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Optimal labors number analysis using constraints approach theory in Weeka Wedang Uwuh small and medium enterprises

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ABSTRACT
The increasing demand for wedang uwuh during the pandemic requires Weeka Wedang Uwuh as a producer to be quick and responsive in meeting demand. Competition for sales of wedang uwuh is currently quite tight because there are more and more wedang uwuh producers. One way to anticipate current business competition, especially in the herbal beverage industry, is to try to manage the resources owned by SMEs, including labor. The right number of workers will guarantee product availability and also provide minimum costs for labor costs. This research aims to provide suggestions for determining the optimal number of workers in order to minimize labor costs. ToC is a problem solving approach that focuses on eliminating constraints using available methodologies. Therefore, this approach is very suitable for eliminating obstacles at Weeka Wedang Uwuh in order to determine the optimal number of workers. To support the TOC approach, the Dynamic Program method will be applied to the obstacle removal step. The optimal number of workers in UKM Weeka Wedang Uwuh will be obtained by reducing 5 (five) workers in the Wedang Uwuh packing section. The savings that occurred during the research time period were Rp. 21,500,302.00 compared to expenses if it had the current number of workers.

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1. INTRODUCTION

The corona virus pandemic that lasted throughout 2020 did not only have an impact on the health sector. The impact of the pandemic also occurred in economic sectors throughout the world, including Indonesia. Behind the negative impact, it turns out there is also a positive impact, one of which is in the sales sector of herb and spices drinks which are believed to increase immunity. Weeka Wedang Uwuh which is located in Wonokromo 2, Wonokromo, Pleret, Bantul, Yogyakarta produces wedang uwuh. Wedang uwuh is a traditional drink from Bantul.

During this pandemic, Weeka Wedang Uwuh experienced a significant increase in sales. At that time, resellers or retail buyers often found they had to buy through an indent system, due to limited resources, both raw materials and labor. The majority of workers were daily workers or workers based on production targets, which was a problem in managing the optimal number of workers. This was done so that Weeka Wedang Uwuh can fulfill orders from consumer requests at the moment they can be served, without increasing the burden of labor costs. It is necessary to plan the optimal number of workers so the addition or reduction of workers does not occur in the middle of the production period.

The Theory of Constraints (TOC) approach which focuses on providing a special methodology for identifying and eliminating constraints is very suitable for determining the number of workers at Weeka Wedang Uwuh. To support the TOC approach, the Dynamic Program method will be applied in the step of removing obstacles. It is hoped that the TOC approach and Dynamic Program method will be able to help Weeka Wedang Uwuh in meeting consumer demand so that it will minimize labor costs and can also increase income.

The Theory of Constraints (TOC) approach to resolving constraints that occur in a system was used by [1- 3]. Rianti et al [1] solved production scheduling problems in printing companies, with their TOC approach focusing on workstations that experienced bottlenecks. Rahmawati et al [2] solved production capacity problems at each work station in a food box company, with their TOC approach focusing on work stations that experienced bottlenecks. Mustikasari and Ardiles [3] in companies engaged in the production of electronic equipment to smartphones solved bottleneck problems on the production floor with the aim of increasing productivity.

TOC research aimed at system innovation and organizational requirements for the work of railway staff has been carried out in connection with questions about their activities and position in the transportation process [4] . The classic P and Q problems were used to illustrate the concept of Throughput Accounting (TA) proposed by the Theory of Constraints (TOC). Research [5] aimed to verify whether decisions based on Throughput Accounting (TA) were robust when simultaneous variations occured, bringing the problem closer to corporate reality. Throughput Accounting's robustness to support product mix and constraint identification decisions in companies was proven in dynamic scenarios featuring variability.

Pacheco et al [6] conducted research by extending operations strategy to the TOC context to examine with more precision the influence of TOC elements on the competitive priorities of high speed, on-time delivery, high flexibility, low cost, and high quality. A multi-method approach was adopted combining qualitative and quantitative approaches. The findings showed that the main competitive dimensions exploited by TOC elements were on-time delivery and high speed, followed by high flexibility.

