

Revenue Optimization Analysis of Rattan Furniture Industry in Palu City, Central Sulawesi, Indonesia (Case Study in PT Meubel Rotan Subur)

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ABSTRACT

Rattan was one of the forest plants that had a high commercial value. Besides, it was a source of foreign exchange, which uses a lot of farmers. Rattan furniture was a very potential product in Indonesia, so it must be maintained and even developed, especially by utilizing the domestic market, which was still possible for improvement. To increase the income from rattan furniture industry's, it is necessary to carry out an optimal analysis. Optimization is an activation process to improve and optimize a job to be more or entirely perfect, functional, or more effective and to find the best solution to several problems to achieve the best possible goal according to specific criteria. The technique of collecting data was by taking ten people as respondents. The data was collected through interviews with the rattan furniture of PT. Meubel Rotan Subur. Types and sources of data used in this study include primary and secondary data. To achieve the objectives of this study, the analysis model used was linear programming analysis. The Fertile Furniture Industry's total income was IDR 52,555,000 by producing 11 types of products and the number of products made in one month. After doing a Linear Programming analyst with the same input and the same price, the company would get an IDR 76,000,000. Revenue from product sales at PT Meubel Rotan Subur for one month if all products sold was optimal. Based on data and calculations through linear programming, three profit was optimal; namely, IDR 11,519,721.62 and the income had already made a significant profit.

Keyword: Rattan, Optimization, Analysis, Income, Linear Programming

1. INTRODUCTION

Indonesia was a country that was rich in forest potential, which includes various types of plants and animals that live and grow in the forest. Apart from being a source of foreign exchange, natural forests could also improve the community's welfare both as a producer of wood and non-timber forest products (NTFP), which had high selling value, one of which was rattan. Rattan was one of the forest plants with a high commercial value; besides that, it was a foreign exchange source, which uses many farmers [1].

Rattan had 850 species spread throughout the world, of which 614 were in South Asia, and 312 species were in Indonesia [2]. The types of rattan that had been known in the world market included stems (*Calamus zolingeri*),

stones (*Calamus filiformis*), feathers (*Khortalsia celebica*), manan (*Calamus manan*), and tretes (*Daemonoropsheteroides*). Rattan could be grouped into two groups: commercial types of rattan and lesser-known rattan types. This grouping was based on the economic value it has. Currently, only 51 commercial types of rattan were recorded, and 14 types of rattan were unknown or not traded [2].

About 85% of world rattan production comes from Indonesia, so it was not an exaggeration if we campaign "The Real Rattan was Indonesia" and bring or propose rattan as world heritage to UNESCO [3]. Central Sulawesi had a forest area of 4,394,932 ha, or the same as 64.60% of the land area of Central Sulawesi (6,803,300 ha), which had considerable potential for raw rattan. Rattan from Central Sulawesi was classified as

prime quality. It has a higher selling value than the same type of rattan outside Sulawesi and is needed by the rattan furniture industry for export purposes. Rattan raw materials are used by 12 small and medium-sized handicraft industries that process two tons of rattan per month [4].

The use of non-timber forest products in Indonesia, such as rattan, had long been carried out by residents around the forest to meet their daily needs. Almost all rattan parts could be used, either as chair construction, fastener, or as a design component [5]. The rattan economic value was very high, and the demand for rattan raw materials continues to increase, so the trade volume of rattan was growing so that the existence of rattan plants was also increasingly threatened due to the large number of crops being harvested [6].

Central Sulawesi was an area that had quite extensive natural forests and was overgrown with various types of rattan, with a relatively high economic value. Palu City, in particular, was the center of the rattan industry, namely the rattan trade in Central Sulawesi. This was because the market demand for rattan was quite significant. Natural rattan industrial production in Palu City reaches 60% of the national output. This rattan was the raw material for the rattan furniture industry and rattan handicrafts in Palu City, fulfilling consumer demand for rattan furniture and rattan handicrafts around Palu City [4]. Rattan furniture was a very potential product in Indonesia, so it must be maintained and even developed, especially by taking advantage of the domestic market, which was still very likely to be improved.

For this reason, efforts to innovate in the development of rattan products must be continuously pursued so that product competitiveness, especially in terms of quality and features offered, could be better. Another problem was the weak marketing side so that the product was still not widely known by the public. Even though if this was done, the benefits would be higher, so that it could increase family income [7].

