it is known that for a week with a total number of 732 coconuts, and the total waste generated weekly of 1464 pieces produces 292.8 kg of coconut fiber.

Table 2. Data weight of coconut coir weekly.

Day	Coconut Sales (piece)	Generated Coconut shell waste (piece)	Weight of Coconut Coir (kg)
1	110	220	44
2	111	222	44.4
3	103	206	41.2
4	101	202	40.4

Day	Coconut Sales (piece)	Generated Coconut shell waste (piece)	Weight of Coconut Coir (kg)
5	100	200	40
6	101	202	40.4
7	106	212	42.4
Total	732	1464	292.8

4.4. Data on Waste Generated During the Month

Based on observation data on the weight of fibers produced during the month after the coconut milling process. Based on the data above, it is known that during a month with a total number of coconuts 3165 pieces, and the total waste generated during the month of 6330 pieces produces coconut fiber weighing 1266 kg.

4.5. Data Processing Stage

Data processing is carried out by testing the normality of the waste data generated during the month using the 7th table data, in the column of waste generated [16]. Testing is done to determine whether or not there is a significant influence between the waste produced and the impact on the environment [17]. Testing is done using the following hypothesis:

- H_0 is the data has normal distribution
- H_1 is that the data is not normally distributed

Decision analysis:

- if F count is smaller than f table or P value is greater than 0.05 then H0 is accepted
- if F count is greater than f table or P value is greater than 0.05 then H0 is rejected.

Based on the normality test using SPSS software and by using the hypothesis and decision analysis, the test results are as follows:

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Limbah_yang_dihasilkan	,149	30	,086	,935	30	,066

a. Lilliefors Significance Correction

Figure 3. SPSS test results on waste data generated during the month

*Kolmogrov-smirnov is used to test data with the amount⩽ 30 data.

*Shapiro-wilk is used to test data with a total of ⩾ 30 data.

Based on the test data above, it can be seen that the sig value in the Kolmogrov-Smirnov column is 0.086, which means it is greater than 0.05 where the null hypothesis is accepted so it can be concluded that the data is normally distributed [18], [19].

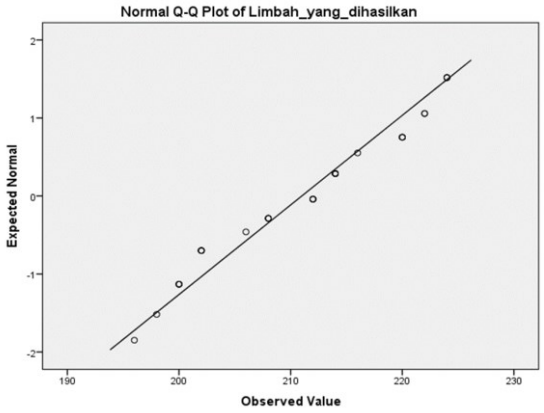

Figure 4 Normal QQ plot of effluent data generated

Based on Figure 3 of the graph above, it can be concluded that the distribution of data is normally distributed, where the data spreads and approaches the graden mean so that the data is said to be normal [20].

4.6. Application of Green Productivity in Making Coconut Fiber POT Crafts

The stage of making coconut fiber pots is quite complicated and difficult. It takes painstakingness and a long time in making 1 pot. The time required in making a pot is approximately 80-120 minutes. The following stages of making coconut fiber pots are as follows:

1. The coconut husk grinding stage by separating the coconut shell with its contents so as to produce only coconut fibers. The following data is one example of the calculation of the time required in the coconut waste of grinding process for the first 1 week. That was shown in table 2, that Pak Mamat Iced coconut resulted 292.8 kg of coconut coir.

Figure 5 Milling stage of coconut husk

The picture above is the result of the coconut waste milling process which produces coconut fibers and then arranged for the next process.

2. Coconut fiber coloring stage, carried out by soaking the fibers in a tub containing textile dyes, where each 1 kg of coconut fiber takes 15 s in this coloring process, one of which is in the process of coloring coconut fibers produced in the first week's milling process is presented as follows:

Table 3 coconut fiber coloring process time for the first week.

Table 3. Data weight of coconut coir weekly.

Day	Weight of Coconut Coir (kg)	Time (second)
1	44	600
2	44.4	666
3	41.2	618
4	40.4	606
5	40	600
6	40.4	606
7	42.4	636
Total	292.8	4392

The table above is the time required in the process of coloring coconut fiber resulting from the milling of coconut waste in the first week, in the table obtained with a weight of 292.8 kg of coconut fiber requires a coloring time of 4392 s.

Figure 5 Coconut fiber coloring stage

The picture above is the coloring process on coconut fibers where coconut fibers are given colors according to needs such as red, green and so on. The coloring process is done in order to beautify the coconut pot that will be made [21].

3. Drying stage of coconut fiber that has been given color.

Figure 6 Coconut fiber drying stage

The picture above is the drying process of coconut fiber where the drying process is done manually and done by drying it in the sun and done until the water content from the previous coloring process has seeped and dried.

4. Pattern-making stage using lungsi.

Figure 7 Pattern-making stage using lungsi

The picture above is the process of making patterns with the help of lungsi (molding in Javanese) [22], where the process is done manually with the time needed in one pattern making as much as 10 minutes or 600 seconds.

5. Stage of making the base of the pot forming a circle.

Figure 8 Stage of making the base of the pot

The picture above is the making of the base of the pot by following the pattern made with function in the previous stage, the base is made based on the shape of the pattern made by winding the fibers following the shape of the pattern itself. This process takes about 9 minutes or 540 s.