Meanwhile, the Dynamic Program method was used [7 ,8]to control raw material inventories with the aim of optimizing raw material inventories, minimizing ordering costs, purchasing costs and raw material storage costs. Meanwhile, the research [9] focused on production planning and inventory control in agro-industrial companies that have make-to-order characteristics.

Astuti & Nurdin [10] conducted research at Weeka Wedang Uwuh regarding Performance Evaluation of Wedang Uwuh UKM Suppliers Based on Multi Attribute Decision Making (MADM). The results of designing the Weeka Wedang Uwuh supplier performance evaluation model are formulations for measuring KPIs. The criteria are quality of raw materials (size and condition of raw materials), ease of service (payment tolerance and information on availability and price changes), experience (average transaction value and average number of transactions), speed of response (changes in quantity and changes in time and raw material prices).

From several previous studies, there is a gap where for the purpose of determining the optimal number of workers, a workload approach was used using work sampling and work analysis methods [11-13]. Therefore, this research was completed using a dynamic program method based on labor costs [14-16]. In this research, to describe the constraints in determining the number of workers, the TOC approach was used, which in previous research, this approach was widely used for work station bottleneck problems on the production floor [17]. For Weeka Wedang Uwuh specifically, no research has been carried out on determining the number of workers, what has been done is on Supplier Performance Evaluation.

2. MATERIALS AND METHODS

In general, the stages that researchers go through are from data collection to drawing conclusions, which forms a systematic flow. The research stages are presented in Figure 1.

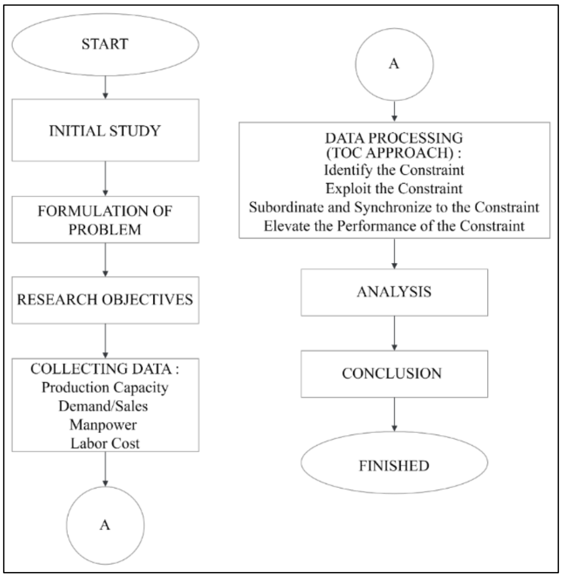

Figure 1 Research Flow

This research is limited to studying the problem of applying the Theory of Constraints (TOC) to determining the optimal number of employees at Weeka Wedang Uwuh. This research focuses on resolving constraint using the Five Focusing Steps in TOC as in Figure 2 [18, 19]

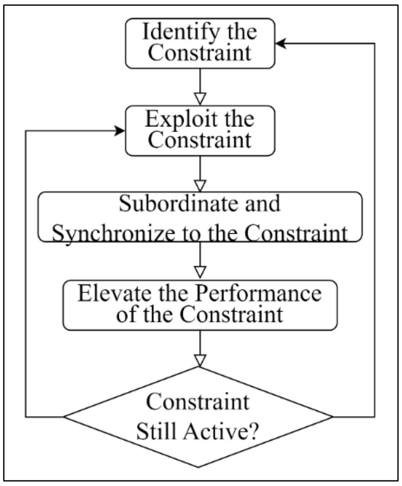

Figure 2 TOC systematics

3. RESULTS

This section can potentially be partitioned using subheadings. The aim is to present a concise and precise account of the results of the experiment, how they were understood, and the conclusions that can be drawn from them.

3.1. Identify the Constraints

This research focuses on the constraints because of the COVID-19 pandemic. The main constraints faced during the pandemic at Weeka Wedang Uwuh was the readiness of Wedang Uwuh products to meet the market demand. Since the Large-Scale Social Restrictions (PSBB) was implemented in March and April 2020, the demand was significantly increased because the ingredients in wedang uwuh are considered capable of increasing immunity. This is a major concern for Weeka Wedang Uwuh to fulfill demand with minimal labor costs.