PT. Meubel Rotan Subur was one of the furniture in the Pasar Tua area, West Palu, Palu City, which was quite successful. This PT. Meubel Rotan Subur was founded in 1984 by Mr. Yusuf Fahmi. Until now, the furniture continues to produce various types of high-quality and comfortable household furniture. Some of these handicraft products from rattan include guest chairs, lounge chairs, bar chairs, mercer chairs, conch chairs, tables, toy easels, baby swings, fruit baskets, and sampiran. This furniture's rattan raw material relies on the rattan's quality from companies located in

Kayumalue, Taipa, and Pantoloan. The company did not collaborate with other companies because the existing capital was the company owner's capital when the company was founded. Over time, this rattan furniture industry company had developed quite well in terms of economic income. Products produced or made in the furniture were based on customers' requests both in terms of design and product type.

Based on this, the authors are interested in analyzing the PT Meubel Rotan Subur industry's income because analyzing and optimizing it could determine the maximum payment with the minimum cost. This was very important to do based on the existing background on maximizing the rattan furniture industry's income so that the furniture industry could continue going forward.

Based on the background description, the following problems could be formulated: How much was PT Meubel Subur Rattan's value in Palu City? How much was the optimum income value of PT Meubel Rotan Subur in Palu City? The purpose of this study was to determine the income of PT. Meubel Rotan Subur and to choose the optimum value of PT. Meubel Rotan Subur Furniture.

Researchers' usefulness was expected to be input and additional information and new knowledge for researchers to analyze other rattan furniture industry income. The benefit of research for the government was as input for the local government and related agencies to develop the upcoming furniture industry. It could provide consideration for local governments in fostering and improving the furniture industry so that it impacted increasing income for the welfare of the surrounding community. The furniture industry's research benefit was providing information in enhancing the income strategy of rattan furniture employees/craftsmen, increasing income for rattan furniture industry companies.

2. RESEARCH MATERIALS AND METHODS

2.1. Time and Location

This research was conducted for four months, from March to June 2020. This research was conducted at the PT Meubel Rotan Subur Jl. Lewara River No. 32 Kelurahan Ujuna, West Palu Subdistrict, Palu City, Central Sulawesi. The researchers chose this study's location because the location of the furniture industry of PT Meubel Rotan Subur was very strategic in the middle of the capital city of Central Sulawesi Province, namely Palu City. In addition, the researcher wants to know the optimal income of the furniture industry in urban areas in

increasing the welfare of the economic income of the employees/rattan craftsmen and the income of the rattan furniture industry company itself.

2.2. Tools and Materials

The tools used in this research were: writing tools to note things that were considered necessary in the research process; cameras were used to document activities in the field, and the personal computer was used to process data obtained during the research process. The materials used in this research were questionnaires which were used to collect data directly from the field.

2.3. Data Collection and Retrieval Techniques

Determination of respondents was carried out by census in which ten respondents were taken. Data collection was carried out through interviews or interviews with rattan furniture PT Meubel Rotan Subur.

The method used in determining the sample was the census method, which took the entire population into a research sample to obtain a total sample size of 10 samples. The census was a data collection technique in which all population elements were investigated one by one or thoroughly. The data obtained as a census result was called actual value and was often called a parameter [3].

2.4. Types and Sources of Data

Types and sources of data used in this study include primary and secondary data. Primary data was obtained from the interview results, including the respondent's identity, the state of rattan furniture production, and the state of the rattan furniture industry's cost. Secondary data needed or used in this research are data from agencies related to the rattan furniture industry income. Other supporting data were in the form of literature studies and research results.

2.5. Data Analysis

After the data from field observations and questionnaires had been collected, the data results were analyzed. Linear Programming Analysis used in this study uses the LINDO (Linear Interactive Discrete Optimizer) application. Lindo was software that could be used to find solutions to linear programming problems [8]. To achieve the objectives of this study, the analysis model to be used was linear programming analysis. The LP model's formulation was formulated by equation 1 as follows: maximize the objective function (profit) max.

$$\sum_{ij}^{n} = 1 C_i X_i \quad (1)$$

Notes: X_i = decision variable (optimum income) of rattan furniture products, C_i = parameter of objective function (price of rattan furniture), with the constraint function equation 2:

$$\sum a_i X_j = b \quad j = 1 \quad (2)$$

Notes: $a_i X_j$ = parameter constraint function i for decision variable j, b_i = capacity constraint i

Total cost is calculated using equation 3 [9]:

$$TC = TFC + TVC \quad (3)$$

Notes: TC = total cost (IDR), FC = Fixed costs (IDR) VC = Variable costs (IDR)

Revenue is calculated using equation 4 [10]:

$$TR = Q \times P \quad (4)$$

Notes: TR = Total revenue (IDR), Q = Number of products (set), P = product price (IDR)

