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Cost and Revenue Optimization of Rattan Industry Management in Palu Town, Central Sulawesi

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Abstract

Rattan industry production of Central Sulawesi reaches 60 percents of national production in Indonesia. Rattan is easy to be cultivated, harvested, transported, stored, easy to sell and easy to get cash. The rattan products have some advantages compared with other forestry industrial raw materials, since the products relatively have cheaper cost, strong, durable, beautiful, comfortable in use, light, portable and have art sense as well. The research objectives are to analyze various models of Rattan products that are produced, in order to be discovered what management strategy is, how much the minimal supposed optimum cost that has to spent by the rattan industry, how much the maximal supposed optimum revenue received by the industry, how much the residual value (slack), the advantages value (surplus) for production inputs that are used at the moment of cost and optimal revenue and to analyze how much the sensitivities value of production input and production without reducing optimum cost and revenue. The research is conducted at CV. Kencana Sakti Rattan Industry Company in Palu Town, Central Sulawesi.

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Analysis instrument applied in the research are Linear Programming, with LINGO software. The result shows that strategy applied by the company is by keeping the production of Batang Rattan with the import qualification AB and Lambang Rattan with the import qualification AB as well, because both of the two models products bring on optimal value. There are 11 variables of problems that appear in production process with different unit\percentages variable value but experienced residue in almost every input. The highest revenue optimization is 7.402.828.000 rupiahs. By the fact, it is recommended that the use of production facility must be more streamlined in order to get optimum product result, especially those which is dealing with labor cost.

Keywords: *Optimization; Revenue; Rattan.*

1. Introduction

Indonesia is the largest rattan-producing country in the world [1] which can supply about 80-90% of world needs, so that Indonesia is known as the rattan producing country that is rich in various kinds of rattan [2,3,4,5,6,7,8,9]. The existence of rattan resource that is almost evenly in every Indonesian region is a chance and a challenge as well for local areas in exploiting the resources become reliable commodity especially for local development and stock of public welfare and also supposed to be national economic development [10].

Central Sulawesi province with an area 4.394.932 ha or about 64% of province area (6.803.300 ha) has a large enough rattan potential. The rattan potential of Central Sulawesi, there is 38 kinds of rattan which have been identified, potential to be commercialized while kinds of rattan have been sold are Lambang rattan (*Calamus sp*), Batang rattan (*Daemonoroups inops* Werb.), Tohiti rattan (*Calamus simpisipus*), Merah rattan, (*calamus panayuga* Becc.), Ronti rattan (*Calamus axilais*), Susu rattan (*Calamus* sp.), Umbul rattan (*Calamus shympsipus*), Tarumpu rattan and Noko rattan [11,12,13].

Rattan is the main object of the research since it has been popular and commonly used by people as strap, carrier, storage of goods, farming tools and household utensils and so on. Besides, rattan is easy to be cultivated, harvested, transported, stored, easy to sell and easy to get cash. The rattan products have some advantages compared with other forestry industrial raw materials, since the products relatively have cheaper cost, strong, durable, beautiful, comfortable in use, light, portable and have art sense as well [14].

Production activity includes three basic questions, what is being produced, how to produce, and who is it produced for. The three basic questions will really be problem since the resources for the production activity are limited. The resources are not like the oxygen we breathe, but available on a limited basis so that we need to make effort of savings. This is what we call as the law of scarcity in economical discipline [15] Every company, especially processing company need to hold inventories, because the process of production will be disturbed without inventories and it means that employers will lose the opportunity in getting profit they supposed to get. Excessive stock will inflict a financial lost to the company. It means that there are a lot of costs to pay for the excessive stock which the expenses are actually supposed to use for other favorable needs. In contrast, the deficiency of stock will disserve the company since it will interrupt the continuity of production process activities and company distribution [16].

For the reason above, it needs a good management since in running business production costs or revenue sometimes it has not got optimum revenue yet, so a strategy to create a combination of product input is needed where the product will give maximum profit. By seeing the importance of cost and revenue problem, it is the reason to got interested to study about “cost and revenue optimization of rattan industry management in Palu, Central Sulawesi Province”.

Based on the background above, the objectives of the research are: a. To analyze various models of Rattan products which are produced in order to know strategy of management. b. To analyze how much the minimal supposed optimum cost that has to spent by the rattan industry. c. How much the residual value (slack), the advantages value (surplus) for production inputs that are used at the moment of cost and optimal revenue.