The readiness of wedang uwuh products not only lies on the availability of raw materials but also lies on the packing process of wedang uwuh. This packing process includes: rock sugar packing, labels packing, wedang uwuh sachets packing, and mica or box packaging. Speed and accuracy of size greatly influence the packing process time, therefore scheduling the number of labors is very necessary to minimize production costs. The following is data on the demand of Wedang Uwuh (sachets) during August 2020 to July 2021 which is shown in Table 1.

Table 1. The Demand of Wedang Uwuh on August 2020 – July 2021

Period	The Total Demand
August 20	32,658
September	35,785
October 20	29,220
November	30,655
December	32,075
January 21	33,727
February 21	37,108
March 21	39,410
April 21	25,012
May 21	26,515
June 21	30,108
July 21	48,745

To schedule labor from August 2021 to December 2021, it is necessary to forecast the number of requests. Plotting the demand data for the past period (August 2020 to July 2021) in Figure 3 shows that the demand is experiencing an increasing trend pattern.

Forecasting is carried out using QS for Windows software and according to [20], if the demand data shows an upward or downward trend pattern, the forecasting methods used are Single Exponential Smoothing (SES), Double Exponential Smoothing (DES), and Linear Regression (LR). To determine the results of the appropriate forecasting method used as a basis for dynamic program calculations, the Mean Absolute Deviation (MAD), Mean Square Error (MSE), and Mean Absolute Percentage Error (MAPE) must be known. The recapitulation can be seen in Table 2 The forecasting accuracy will be higher if the MAD, MSE and MAPE values are smaller.

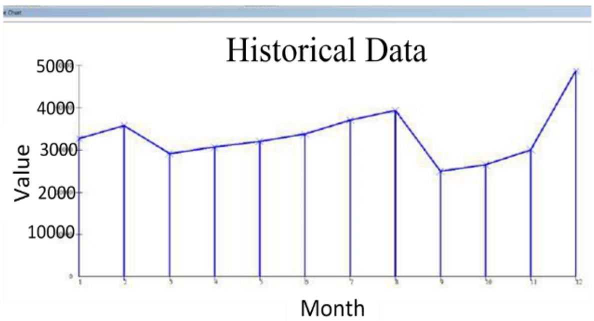

Figure 3. Plotting the Demand Data

Table 2. Recapitulation of Forecasting Comparisons

Method	MAD	MSE	MAPE
SES	4963,739	4,298388E+0	14,43664
DES	4904,124	4,137734E+0	14,24388
LR	4669,327	3,567474E+0	14,17628

Based on Table 2 the forecasting that will be used is Linear Regression, because it has smaller values for MAD, MSE, and MAPE. The results of forecasting demand for Wedang Uwuh sachets (including demand for sugar and demand for Wedang Uwuh mica/box) for August 2021 to December 2021 can be seen in Table 3

3.2. Constraints Exploitation

At this stage, the constraints in each packing process will be exploited, so that the constraints that occur will be found and eliminated in each process.

Table 3. The Demand Forecasting Results of Wedang Uwuh

Month	The Demand of Wedang Uwuh (Sachet)	The Demand of Sugar (kg)	The Demand of Wedang Uwuh (Mika/Box)
August 21	35.784,07	1.145,09	3.578,41
September	36.148,06	1.156,74	3.614,81
October 21	36.512,04	1.168,39	3.651,20
November	36.876,03	1.180,03	3.687,60
December	37.240,01	1.191,68	3.724,00

3.2.1 Sugar Packing Process

In this process, 32 grams of rock sugar are packaged into plastic clips. Therefore, the amount demand for wedang uwuh will be converted into the weight of rock sugar. The conversion results are listed Table 3.

The initial conditions for this process have 5 (five) labors whose target packing capacity per labor per day is 12 kg of sugar. With a fixed wage for sugar packing labors (Rp. 1.400,00/kg) and labor overtime wages (Rp. 2.000,00/kg), the cost of hiring sugar packing labors is equivalent to 2 working days of sugar packing labors, which is Rp. 33.600,00. It is because the labor is new and still needs to get used to practicing for approximately 2 days in packing sugar. The cost of reducing labor as a sign of thanks is given equivalent to a week's work, which is Rp. 100.800,00.

