Study of activity based costing implementation for palm oil production using value-added and non-value-added activity consideration in PT XYZ palm oil mill

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Abstract. Cost allocation at manufacturing industry particularly in Palm Oil Mill still widely practiced based on estimation. It leads to cost distortion. Besides, processing time determined by company is not in accordance with actual processing time in work station. Hence, the purpose of this study is to eliminates non-value-added activities therefore processing time could be shortened and production cost could be reduced. Activity Based Costing Method is used in this research to calculate production cost with Value Added and Non-Value-Added Activities consideration. The result of this study is processing time decreasing for 35.75% at Weighting Bridge Station, 29.77% at Sorting Station, 5.05% at Loading Ramp Station, and 0.79% at Sterilizer Station. Cost of Manufactured for Crude Palm Oil are IDR 5.236,81/kg calculated by Traditional Method, IDR 4.583,37/kg calculated by Activity Based Costing Method before implementation of Activity Improvement and IDR 4.581,71/kg after implementation of Activity Improvement Meanwhile Cost of Manufactured for Palm Kernel are IDR 2.159,50/kg calculated by Traditional Method, IDR 4.584,63/kg calculated by Activity Based Costing Method before implementation of Activity Improvement and IDR 4.582,97/kg after implementation of Activity Improvement.

1. Introduction
Rapid development of technology in the global era resulted in an intensified usage of production machines then it replaced the use of labor. With the increasing use of the machine then the composition of the company's cost of goods manufactured be changed i.e. decreasing in the direct labor costs and increasing factory overhead costs. PT XYZ Palm Oil Mill is one of the manufacturing companies that are engaged in the processing of Palm Oil Fresh Fruit Bunches (FFB) into Crude Palm Oil (CPO) and Palm Kernel [1]. The production process at the PT XYZ Palm Oil Mill using various kinds of production machines so it absorbs high costs. Therefore, the accuracy in calculating and charging according to the amount consumed by the activities of product manufacturing is absolutely required.

Currently, calculation of cost of goods manufactured in PT XYZ Palm Oil Mill still using the traditional method. Traditional method tends to charge higher overhead costs against its production volume of products more than any other products that produced less. In addition, the results of the preliminary observations are conducted, there is a waste of processing time in PT XYZ Palm Oil Mill’s work stations. From the results of the preliminary observations, the actual processing time company as...
measured using Stopwatch Time Study method shows the result of a longer processing time than based on company data. To solve both problems that a calculation of product pricing based on its activities need to be done.

Research about cost based on activity has been conducted by [2] who estimate cost based on activity of pyro processing. From the results of the calculations there are 4 pieces of activity that consumes the costs i.e. the Pretreatment (19%), Electrochemical Reduction (29%), Electro fining (22%) and Electro wiring (30%). [3] used Activity Based Costing (ABC) method to measure the cost of products in real-time and [4] used Activity Based Costing (ABC) method able to save the cost of a transplant stem cell. The application of ABC Method in Service Examination MR. Enterography who conducted by [5] able to reduce Non-Value-Added stages and charged 13%, employee work time amounting to 16%, and the processing time of the patient by 17%. While research on Value-added and Non-Value-added Activities was done by [6] on iron ore Industry resulted there are 33% of the Non-Value-Added Activities and 14.20% Necessary Non-Value-Added Activities on production process that result in production efficiency reached only 52%.

2. Methods

Research conducted on Palm Oil Mill in North Sumatra in 2016. This research includes descriptive (descriptive research) because it can solve the problem that exists in a systematic and factual. The object of the research is the observed production activities at the Weighting Bridge work station, Sorting work station, Loading Ramp work station and Sterilizer work station.

The data used are the Production Activity, Production Processing Time, Production Cost and Production Volume. Data processing method is described as follow:

![Figure 1. The Stages of Data Processing](image_url)

Calculation of cost of goods production is conducted using traditional method and Activity Based Costing method.
Activity-Based Costing (ABC) is an accounting information system that identifies the various activities that are carried out within an organization and collect fees on the basis and nature of existing and expansion of its activities. ABC focuses on the costs inherent in the activity based products to produce, distribute or support the products concerned.

