Improve productivity in production part using marvin e mundel method

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Abstract. Competition between companies is very high resulting in companies having to implement production plans so that productivity does not decrease. This is the case with palm oil mills which often experience engine failure resulting in reduced productivity in the company. To examine the problem, it is necessary to measure productivity in the company and design proposals that must be done by the company. In the past data, the company experienced a total productivity index of 71.77% so it is necessary to do a design of engine maintenance proposals so that the time of stagnation can be reduced and the productivity index can increase. After the productivity index is implemented, the lowest total productivity index increases to 161.97% after doing maintenance design, the productivity of the company can increase by 50%.

1. Introduction

Competition between companies is measured at the level of the company. Many companies fail to implement production plans so productivity decreases. Palm oil mills often experience engine failure so companies often experience stagnation which results in decreased productivity in the company. In the present, the development of knowledge and technology is known to progress very rapidly, so that the competition between companies is getting tougher. Plus a lot of new companies are emerging, even though consumer demand remains or even decreases.

This requires every company to always make improvements in its business process. One of the keywords of all is efficiency and productivity. Efficiency and productivity measurements are important to know at what level the efficiency and productivity of business processes that have been carried out by the company, whether there is an increase or a decrease. Increased productivity is a motor for driving economic progress and corporate profits [1-2].

Palm oil mills, Saberang Langkat palm are crude oil and palm kernel processing plants. This company processes Fresh Fruit Bunches (FFB) into crude oil and palm kernel. This company has never made productivity measurements before, management only sees from production income data.

The purpose of this research is to find out the cause of the decline in the productivity index in the company and to improve productivity in the company. In this study, the productivity index will be calculated using the marvin e mundel method [2-4].
2. Methodology/Experimental

Based on its nature this research is classified as descriptive research, which is research that describes problem solving on a problem that exists systematically and factually based on data. This research includes the process of data collection, data processing, and problem solving analysis. This research was carried out at PT Perkebunan Nusantara II, Palm Oil Mill, Palm Oil Saberang Langkat.

The independent variables in the research that will be carried out include Energy, Machine Depreciation, Materials, Maintenance and Labor. If the productivity index on these five variables according to it will affect the dependent variable, namely productivity. Following is the flow chart of the research that will be carried out:

Basically the model model is a model of productivity measurement based on concepts in engineering and industrial management. This model requires that the company to be measured for productivity has a standard time for standard operation time, a requirement that is still difficult to meet by most traditional Indonesian industrial companies in Indonesia. Marvin E. Mundel introduces the use of productivity index numbers at the company level based on 2 (two) measurement forms:

\[
IP = \frac{\text{AOMP}}{\text{RIMP}} \times 100
\]

Productivity index (measurement period performance index/ base period performance index)

\[
IP = \frac{\text{AOMP}}{\text{AOPR}} \times 100
\]

Productivity index (Output / Input Index)

IP = Productivity Index
AOMP = The aggregate output for the period measured
AOPR = Aggregate output for the base period
RIMP = index period measured
RIBP = input for the base period

3. Results And Discussion

Data collected from the company will be obtained using the Marvin E Mundel method following the steps as follows:

a. Calculation of Deflator

Research Moon Deflator = \[
\frac{LH \text{ Research Period} - LH \text{ Base Period}}{LH \text{ Base Period}}
\]

b. Constant Price Calculation

Examples of constant prices for depreciation costs in February 2016 are:

\[
\frac{\text{current cost} \times 100}{100 + \text{deflator}} = \frac{14,523,220,53 \times 100}{100 + 0.063} = 14,514,076.13
\]

c. Calculation of Partial Input Total Resources (RIP)

After the constant price of each input is obtained, a partial resource input (RIP) calculation is carried out, which is the sum of all constant price inputs.

Table 1. Calculation of Partial Input Total Resources (RIP)

| Month   | 2016            | 2017            |
|---------|-----------------|-----------------|
| January | 7,728,807,515   | 8,194,019,396,55|
| February| 9,114,671,587,87| 7,045,362,743,14|
| March   | 7,879,188,413,85| 9,897,878,342,63|
| April   | 6,800,780,917,83| 9,842,965,842,05|
| May     | 8,094,562,912,57| 11,139,893,394,68|
| June    | 6,392,372,996,02| 10,108,775,382,07|
| July    | 6,387,741,641,98| 8,857,796,956,58|
| Agust   | 8,861,085,916,09| 9,900,682,864,36|
| September| 8,121,992,907,04| 9,762,774,986,43|
a. Calculation of Agregat Output

\[
\text{Agregate output} = (\text{amount of oil production} \times \text{selling price of perilogram CPO})
+ (\text{core production amount} \times \text{selling price per kilogram})
\]

\[
\text{Agregate output} = (1,221,555 \times 6,929,67) + (214,720 \times 4,418,17)
= 9,413,642,499,25
\]

b. Calculation of Partial Productivity Index

\[
\text{IP Parsial} = \frac{12,804,646.004,83}{14,514,079.13} \times 100 = 104,20
\]

c. Calculation of Total Productivity Index

The total productivity index is obtained from a comparison between all outputs, namely products with inputs, namely: material, labor, deprivasi, energy, and maintenance. The production index graph of the measurement results using the Marvin E Mundel method in the palm oil mill can be seen in Figure 1.

Based on figure 1, it can be seen that overall the productivity index has decreased. In early January-April 2016 the productivity index increased, while in the month of May until February 2017 the productivity index after measuring the following partial productivity index are index data comparison of past partial productivity data with the proposed productivity index.

| Type of measurement       | Measurement Productivity | Productivity Proposal |
|---------------------------|--------------------------|-----------------------|
| Depreciation Productivity | 120.75                   | 126.68                |
| Material Productivity     | 106.85                   | 151.38                |
| Labor Productivity        | 104.13                   | 191.92                |
| Energy Productivity       | 103.20                   | 174.15                |
| Maintenance Productivity  | 102.91                   | 169.67                |
| Total Productivity        | 104.24                   | 165.32                |

Comparison of the total productivity index of the past data and proposed design productivity in 2017 increased by 59.28% compared to past data. At the measurement of past data in 2017 it is known that the depreciation productivity index is 104.24% and in the calculation of the proposed data productivity increases to 165.32%. Increased productivity occurs because the number of outputs has increased so
that the productivity index has also increased. The maintenance Productivity Index can be seen in Figure 5.6 below:

![Total Productivity Graph](image)

**Figure 2.** Graph of Total Productivity Index

### 4. Conclusion

In the initial conditions, the factor that causes a decrease in the productivity index in the company is the time of factory stagnation. If the factory stagnation time is too long, the number of production outputs in the company is not optimal, so the calculation of the partial and total productivity index in the company decreases. From the results of productivity measurements it is known that the total productivity index has decreased during the measurement period. The company's total productivity index in 2016 was 133.05% and in 2017 it was 104.24%. The productivity index declined by 28.81% after improving the total productivity index increased by 59.28%. In 2017 the productivity index totaled 104, 24% to 165.32%.

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