3.2.2 Label Packing Process

This process is to insert the Weeka Wedang Uwuh label into the plastic packaging. The number of packing labels demand will be the same as the predicted number of Wedang Uwuh sachets demand because each Wedang Uwuh sachet packaging has 1 (one) label. The initial condition for this process has 1 (one) labor, with a wage of Rp. 8.00/label, no fees charged for hiring and dismissing labors.

3.2.3 Sachet Packing Process

This process involves putting spices into plastic packaging that already contains sugar and a label. The number of wedang uwuh sachets demand is in accordance with the number of forecasting results. The initial conditions for this process have 10 (ten) labors, who each day have a target of 2,000 (two thousand) wedang uwuh sachets, which are carried out for 8 working hours per day. If during these working hours the target is not achieved, overtime will be charged without charge. However, if overtime is due to fulfilling the excessive demand, the labor will get overtime salary of Rp. 10,000.00/ hour.

The wage per labor per week is Rp. 325,000.00 or Rp. 1,300,000.00 per month. The cost of hiring sachet packing labors is equivalent with 2 days of work for sachet packing labors (Rp. 108,333.00). It is because new labors still need to get used to and practice for approximately 2 days in packing sugar. The cost of reducing labor as a sign of thanks is given equivalent with a week's work which is Rp. 325,000.00.

3.2.4 Mica/Box Packing Process

This process is to put sachets of wedang uwuh into exclusive mica packaging or boxes. Each packaging consists of 10 (ten) sachets so the amount of wedang uwuh demand will be converted into mica or box packaging unit. The conversion results are listed in Table 3

The initial condition for this has 2 (two) labors, who each day have a target of 200 (two hundred) wedang uwuh mica/box packages, which is carried out for 8 working hours per day. If during these working hours the labor target is not achieved, it will be charged overtime without charge. However, if overtime is due to fulfilling the exessive demand, the labor will be paid Rp. 10,000.00/ hour.

The wage per labor per week is Rp. 325,000.00 or Rp. 1,300,000.00 per month, the cost of hiring mica/box packing labor is equivalent with 2 working days of mica/box packing labor (Rp. 108,333.00). It is because new labor still needs to get used to and practice for approximately 2 days in packing sugar. The cost of reducing labor as a sign of thanks is given equivalent with a week's work (Rp. 325,000.00).

3.3 Subordination and Synchronization Constraints

The next stage is working on non-constraint systems/resources to support the maximum effectiveness of constraint improvement, not to complicate the constraints.

At this stage, restrictions are made on things that exceed capacity and elimination of things that are not needed. Assume that the production target of 2,000 sachets per day is a non-constraint resource. It is assumed that the production process runs smoothly without any problems. The constraint is how to determine the optimal number of labors so that the wage costs incurred can be as minimal as possible. Therefore, it is necessary to analyze labor needs.

3.3.1. The Labor Needs Analysis

The number of labors here is calculated based on the Work Load Analysis (WLA), which is a calculation the number of labors based on the total workload as follows:

$$WLA = \frac{\text{number of products } x\ process\ /unit}{working\ hours\ x\ working\ days/month} \tag{1}$$

Calculations to determine the number of labors in the sugar packing process in August 2021: Number of desired products (Table 3) = 1,145.09 kg; Processing time per unit = 0.667 hour/kg; Working hours per day = 8 hours; Working days per month = 24 days. Calculations for the following month and other packing processes are listed in Table 4.

$$WLA = \frac{1.145{,}09 \text{ x } 0{,}667}{8\ x\ 24} = 3{,}98\ Labor \tag{2}$$

Table 4. Number of Labors Based on WLA

Month	Work Load Analysis			
	Sugar Packing	Label Packing	Sachet Packing	Mica/Box Packing
August 21	3,98	0,75	7,46	1,49
September 21	4,02	0,75	7,53	1,51
October 21	4,06	0,76	7,61	1,52
November 21	4,10	0,77	7,68	1,54
December 21	4,14	0,78	7,76	1,55

The attendance rate is a comparison between lost working days and at Weeka Wedang Uwuh. The formula for calculating the attendance rate is as follows:

$$Attendance\ Rate = \frac{lost\ working\ days}{all\ working\ days}\ x\ 100 \tag{3}$$

Based on the 2021 calendar, the results of calculating attendance levels are obtained as shown in Table 5.