3. Results and Discussions

3.1. Process Activity Mapping Arrangement

Process Activity Mapping (PAM) was arranged to identify Value Added and Non-Value-Added Activities. The results obtained can be seen in Table 1. Then the Activity Improvement need to be implemented on each work station.

Table 1. Process Activity Mapping

| No | Work Station     | Amount of Activity | Details          | Time Average (minutes) |
|----|------------------|--------------------|------------------|------------------------|
| 1  | Weighting Bridge | 7                  | 3 VA, 2 NVA, 2 NNVA | 52.53                  |
| 2  | Sorting          | 4                  | 1 VA, 3 NNVA      | 50.21                  |
| 3  | Loading Ramp     | 6                  | 3 NVA, 3 NNVA     | 40.59                  |
| 4  | Sterilizer       | 7                  | 1 VA, 3 NVA, 3 NNVA | 115.35                |

3.2. Activity Improvement

Activity Improvement performed in two ways:

- Doubled the capacity of Fresh Fruit Bunch (FFB) Truck Loader so that the frequency Fresh Fruit Bunch transportation and the average time of activity can be reduced by half. This improvement can only be applied to Weighting Bridge Work Station and Sorting Work Station.
- Improvements to the facilities, equipment and working to smoothen production activity. This improvement leads to smallest production cycle time as the best result. This improvement can only be applied to Loading Ramp Work Station and Sterilizer Work Station.

The results of the activity improvements can be seen in Table 2. The decrease in production activity time will be directly proportional to the decrease in the cost elements involved, i.e. the direct labor cost, as can be seen in Table 3.
Table 2. Results of Activity Improvements

| No | Work Station    | Average Times Before | Average Times After | Percentage |
|----|----------------|----------------------|---------------------|------------|
| 1  | Weighting Bridge | 52.53                | 33.75               | 35.75%     |
| 2  | Sorting         | 50.21                | 35.26               | 29.77%     |
| 3  | Loading Ramp    | 40.59                | 38.54               | 5.05%      |
| 4  | Sterilizer      | 115.35               | 114.43              | 0.79%      |

Table 3. Decreasing of Direct Labor Cost

| No | Work Station    | Direct Labor Cost (IDR) Before | Direct Labor Cost (IDR) After |
|----|----------------|-------------------------------|-------------------------------|
| 1  | Weighting Bridge | 10,043,300                   | 6,452,720                    |
| 2  | Sorting         | 11,383,190                   | 7,993,851                    |
| 3  | Loading Ramp    | 6,662,000                    | 6,325,535                    |
| 4  | Sterilizer      | 17,590,700                   | 17,450,401                   |

3.3. Calculation of Cost of Goods Manufactured Using Traditional Methods

The imposition of costs to calculate the cost of goods production uses a percentage of 90% for Crude Palm Oil products and 10% for palm kernel. The total cost is the cost that is used before activity improvement, as can be seen in Table 4

Table 4. Cost of Goods Manufactured Calculation using Traditional Method

| Cost Sub Element | Product                  | Crude Palm Oil (90%) | Palm Kernel (10%) |
|------------------|--------------------------|----------------------|-------------------|
| Raw Material Cost| 15,840,531.03            | 1,760,059.00         |
| Direct Labor Cost| 122,498,000.10           | 13,610,888.90        |
| Indirect Cost    | 2,574,267.40             | 286,029,711.30       |
| Total Allocation | 18,537,296.43            | 2,059,699.60         |
| Production Volume| 3,539.81                 | 953.78               |
| COGM (IDR/kg)    | 5,236.81                 | 2,159.50             |