Income is the difference between revenue and all costs incurred, which could be formulated mathematically by equation 5 [9]:

$$\pi = TR - TC \quad (5)$$

Notes: π = Income (IDR), TR = Total Revenue (IDR), TC = Total Cost (IDR)

Basic assumptions in linear programming were: Proportionality, this assumption means that the fluctuation of the Z value and the use of available resources or facilities would change proportionally with changes in the level of activity; Additivity, this assumption means that the objective value of each activity did not affect each other, or in LP it was considered that the increase in the value of the objective (Z) caused by an increase in activity could be added without affecting the portion of the Z value obtained from other activities; Divisibility, this assumption states that the output produced by each activity could be a fraction. Likewise with the resulting Z value; Deterministic, this assumption says that the parameter value of an optimization criterion (coefficient of decision-making variables in the objective function) was the sum of the values of the individuals C_j in the LP model.

3. RESULTS AND DISCUSSION

3.1. Types and Sources of Raw Materials

According to [18] raw materials were materials that form an integral part of the finished product. Raw materials processed in manufacturing companies could

be obtained from local buyers, import buyers, or their processing. The types of raw materials consist of direct dan indirect raw materials.

Direct raw materials were all raw materials that were part of the finished goods produced. The costs incurred to purchase natural raw materials had a close relationship and were proportional to the number of finished goods produced. Indirect raw materials were raw materials that play a role in the production process but were not directly visible in the finished goods produced. If the finished goods produced were tables and chairs, then the wood was the direct raw material, while nails and plamir were indirect raw materials.

PT. Meubel Subur Rotan was a company engaged in the furniture sector. The furniture products produced by the company were not only made of rattan, but also many products that use other raw materials. For product frames, companies usually use natural materials in the form of rattan. In contrast, for wicker, the raw material traditionally used could be pyrites (the inside of the rattan, which was processed into various smaller diameter sizes, usually 2 mm or 3 mm). The rattan types that were used as frame raw materials were stem rattan, phytite rattan, polis rattan, and rattan rattan. The tools and materials used in making the product were glue, nails, varnish, paint, nail gun, screw nails, cloth, and foam.

3.2. Production Process

The production process of PT. Meubel Rotan Subur would start after a purchase agreement was made between the company and the buyer. The buyer determined various productions based on orders from the buyer, either from the design or production model. Making rattan handicrafts consists of preparing rattan raw materials from companies in Kayumalue, Taipa, and Pantoloan. After the rattan raw material was available, the rattan was processed by cutting the rattan with a saw through several stages. The rattan process would be given a steam treatment (heating) in an aluminium tube in an aluminium tube called a cylinder.

This heating process was carried out with hot steam produced from the water's boiling process connected to the combustion furnace. This activity aims to make it easier for craftsmen to form rattan according to the product's design because the rattan would be more flexible after steam was applied. After the steam process (heating), the rattan would be removed from the tube and formed using a vice tool. The rattan created would be joined to one another using nails to form the mainframe. In the final stage, a decoration process would be carried

out, adding several rattan components to the mainframe so that the structure looks more attractive.

The next stage after making the mainframe and decorating the frame was the rattan weaving stage. The raw material used for the manufacture of webbing was pyrite rattan which was 2.5 mm thick. In making weaving, skill and accuracy were needed so that it produces neat and artistic weaving. The initial activity was cutting the pyrite rattan to form a series of basic plaits attached to the frame. The series of basic webbing would be tied using nails. After the plaits' base was created, the pyrites would be woven alternately and alternately to form a plate.

Furniture products that the craftsmen had done would enter the finishing stage, carried out at the company. Before colouring, rattan furniture products would be serviced the basics first. This aims to repair minor damage in the product that may arise during transportation from the craftsman to the factory. The fine hair cleaning activity was then carried out, aiming to remove the fine hairs found on the rattan webbing using a stove. The finishing stage consists of sanding using coarse sandpaper. After going through the necessary sanding process, then the furniture product would be painted. Then the outcome would be dried again using sunlight.

After the finishing process was complete, there would be an installation of furniture accessories for products that require additional accessories, such as the installation of foam and fabric and glass on table furniture products. Then the outcome would be rechecked by the company's owner to make sure the finished product was of good quality.

3.3. Discussion

The analysis results with the Linear Programming, Interactive, and Discrete Optimizer (LINDO) Model were ready-to-use program packages used to solve linear problems and quadratic programming [10]. The Linear Programming method was an option that would determine the amount of production of each product so that the optimization of the production process could be achieved precisely and adequately [5].