Table 5. Labor Presence Level

Month	Off Days	Work Days	Attendance Rate
August 21	2	26	0.076923
September 21		24	0
October 21	1	26	0.038462
November 21		26	0
December 21	1	27	0.037037

Labour Turn Over (LTO) is defined as the turnover of incoming and outgoing labors during a certain period. The size of the LTO is an indication of company stability. From the beginning of 2020 to 2021, the number of labors at Weeka Wedang Uwuh did not change or it could be said that there were no labors entering or leaving so that the workforce turnover rate was 0 (zero).

Work Force Analysis (WFA) or ideal workforce is determined based on the number of workers resulting from the WLA calculation plus the level of attendance and workforce turnover which is shown in Table 6

$$WFA = WLA + \%\, attendance\ rate + \%\, LTO \tag{4}$$

Table 6. The Ideal Workforce Based on WFA

Month	Ideal Workforce			
	Sugar Packing	Label Packing	Sachet Packing	Mica/Box Packing
August 21	5	1	8	2
September 21	5	1	8	2
October 21	5	1	8	2
November 21	5	1	8	2
December 21	5	1	8	2

3.3.2. Dynamic Program for Determining the Number of Labors

Labor is a resource that is complex and difficult to predict. Therefore, it is necessary to manage the workforce through several methods, such as determining the composition of the workforce, determining the optimum number of workers, and allocating the workforce [21].

The dynamic program method aims to find out alternative numbers of workers that will produce the minimum labor costs [2].

To be able to apply the Dynamic Program method, the amount of work assigned must be the same as the number of tasks to be completed. Additionally each job should be assigned to only one task. Thus, the assignment problem includes n sources that have n assignments [22].

Determination of the number of workers will be calculated for each stage of the packing process. To find out whether the workforce that has been obtained based on the WFA is optimal or not, it will be completed using the Dynamic Program method with the following objective function:

$$Sk(b) \sim minimum \sum_{\substack{j=k \\ xk \ldots xn}}^{n} = \{f_i(x_j - x_{j-1}) + g_j(m_j - x_j) + h_j(x_j)\} \tag{5}$$

k = 1,2,3, … n

$$Sk(b) \sim minimum\ \{f_k(x_k - b) + g_k(m_k - x_k) + h_k(x_k) + S_{k+1}(x_k)\} \tag{6}$$

k = 1,2,3, … n

where :
Sb = State the decision on the stage N
xj = Decision variable on the stage N
Sk(b) = Optimal gain function
(to show the minimum cost for k until n month)
X*b = Optimal Decision Variable
b = State parameter that shows the number of labors in month k
The functions fj and gj in this case have the following formula:

$$f_i(x_i) = C_a(x_j - x_{j-1}), x_j - x_{j-1} > 0 \tag{7}$$

$$f_i(x_i) = C_p(x_j - x_{j-1}), x_j - x_{j-1} < 0 \tag{8}$$

$$g_j(x_j) = CL\ (m_j - x_j),\ \ m_j - x_j > 0 \tag{9}$$

$$h_j(x_j) = CU \tag{10}$$

where :
Ca = The cost for hiring new labor
Cp = The cost for dismissal the labor
CL = Overtime Cost, in this calculation, the difference in processing time will be looked for if the labor is less than the ideal number of workers, because overtime costs are calculated per hour
CU = Monthly labor wages by applying the backward recursive
The various known variables are as follows:
Stage = Time period during 5 months (1, 2, 3, 4, 5)
mj = The ideal number of labors needed in the jth month
xj = Decision variables, starting from the number of labors that Weeka Wedang Uwuh has to the number of labors needed
State b = Number of labors in month k

3.3.3. Determining the Number of Labors for the Sugar Packing Process

The following is the optimal labor calculation for the sugar packing process. Table 7 shows the ideal number of labor and Table 8 is the dynamic program calculation stages by applying backward recursive.