6. The filling stage of the pattern that has been made using coconut fiber.

The figure 9 is show the process of filling the pattern that has been made by winding coconut fibers on the pattern by rotating according to the desired color or image model[23]. This filling process takes as much as 20 minutes or 1200 s.

Figure 9 Stage of filling the pot pattern

7. Pot cutting stage

Figure 10 The shaving stage of the pot pattern

The picture above is the process of shaving coconut fibers on pots and patterns that have been made. This shaving process is done so that the pattern that has been made on the pot looks more flat and so that the pot pattern has the same length so that it looks more attractive and emphasizes the pattern itself. This process takes about 15 minutes or 900 s.

8. Removing the top rope of the warp and smoothing the pot.

Figure 11 The pot removal stage

The picture above is the process of releasing the lungsi rope used as the formation of the pot model at the previous stage, after the lugsi rope is removed then the po that has been made is tidied up starting from the edges to the details of the fibers that are too long are cut and tidied up to make it look more attractive and beautiful. This process takes about 10 minutes or 600 s.

9. The finished pot

Figure 11 Finished Pot

The picture above is the result of the pot loading process using coconut fibers, in the picture can be seen various shapes pots of different sizes. This coconut fiber pot can be used as a decorative plant holder and home display because of its unique shape with environmentally friendly materials as well as aesthetics.

4.7. Analysis of Pot Making Preparation Time Calculation

The analysis of the calculation of the preparation time for making pots using data on the estimated number of iced coconut water pak mamat sold and the waste generated in a month of research is presented as follows:

Known:

amount of coconut waste = 6330 pieces

Grinding time of 1 piece of waste = 7 s

Weight of coconut fiber = 1266 kg

Coloring time of 1 kg of coconut fiber = 15 s

Coconut fiber drying time = 4 hours or 14400 s

Ask:

a. Milling time of coconut husk from the first week's data?

b. Coloring time of coconut fiber from the first week's waste?

c. Drying time of coconut fibers?

Answer:

a. Total milling time

= amount of waste x grinding time 1 piece of waste

= 6330 pieces x 7 s

= 44310 s

So the total coconut milling time on the estimated data of coconut waste generated in the first week of the study was 44310 s.

b. Total coloring time

= total weight of fibers x coloring time 1kg of fibers

= 1266 x 15 s

= 18990 s

So the total time of coloring on the results of the coconut waste skin in the first week of the study was 18990 s.

c. Coconut fiber drying time = 4 hours or 14400 s

Table 4 Recap of monthly pot making preparation time

Stage	Time (second)
coconut shell milling	1
coconut fiber coloring	3
coir drying	5
Total	777,000

The table above is data on the time of preparation of materials or materials before the formation and process of making pots, the data above uses the estimated number of sales and coconut waste from Pak Mamat's business in the first week of research, based on the table, the amount of time for grinding coconut skin is 44310 s, coconut fiber coloring time is 18990 s, and coconut fiber drying time is 14400 s with a total material preparation time before making the pot of 77700 s, if converted into hours is 21.58 hours.

4.8. Analysis of Pot Making Production Time Calculation

Analysis of the calculation of production time for making one pot with a size of 70 cm high, and 50 cm wide is presented as follows:

Table 4 Time data in making one pot

Stage	Time (second)
pattern making	600
pot base making	540
pattern filling	1200
pot shaving	900
pot trimming	600
Total	3840

The table above is data on the time spent in making pots from coconut fiber, in the table it is known that the amount of time for making patterns is 600 s, making the base of the pot is 540 s, filling the pattern is 1200 s, carving and firing the pot is 900 s, and 600 s respectively.

Estimated number of coconut fiber pots produced per month

The estimated number of coconut fiber pots produced within one month with a pot size of 70 cm x 50 cm, each pot weighing 5 kg, the estimated number of pots that can be produced by using the sale of coconut and coconut fiber waste in one month of research is presented as follows;

Unknown:

Weight of coconut fiber per month = 1266 kg

Weight of pot = ± 7 kg

Asked: Estimated pots that can be produced from sales for one month iced coconut water pak mamat?

Answer:

Estimated pots produced

= (Weight of fibers produced)/(Weight of pots to be made)

= 1266/7

= ±180,85 ≈ 180

So, the estimated products that can be produced in making coconut fiber pots from sales data and waste generated for one month are ±180 products.

5. Conclusions

Making pot crafts from coconut fiber waste is done by taking the waste from the sale of iced coconut water pak mamat, coconut waste is then milled to separate the skin with coconut fiber, the second step of coconut fiber is then soaked given the color as needed, then the drying process is carried out until the water from the dye decreases, the next step is making patterns and the base of the pot by winding the fibers according to the pattern that has been made, The style that has been made is then filled with coconut fibers according to the pattern to form the body of the pot, the finished pot is then shaved to shorten the coconut fibers so that the pattern on the pot is visible, the last step is the pot fireplace this step is done to beautify the pot so that the fibers that have different lengths or out of the pattern can be cut and tidied up.

The utilization of waste from pak mamat's ice degan is very feasible because in addition to reducing waste, it can also increase income and activities for families and residents around pak mamat's residence. Pots made from coconut fiber waste, apart from being used as plant pots, can also beautify the house because the materials used are natural, adding aesthetic value. Pots from coconut fibers have advantages that can help plant growth when planted in this pot because coconut fibers will hold water that is poured on the plant so that it helps the absorption process as well as coconut fibers have contents such as cellulose, hemicellulose, lignin and other substances that can be used as natural fertilizers in plant growth, so this pot is also suitable for use in ornamental plants.

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