Table 1 shows that the Fertile furniture industry's total revenue was IDR 52,555,000 by producing 11 types of products. This product was the amount of revenue for a producer. According to [17], revenue was an amount of money earned from selling a number of outputs or, in other words, all income earned by a company from the sale of its products to consumers. So acceptance was the

Table 1. Industrial product revenue of PT. Meubel Rotan Subur

No.	Product Types	Unit	Price (IDR)	Value (IDR)
1	Conch Chairs	3	3,000,000	9,000,000
2	Medium Chairs	4	2,000,000	8,000,000
3	Sofa Chairs	2	6,000,000	12,000,000
4	Mersi Chairs	3	2,000,000	6,000,000
5	Longue Chairs	5	1,000,000	5,000,000
6	Bar Chairs	7	350,000	2,450,000
7	Table	2	1,300,000	2,600,000
8	Sampiran	5	400,000	2,000,000
9	Swing Baby	3	330,000	990,000
10	Toy Easel	12	350,000	4,200,000
11	Fruit basket	9	35,000	315,000
Total				52,555,000

Source: Research questionnaire, 2020

Table 2. Application revenue LINDO industrial products PT. Meubel Rotan Subur

No.	Product Types	Unit	Price (IDR)	Value (IDR)
1	Medium Chairs	3	2,000,000	6,000,000
2	Sofa Chairs	11	6,000,000	66,000,000
3	Longue Chairs	2	1,000,000	2,000,000
4	Sampiran	5	400,000	2,000,000
Total				76,000,000

Source: Data from the LINDO application

entire sales proceeds from each furniture product received by a person or company within a particular time.

Table 2 shows that after an LP analyst with the same input and the same price, the company would get an IDR 76,000,000- if the product was sold for one month in that unit. Types produced so that there were four types of products for optimum income, and optimum income was the highest revenue a company could get by maximizing production (a particular time), including three units of medium chairs, 11 sofa chairs, two lounge chairs, and sampiran five units. To determine the unit for four types of products, namely the result of the value in the LINDO application and the product's price to get the unit result. This refers to the number of products produced in the sales results sold within one month in units of units.

The results of the linear programming analysis of four types of products were generated from the LINDO software application results. This computer application could be used in linear programming. LINDO was a ready-to-use program package used to solve linear and quadratic programming problems [10]. This program's primary purpose was to enter linear program formulas quickly to solve them and assign basic formula corrections or checks to completion. The formula that was entered was from all the raw materials used in each

product. After all the variables and functions had been determined, the mathematical model was written on the LINDO board to find an optimal solution. After the mathematical model was entered into the LINDO column, click Solve on the toolbar [6]. The output of the LINDO program would be obtained for solving the mathematical model.

Of all types of products, not all of them use the same materials and tools, each product had a different way of manufacture and formation, including the conch chair using phytitic rattan, rod rattan, varnish, firing nails, cloth, foam and glass, a set of snail chairs consists of two chairs and one table. Medium chairs use polis rattan, phytite rattan, rattan rattan, glue, varnish, firing nail, screw nails, cloth, foam, and glass, a set of medium chairs consists of two small chairs, one long chair, and one table. The guest chairs use Phyto-rattan, rod rattan, varnish, firing nails, screw nails, cloth, and glass. A guest chair set consists of two long chairs, two small chairs, and a table. The mersi chair uses phytitic rattan, rod rattan, varnish, firing nails, screw nails, cloth, foam, and glass, a set of mersi chairs including three small chairs, one long chair, and a table. The lounge chair was only a set that uses tools and materials, namely polis rattan, phytite rattan, varnish, and screw nails. Bar chairs were also only one unit where tools and materials

were used, namely polis rattan, phytrite rattan, rod rattan, varnish, cloth, and foam. The dining table uses polis rattan, rattan rattan, varnish, firing nails, screw nails, and glass, a dining table set consisting of six chairs and one table. Sampiran used polis rattan, phytritic rattan, rattan rattan, varnish, and firing nails. The baby swing uses polis rattan, phytritic rattan, glue, firing nails, and mattresses. The toy horses used polis rattan, phytrite rattan, glue, varnish, and firing nails. And fruit baskets using phytrite rattan and firing nails.

The manufacture of these products requires a lot of money, which was the total cost. Total cost was the total amount of production costs incurred, which was the sum of fixed costs and variable costs with revenues in a month period could be seen in Table.