3.4. Calculation of Cost of Goods Manufactured Using Activity Based Costing Methods.

First overhead percentage allocation for each product was calculated by dividing Production Volume with Cycle Time

\[
CPO \text{ production volume} = \frac{CPO \text{ production volume}}{\text{Cycle time}} = 67,386.53
\]

\[
Palm \text{ Kernel Allocation} = \frac{\text{Palm Kernel production volume}}{\text{Cycle time}} = 18,156.88
\]

So, the overhead percentage for each product can be calculated as follows:
\[ \% \text{CPO Allocation} = \frac{\text{CPO Allocation}}{\text{CPO Allocation} + \text{Palm Kernel Allocation}} \times 100\% = 78.77\% \quad (3) \]

\[ \% \text{Palm Kernel Allocation} = \frac{\text{Palm Kernel Allocation}}{\text{CPO Allocation} + \text{Palm Kernel Allocation}} \times 100\% = 21.23\% \quad (4) \]

Results the percentage of allocation can be seen in Figure 2.

![Figure 3. Allocation Percentage](image)

3.4.1. Calculation of Cost of Goods Manufactured Using Activity Based Costing Method Before Activity Improvement. Calculation cost of goods manufactured with the approach of the activity before the Activity Improvement was performed using sub cost element before the activity improvement was implemented and using imposition of percentage that has been calculated above, as can be seen in Table 5.

| Cost Sub Element      | Crude Palm Oil (90%) | Palm Kernel (10%) |
|-----------------------|----------------------|-------------------|
| Raw Material Cost     | 13,863,984.77        | 1,760,059.00      |
| Direct Labor Cost     | 107,212,971.90       | 13,610,888.90     |
| Indirect Cost         | 2,253,056.04         | 286,029,711.30    |
| Total Allocation      | 16,224,253,778.90    | 2,059,699.60      |
| Production Volume     | 3,539.81             | 953.78            |
| COGM (IDR/kg)         | 4,583.37             | 2,159.50          |

3.4.2. Calculation of Cost Of Goods Manufactured Using Activity Based Costing Method After Activity Improvement. Calculation cost of goods manufactured with the approach of the activity after the Activity Improvement was performed using sub cost element after the activity improvement was implemented and using imposition of percentage that has been calculated above, as can be seen in Table 6.
### Table 6. Calculation of Cost of Goods Manufactured with Activity Based Costing After Improvement Activity

| Cost Sub Element | Product                      | Crude Palm Oil (78.77%) | Palm Kernel (21.23%) |
|------------------|------------------------------|-------------------------|----------------------|
| Raw Material Cost| 13,863,984.77                | 3,736,605.26            |
| Direct Labor Cost| 101,339,342.70               | 27,312,863.33           |
| Indirect Cost    | 2,253,056.04                 | 607,241,077.10          |
| Total Allocation | 16,218,359,966.55            | 4,371,149,709.57        |
| Production Volume| 3,539.81                     | 953.78                  |
| COGM (IDR/kg)    | 4,581.71                     | 4,582.97                |

### 4. Conclusion

Based on the results and discussion so it can be taken a few conclusions are as follows:

- There are 24 activities observed at the Weighting Bridge Works Station, Sorting Works Station, Loading Ramp Works Station, and Sterilizer Works Station with details as follow: 5 Value Added Activities, 8 Non-Value-Added Activities and 11 Necessary Non-Value-Added Activities.
- Improvement activities by producing a decrease in the activity of production time 35.75% in Weighting Bridge Works Station, 29.77% at the Sorting Works Station, 5.05% in Loading Ramp Works Station and 0.79% of the Sterilizer Works Station.
- Cost of goods the manufactured of which is calculated using Activity-Based Costing method after activity improvement is IDR. 4,581.71/kg for Crude Palm Oil and IDR 4.582.97/kg for palm kernel.
- Cost of goods manufactured of Crude Palm Oil calculated using Activity-Based Costing method shows cheaper result compared with that calculated using the traditional method, meanwhile Cost of goods manufactured for palm kernel shows vice versa result.

### References

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