

Productivity Analysis Using Method Murvin E. Mundel Case Study PT. Johan Sentosa

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Abstract: Productivity is an alternative to evaluating the performance that has been done even one of the most effective ways in assessing the efficiency of using several inputs in producing certain outputs. The study was conducted at PT Johan Sentosa. The company is engaged in processing palm oil into CPO (crude palm oil) and kernels. In this case, the company must replace an important process called the sterilizer system from the horizontal sterilizer to the vertical sterilizer. This change will certainly have an impact on company productivity. In this study, the method used is Marvin E Mundel where partial productivity will be identified in the form of depreciation value index, material, labor, energy, and maintenance, and know the total production value index. The results of this study obtained a partial productivity index on the declining workforce, other partial productivity such as depreciation, material, labor, energy, and maintenance have increased while the index value of total productivity increased after a change in the sterilizer system.

Keywords: Partial productivity, total productivity, productivity index

INTRODUCTION

PT Johan Sentosa, This company is engaged in processing palm oil into CPO (*crude palm oil*) and kernel. Behind a good processing process, of course, good machine maintenance is also carried out. There are times when the machine enters a period of having to be replaced because its *lifetime* has expired, so it is no longer economical to continue operating. The phase where we change machines will cause an increase in maintenance costs, the swelling affects the company's productivity because one of the inputs to the production value is maintenance costs. This occurred at the company PT Johan prosperous, where they have to replace an important process called system *sterilizer* of *sterilizerhorizontal* to *sterilizervertical*. The *sterilizer* itself is a combined process of *material handling* and boiling of palm fruit, where all raw materials that are ready to be processed are brought by the method *lorry* or *conveyor* to the boiling either in the form of the old horizontal or the new vertical at PT. This is Johan Sentosa. After the change in the system, the *sterilizer* author is interested in researching how the company's productivity is. Application productivity analysis with the method of Marvin E. Mundel

As a tool to analyze the success of the company. The study has the objective to calculate an index value of the company after the partial productivity system changes *sterilizer* and the index value of the total

productivity of the company after the change *sterilizes* system.

METHOD

The type of research conducted by the author is descriptive quantitative research, namely processing data in the form of numbers in a company or industry which later data will be collected and processed to provide useful information using mathematical formulations. So this research includes the process of collecting, presenting, and processing data, as well as analysis and interpretation at PT. John Sentosa.

In productivity, there are input and output variables used for output and input, namely depreciation costs, energy costs, material costs, maintenance costs, labor costs, while the output variables are the amount of production, CPO prices, and kernel prices.

The types of data used in this study are primary data and secondary data, namely in the form of what costs are used, and how much profit is obtained.

To perform productivity calculations using the Murvin E.Mundel Method, it is done after the data that can be collected,

1. Deflator Calculation
2. Constant Price Calculation
3. Output Aggregate Calculation
4. Partial Productivity Index Calculation

RESULT AND DISCUSSION

The stages in the processing of the Murvin E. Mundel method are as follows:

1. Partial Costs

Table 1. Partial Cost Data

Periode	Biaya				
	Depresiasi	Material	Tenaga Kerja	Energi	Maintenance
Januari	26.891.456	17.695.702.260	308.739.297	238.650.879	280.489.792
Februari	24.766.014	15.429.708.800	321.875.148	156.765.189	200.963.680
Maret	26.367.796	16.293.136.500	337.713.865	135.608.948	228.956.428
April	37.503.261	17.459.008.000	368.364.088	142.193.069	375.860.437
Mei	31.173.142	20.505.223.200	329.821.715	190.926.900	277.224.313
Juni	37.377.583	22.982.365.080	387.276.201	151.822.238	204.969.299
Juli	34.530.724	25.654.392.510	422.035.165	114.922.147	181.825.713
Agustus	37.583.350	22.837.440.360	408.850.929	106.359.595	148.730.090
September	37.333.842	21.763.680.460	402.664.524	123.836.556	176.107.949
Oktober	41.307.494	22.573.912.000	421.835.658	142.976.071	203.120.179
Nopember	35.732.060	15.891.331.280	400.145.035	213.725.724	209.709.384
Desember	36.224.916	14.884.382.280	566.770.403	185.805.990	238.310.482

Source: Mill Manager Report PT Johan Sentosa 2018

2. Price Index Data

Table 2. BPS Riau 2018 Price Index Data

Periode	Indeks Harga				
	Material	Tenaga Kerja	Depresiasi	Energi	Maintenance
18-Jan	440,2	513,8	304,4	170,9	357,3
18-Feb	435,7	514,1	320,6	171	357,3
18-Mar	440,9	520	321,6	171,4	362,9
18-Apr	440,8	520	321,7	170,7	362,9
Mei-18	449,1	522,2	323,8	171,1	362,9
18-Jun	464,6	533,3	325,7	172,3	380,5
18-Jul	462,6	534,6	326,7	172,4	380,5
Agust-18	465,6	546,5	327,6	173	374,3
18-Sep	474,7	547,1	327,6	173,8	376,8
Okt-18	477,9	547,8	331,7	174	376,8
Nop-18	485,3	547,8	331,8	175,1	376,8
Des-18	497,3	560,2	334,4	176,5	376,8