2. Methodology

The research is conducted at CV. Kencana Sakti Rattan Industry Company in Palu. The research is conducted for 6 (six) months effectively, it is done from February to July 2014, consist of Surveying, Data Gathering (primary, secondary, documentation and other secondary information sources). Materials used in the process of this research are Batang Rattan (polish) and Lambang Rattan (core). While the research tools applied in the research are: stationeries, digital camera, computer, and calculator.

Data needed in the research are: (1) Primary data, that is collected by direct observation at field and doing interview; (2) Secondary data, that is collected from data released by the company, besides from references that related to the research. Method of data processing and analysis is done by applying Linear Programming Analysis and LINGO software. Steps in applying Linear Programming Method (LP) can be described as follows:

2.1 Determining Decision Variable.

Decision variable shows number of every kinds of product that supposed to be produced by CV Kencana Sakti Rattan in order to reach optimum condition. Some of the product decision products among them are:

X1 = AB quality (Batang Rattan)

X2 = BC quality (Batang Rattan)

X3 = CD quality (Batang Rattan)

X4 = DE quality (Batang Rattan)

X5 = AB quality (Lambang Rattan)

X6 = BC quality (Lambang Rattan)

2.2 Linear Programming Analysis

The problem of linear programming can be found at various fields and can be used for assisting to make decision to choose an accurate alternative and the best solution.

The formula applied:

$$Z = \sum C_j X_j$$

To the function of constraints

$$a_{11} X_1 + a_{12} X_2 + a_{13} X_3 \ldots\ldots\ldots\ldots \ldots\ldots\ldots + a_{1n} X_n \leq = \geq b_1$$

$$a_{21} X_1 + a_{22} X_2 + a_{23} X_3 \ldots\ldots\ldots\ldots \ldots\ldots\ldots + a_{2n} X_n \leq = \geq b_2$$

$$a_{m1} X_1 + a_{m2} X_2 + a_{m3} X_3 \ldots\ldots\ldots\ldots \ldots\ldots + a_{mn} X_n \leq = \geq b_m$$

Where:

X_j : Decision variable to – j

C_j : objective function parameter to – j

b_1 : constraints capacity to – i

a_{1j} : constraints function parameter to – j

i : 1,2,3, …. …. …., m

j : 1,2,3, …. …. …., n

2.3 Determining Objective Function

The collected quantitative data is processed by computer and tabulated based on activities for further analysis. The analysis which is done from LINGO processed result includes: 1. Primal analysis; by the existence of this analysis, it can be known which one the best product combination is, which can produce maximum objective, that is maximum profit. 2. Dual analysis; if slack/surplus value = 0 and dual value > 0, then the resources include in rarely resource (barrier), and if slack/surplus value > 0 and dual value = 0, then the resources include in excess resources (not barrier).

3. Result and discussion

3.1 The Production Process of CV. Kencana Sakti Rattan

The raw material of rattan is generally supplied from some regencies like Donggala, Parigi Moutong, Poso, Sigi, and Morowali. The kinds of rattan among them are Batang, Tohiti, Noko, Tarumpu, and Lambang. The process of rattan production passes through 7 steps, those are: 1. Weighing; 2. Frying; 3. Drying; 4. Straightening; 5. Stripping; 6.Cutting; and 7. Finishing (sorting/ selection, weighing, and packing).

3.2. Optimization of Production

Optimization production level can be done by minimizing the total cost of inventory production by considering inventory product levels and product demand.

a. ***Formulation of Decision Variables***

Decision variable indicates number of every kind of product which should be produced by the company in order to get optimal condition.

Table 1: Data of Decision Variable

Decision Variable	Production Ton / Monthly	Cost (Rp)	Revenue (Rp)
(X1) AB	246,75	12.500.000	3.084.400.000
(X2) BC	113,14	11.500.000	1.301.056.000
(X3) CD	67,29	7.000.000	471.072.000
(X4) DE	44,86	5.000.000	224.320.000
(X5) AB	33,28	7.000.000	233.000.000
(X6) BC	26,76	6.500.000	174.000.000

b. ***Formulation of objective function***

Main objective of optimization done by the company is for maximizing the revenue/income by making combination models of Model 1 and Model 2 as seen in Table 2 and 3.

Table 2: Model 1.

Variable	**Quality**	**Kind of Rattan**	**Size (mm)**
X1	AB	Batang	36 – 38
X2	BC	Batang	34 – 36
X3	CD	Batang	32 – 34
X4	DE	Batang	30 – 32

Table 3: Model 2.

Variable	Quality	Kind of Rattan	Size (mm)
X1	AB	Batang	36 – 38
X2	BC	Batang	34 – 36
X3	CD	Batang	32 – 34
X4	DE	Batang	30 – 32
X5	AB	Lambang	16
X6	BC	Lambang	16

c. Formulation of Constraints Function

There are 11 constraints variables related to product that produced by CV. Kencana Sakti Rattan as indicated in Table 4.