Table 3. Income from sales and production of PT. Meubel Rotan Subur

No.	Description	Value (IDR)
1	Total Cost (TC)	41,035,278.38
2	Total Revenue (TR)	52,555,000.00
3	Benefit (TR-TC)	11,519,721.62

Source: Primary data after being processed in 2020

Table 3 shows the total cost at PT. Meubel Rotan Subur for IDR 41,035,278.38 of the total amounts of fixed costs and variable costs in one month. The proceeds from all sales received by the Subur rattan furniture amount to IDR 52,555,000 for one month. And the research results show that the income earned on Fertile furniture for one month if all products were sold, the income received was IDR 11,519,721.62. To know the revenue was obtained after learning the revenue and the number of production costs (total costs). The production process was this activity of a company that was carried out. Through this process, the company would benefit through the added value created [7].

The research on "Optimization of Production Profits in the Wood Industry of PT. Indopal Harapan Murni Using Linear Programming" aimed to determine the maximum profit by determining the optimal amount of production [14]. The optimal analysis method uses the linear programming method by applying LINDO software to determine the maximum profit on wood production at PT Indopal Harapan Murni Palembang. The results of the research on profit optimization obtained by PT. Indopal Harapan Murni had been optimal because based on data and calculations through linear programming it shows that the total profit from the sale of the three types of wood was already maximum.

The study on "Maximizing Irma Jaya's Rattan Furniture Business Income in Palu City" was conducted

in an industry that processes rattan into chairs and tables into finished goods in the form of various kinds of products [7]. Irma Jaya's rattan industry was one of the potential industries and was able to survive in the midst of competition with other industries in Palu City which process phytritic rattan, polish rattan and stem rattan into various kinds of rattan handicraft products such as box chairs, conch chairs, steel chairs, vabion chairs and the dining table could be an interior that provides comfort and class of its own. This study had two objectives, the first was to determine the income of Irma Jaya's rattan furniture business in Palu City and to determine the maximum revenue. The analytical method used in this research was linear programming analysis. The software used in linear programming data processing was LINDO (Linear Interactive Discrete Optimizer) software. The linear programming analysis results show that Irma Jaya furniture's optimal production was the maximum income from the analysis that was greater than the previous gain.

4. CONCLUSION

The conclusions of this study were as follows: Total revenue of PT. Meubel Rotan Subur for IDR 52,555,000 by producing 11 types of products in one month. After doing Linear Programming analyst with the same input and the same price the company would get an income of IDR 76,000,000 if all the products were sold during one month with the units.

Revenue from sales of products at PT. Meubel Rotan Subur for one month if all products were sold, the profit obtained by the Subur rattan furniture was optimal because based on data and calculations through linear programming it shows that the profit was optimal, namely the total revenue (TR) of IDR 52,555,000 reduced by the total cost of production (TC) of IDR 41,035,278.38 so that you get a profit of IDR 11,519,721.62 and the income had already made a big profit.

REFERENCES

- [1] T. Kalima, Jasni, Abundance population levels of rattan species in Batukapar protection forest, North Gorontalo, Journal of Forest Research and Nature Conservation, 6(4), 2010, pp. 439-450. <http://ejournal.forda-mof.org/ejournal-litbang./index.php/JPHKA/article/view/1255>.
- [2] S. Aprilyanti, Optimization of Production Profits in the Wood Industry PT Indopal Harapan Murni Using Linear Programming, Journal of Industrial Systems & Engineering Research and Applications (PASTI), (13)1, 2019, pp. 1-8, ISSN: 2085 – 5869.

- [3] R.O. Jasni, Rattan Resources, Its Nature and Processing, Forestry Engineering Research and Development Center and Forest Product Processing, Bogor, 2013.
- [4] P.P.E. Nuwa, B. Pisi, Assistance for the Development of Design and Marketing of Rattan Weaving Products in the Jekan Raya District. PengabdianMu, 2(2), 2017, pp. 98-103.
- [5] I. Kusnaedi, A.S. Pramudita, Bending System for Rattan Chair Processing in Cirebon, Rekajiva Journal, 1(2), 2013.
- [6] T. Kalima, Sumarhani, Identification of rattan types in community forests, 2015.
- [7] A.M. Pingki, D Howara, Maximizing Irma Jaya's Rattan Furniture business revenues in Palu City. Journal of Agribusiness Development 2(1), 2019, pp. 40–30.
<http://jurnal.untad.ac.id/jurnal/index.php/jpa/article/view/13787>.
- [8] Koko, Tutorial on Using Lindo (Linear Interactive Discrete Optimizer), 2011. Retrieved 11 February 2020.
- [9] Syamrlaode, Raw Material Control and Optimal Inventory Determination, 2010. Accessed on Wednesday, 9 September 2020.
- [10] S. Sadono, Introduction to Macroeconomic Theory, PT Raja Grafindo Persada, Jakarta, 2004.