Source: BPJS Riau in figures for the 2018 period

3. Production Data

Table 3. Production Data of PT Johan Sentosa 2018

Periode	CPO (Kg)	Kernel (kg)
Januari	2.559.943	442.816
Februari	2.276.677	408.984
Maret	2.466.249	540.850
April	2.523.943	573.120
Mei	3.154.600	683.550
Juni	3.631.275	745.146
Juli	4.454.243	932.226
Agustus	4.163.402	547.640
September	3.902.599	648.792
Oktober	4.601.788	827.978
Nopember	3.691.841	745.066
Desember	3.580.739	809.532

Source: Mill Manager Report PT Johan Sentosa 2018

4. Average Price of CPO and Palm Kernel Oil

Table 4. Average Price of CPO and Kernel Oil 2018

Price CPO and Kernel		
Period	Cpo	Kernel
January	7.779	7.204
February	7.843	6.840
March	7.925	5.748
April	8.056	5.973
May	7.733	5.821
June	7.534	5.344
July	7.004	5.056
Agust	6.690	5.384
September	6.822	5.725
October	6.545	5.190
November	6.014	4.116
December	5.950	4.108

Source: Mill Manager Report PT Johan Sentosa 2018

5. Deflator Calculation

Research month deflator

$$= \frac{\text{I. H Research month} - \text{I. H Base month}}{\text{I. H Base month}}$$

January depreciation example:

January deflator

$$= \frac{\text{I. H Month January} - \text{I. H Month January}}{\text{I. H January}}$$

$$\text{January deflator} = \frac{304,4 - 304,4}{304,4} = 0$$

Table 5: Deflator value

Periode	Deflator				
	Depresiasi	Material	Tenaga Kerja	Energi	Maintenance
Januari	0	0	0	0	0
Februari	0,053	0,01	0,001	0,001	0
Maret	0,057	0,002	0,012	0,003	0,016
April	0,057	0,001	0,012	0,001	0,016
Mei	0,064	0,02	0,016	0,001	0,016
Juni	0,07	0,055	0,038	0,008	0,065
Juli	0,073	0,051	0,04	0,009	0,065
Agustus	0,076	0,058	0,064	0,012	0,048
September	0,076	0,078	0,065	0,017	0,055
Oktober	0,09	0,086	0,066	0,018	0,055
Nopember	0,09	0,102	0,066	0,025	0,055
Desember	0,099	0,13	0,09	0,033	0,055

6. Constant price calculation

$$\text{Constant price} = \frac{\text{Research period value} \times 100}{100 + \text{Deflator}}$$

Example constant price depreciation January

$$= \frac{\text{Constant price depreciation January} \times 100}{100 + \text{January}}$$

$$\begin{aligned} \text{Constant price depreciation January} &= \frac{26.891.456 \times 100}{100 + 0} \\ &= 26.891.456 \end{aligned}$$

Table 6. Constant price values

Periode	Konstan				
	Depresiasi	Material	Tenaga Kerja	Energi	Maintenance
Januari	26.891.456	17.695.702.260	308.739.297	238.650.879	280.489.792
Februari	24.766.014	15.429.708.800	321.875.148	156.765.189	200.963.680
Maret	26.367.796	16.293.136.500	337.713.865	135.608.948	228.956.428
April	37.503.261	17.459.008.000	368.364.088	142.193.069	375.860.437
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Juni	37.377.583	22.982.365.080	387.276.201	151.822.238	204.969.299
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Nopember	35.732.060	15.891.331.280	400.145.035	213.725.724	209.709.384
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7. Calculation of Total Resources Input Partial (RIP)
 RIP January Total = January Depreciation Constant Price + January Constant Material Price + January Constant Price of Labor + January Energy Constant Price + Maintenance Constant Price
 RIP Total January = Rp 26.891.456 +
 Rp17.695.702.260+ Rp
 308.739.297 + Rp 238.650.879
 + Rp 280.489.792
 = Rp 18.550.473.684

Table 7. Value Total Resources Input Partial (RIP)

Period	Rp
January	18.550.473.684
February	16.134.078.831
March	17.021.783.537
April	18.382.928.855
May	21.334.369.270
June	23.763.810.401
July	26.407.706.259
Agust	23.538.964.325
September	22.503.623.331
October	23.383.151.402
November	16.750.643.483
December	15.911.494.071

8. Calculation of Aggregate Output
 Aggregate Output = (Amount of palm oil production in the month of research x selling price of CPO oil per kilogram) + (Number of kernel production in the month of research x selling price of kernel per kilogram)

$$\begin{aligned} \text{Agregat Output January} &= (2.559.943 \text{ kg} \times \text{Rp } 7.779 / \text{kg}) + (442.816 \text{ kg} \times \text{Rp } 7.204 / \text{kg}) \\ &= \text{Rp } 23.103.843.061 \end{aligned}$$