Table 4: Data of Inventory Function

No	Description of costs	Model 1	Model 2	Model 3
1	Fuel	15	15	Drum
2	Depreciation Of Machinery	16	11	%
3	Depreciation Of Building	8	11	%

4	Electricity	7.500	7.500	KWH
5	Weighing	26	28	HOK
6	Frying	13	13	HOK
7	Drying	14	16	HOK
8	Straightening	22	22	HOK
9	Sanding	82	90	HOK
10	Cutting	28	29	HOK
11	Packing	21	23	HOK

3.3. Analysis Of Optimum Revenue

The result of Linear Programming analysis and LINGO program indicates optimum revenue in model 1 and model 2 as looked in Table 5 and Table 6.

Table 5: Optimum Revenue of income Model 1

No	Kind of Product	Optimal Value	Revenue (Rp)	Optimum Revenue (Rp)
1	(X1) AB (batang)	1	3.048.400.000	3.048.400.000
2	(X2) BC (batang)	1	1.301.056.000	1.301.056.000
3	(X3) CD (batang)	1,5	471.702.000	722.310.000
4	(X4) DE (batang)	0	224.320	0
	Total	3,5		5.107.766.000

The Table 5 indicates that in model 1, there are only 3 kinds of product have optimal value of (X1) AB, (X2) BC, and (X3) CD. The optimum revenue is Rp. 5.107.766.000,- greater than earlier revenue which is Rp. 5.080.484.00,-

Product of (X4) is not feasible to be produced since it does not generate optimal value in the analysis of Linear Programming and LINGO (The empirical findings).

The Table 6 above indicates that in the model 2, there are only 4 kinds of product have optimal value of (X1) AB, (X2) BC, and (X3) CD and (X5) AB). The optimum revenue is Rp.7.402.828.000,- greater than earlier revenue which is Rp.5.487.848.00,-

Products of X4 and X6 are not feasible to be produced since they do not generate optimal value in the analysis of Linear Programming and LINGO (The empirical findings).

Table 6: Optimum Revenue of Income Model 2.

No	Kind of Product	Optimal Value	Revenue (Rp)	Optimum Revenue (Rp)
1	(X1) AB (batang)	1,75	3.048.400.000	3.048.400.000
2	(X2) BC (batang)	1	1.301.056.000	1.301.056.000
3	(X3) CD (batang)	1,5	471.702.000	722.310.000
4	(X4) DE (batang)	0	224.320	0
5	(X5) AB (lambang)	1		233.000.000
6	(X6) BC (lambang)	0		0
	Total	4,75		7.402.828.000

3.4. The Value of the Means of Production at Optimum Revenue

Dual analysis applied to know the use of resources is by seeing the slack/surplus and dual price/shadow price (Tabel 7).

Table 7: Salvage value and Value Added of Model

No	Description of costs	Salvage value (Unit)	Value Added (Rp)
1	Fuel	2,93	0
2	Depreciation Of Machinery	1,8	0
3	Depreciation Of Building	0	992.616.000
4	Electricity	0	314.000
5	Weighing	3	0
6	Frying	1	0
7	Drying	6	0
8	Straightening	4	0
9	Sanding	7	0
10	Cutting	2	0
11	Packing	11	0

Table 7 indicates that there is still surplus from the investment of the use of production means. Therefore, variable indication X4 in model 1 is not feasible to be produced since it is indicated that small production and the number of residual value (Empirical findings).

Table 8: Salvage Value and Value Added of Model 2

No	Description of costs	Salvage value (Unit)	Value Added (Rp)
1	Fuel	0	0
2	Depreciation Of Machinery	0,75	0
3	Depreciation Of Building	0,75	0
4	Electricity	0	1.542,2
5	Weighing	2	0
6	Frying	2	0
7	Drying	2	0
8	Straightening	2	0
9	Sanding	1	0
10	Cutting	2	0
11	Packing	2	0

It is looked at Table 8 that almost all of production means still have salvage value, but the use of fuel and electricity are consumable.

4. Conclusion

Based on the research result and discussion, it can be conclude as follows:

1. The strategy needs to be applied by the company is by keeping the Batang rattan with AB quality and Lambang rattan with AB quality produced.

2. There are 11 (eleven) constraints variables appears in production process in the company, with their different unit/percentage, but almost every production means experiences salvage value.

3. Optimization of the highest revenue is Rp. 7.402.828.000.

4. The value of input raw material usage and the price determines reachable models of production, even though there is still salvage value.

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