Table 8. Score Output Agregat

Period	Rp
January	23.103.843.061
February	20.653.428.271
March	22.653.829.125
April	23.756.130.568
May	28.373.466.350
June	31.340.086.074
July	35.910.852.628
Agust	30.801.653.140
September	30.337.864.578
October	34.415.908.280
November	25.269.423.430
December	24.630.954.506

9. Partial productivity index calculation
 Example of depreciation productivity index
 January:
 IP Depreciation

$$= \frac{\frac{\text{AOMP}}{\text{AOBP}}}{\frac{\text{RIMP}}{\text{RIBP}}} \times 100$$

 IP Depreciation

$$= \frac{\frac{\text{Output aggregate depreciation month January}}{\text{Output agregat depreciation month January}}}{\frac{\text{Input depreciation period month January}}{\text{Input depreciation period month January}}} \times 100$$

 IP Depreciation

$$\frac{23.103.843.061}{26.891.456} \times 100 = 100$$

Table 9. Partial Productivity Index Value

Periode	Nilai Indeks Parsial				
	Depresiasi	Material	Tenaga Kerja	Energi	Maintenance
Januari	100	100	100	100	100
Februari	97,07	102,52	85,75	136,09	124,77
Maret	100	106,49	89,64	172,56	120,12
April	73,73	104,22	86,18	172,57	76,73
Mei	105,94	105,98	114,96	153,51	124,26
Juni	97,59	104,45	108,14	213,23	185,63
Juli	121,05	107,21	113,71	322,78	239,77
Agustus	95,39	103,3	100,67	299,14	251,42
September	94,58	106,77	100,68	253,06	209,14
Oktober	96,98	116,77	109,02	248,64	205,7
Nopember	82,31	121,79	84,39	122,13	146,29
Desember	79,14	126,75	58,07	136,93	125,48

10.Total Productivity Index Calculation

Table 10. Index Value Produktivitas Total

Period	Nilai
January	100,00
February	102,78
March	106,86
April	103,76
May	106,78
June	105,89
July	109,19
Agust	105,06
September	108,24
October	118,18
November	121,13

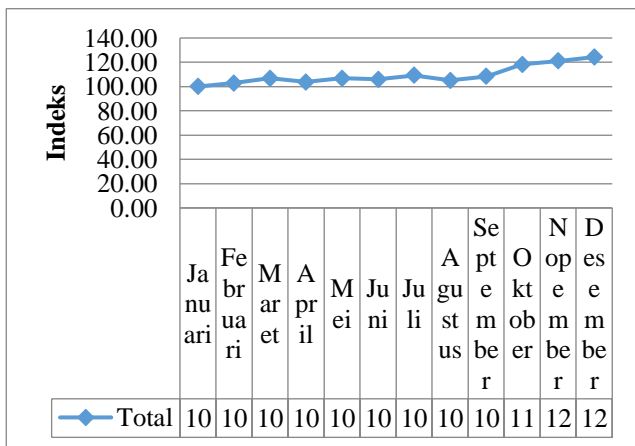


Figure 1 Total Productivity Index

CONCLUSION

Based on data processing and analysis, the following conclusions can be drawn:

1. The company's partial productivity index after the sterilizer system change can be seen a decrease in labor productivity By setting January as the base period, the index value for February is 85.75% and then March by 89.64% followed by April with 86.18% the highest productivity index was achieved in May at 114.9%, then June at 108.14% and July at 113.71%, continuing to August with a figure of 100.68% further to October at 109.02% and then November with 84.39% the lowest index occurred in December at 58.07%. due to the adjustment of the new system. While the index of parial productivity values such as depreciation, By setting January as the base period, February got the lowest index of

102.5%, March of 106.49%, then April with a value of 104.22%, followed by May at 105.98% and then June at 104, 45% then July at 107.21% continued to August at 103.30% then September 106.77% October at 116.77% November 121.79% The highest productivity index was achieved in December at 125.7%. materials, energy, and maintenance have increased.

2. The index of the company's total productivity value after the sterilizer system change has increased. This is in line with the company's goal of increasing productivity.

REFERENCES

Gaspersz, Vincent. *Manajemen Produktivitas Total*. Granmedia Pustaka Utama, Jakarta.2000

Sinungan, Muchdarsyah.*Produktivitas Apa dan Bagaimana Cetakan 8 Edisi 2*. Jakarta: Bumi Aksara.2005.

Summanth. David.J. *Productivity Enginering and Management*, Mc Graw Hill Book Company, New York 1984

Suprato. *Metodologi Penelitian Bisnis Untuk Akuntansi dan Manajemen Edisi 1*. Yogyakarta : BPFE. 2001.

Sahat. *Analisis Produktivitas dengan Menggunakan Metode Marvin E.Mundel Pada PT. Coca-cola*. Jurnal Departemen teknik Industri, fakultas Teknik, Jurusan teknik Industri, Universitas Sumatra Utara, Medan.2008

Rejeki, Sinulingga, and Tarigan. *Analisis Produktivitas dengan Menggunakan Metode Marvin E.Mundel (Studi Kasus pada CV NURYZ BERSAUDARA)*. Jurnal Teknik Industri.2013