Table 7. Ideal Labor and 4 Labors Overtime Hours in Sugar Packing Process

Month	Ideal Labor	4 Labor Ovetime Hours
August 21	4	-6,90976
September 21	4	4,73792
October 21	4	16,38528
November 21	4	28,03296
December 21	4	39,68032

Table 8. The Calculation of Dynamic Program Each Stage

Stage 5, m5 =5				
x4	S5(bi)		Optimal Solution	
	x5 = 4	x5=5	f5(x4)	x5
4	1.692.161	2.049.600,00	1.692.161	4
5	1.792.961	2.016.000,00	1.792.961	4
Stage 4, m4 =5				
x3	S4(bi)		Optimal Solution	
	x4 = 4	x4=5	f4(x3)	x4
4	3.361.027	3.842.560,64	3.361.027	4
s5	3.461.827	3.808.960,64	3.461.827	4
Stage 3, m3 =5				
x2	S3(bi)		Optimal Solution	
	x3 = 4	x3=5	f3(x2)	x3
4	5.006.597	5.511.426,56	5.006.597	4
5	5.107.397	5.477.826,56	5.107.397	4
Stage 2, m2 =5				
x1	S2(bi)		Optimal Solution	
	x2 = 4	x2=5	f2(x1)	x2
4	6.628.873	7.156.997,12	6.628.873	4
5	6.729.673	7.123.397,12	6.729.673	4
Stage 1, m1 =5				
x0	S1(bi)		Optimal Solution	
	x1 = 4	x1=5	f1(x0)	x1
5	8.342.473	8.779.272,96	8.342.473	4

3.3.4. Determining the Number of Labors for the Label Packing Process

Determining the number of labors in the label packing process does not use the dynamic programming method. It is because the ideal workforce needed based on WFA is less than 1 labor. Thus, 1 labor has been determined without going through the Dynamic Program calculation process.

3.3.5. Determining the Number of Labors for Sachet Packing Process

The following is the optimal labor calculation for the sachet packing process. Table 9 shows the ideal number of TK and the number of overtime hours for a month. Table 10 is the dynamic program calculation stages by applying backward recursive.

Table 9. Ideal Labor and 7 Labors Overtime Hours in Sachet Packing Process

Month	Ideal Labor	7 Labors Overtime Hours
August 21	8	8,73628
September 21	8	10,19224
October 21	8	11,64816
November 21	8	13,10412
December 21	8	14,56004

Table 10. The Calculation of Dynamic Program Each Stage

Stage 5, b5 =8				
x4	S5(bi)		Optimal Solution	
	x5 = 7	x5=8	f5(x4)	x5
7	9.245.600	10.508.333,33	9.245.600	7
8	9.570.600	10.400.000,00	9.570.600	7
Stage 4, b4 =8				
x3	S4(bi)		Optimal Solution	
	x4 = 7	x4=8	f4(x3)	x4
7	18.476.642	20.078.933,73	18.476.64	7
8	18.801.642	19.970.600,40	18.801.64	7
Stage 3, b3 =8				
x2	S3(bi)		Optimal Solution	
	x3 = 7	x3=8	f3(x2)	x3
7	27.693.123	29.309.974,93	27.693.12	7
8	28.018.123	29.201.641,60	28.018.12	7
Stage 2, b2 =8				
x1	S2(bi)		Optimal Solution	
	x2 = 7	x2=8	f2(x1)	x2
7	36.895.046	38.526.456,53	36.895.04	7
8	37.220.046	38.418.123,20	37.220.04	7
Stage 1, b1 =8				
x0	S1(bi)		Optimal Solution	
	x1 = 7	x1=8	f1(x0)	x1
8	46.407.408	47.620.045,60	46.407.40	7

3.3.6. Determining the Number of Labors for Mica/Box Packing Process

The following is the optimal labor calculation for the mica/box packing process. Table 11 shows the ideal number of labors and the number of overtime hours for a month. Table 12 is the dynamic program calculation stages by applying backward recursive.

Table 11. Ideal Labor and 1 Labor Overtime Hours in Mica/Box Packing Process

Month	Ideal Labor	1 Labor Overtime Hours
August 21	2	94,27
September 21	2	97,18
October 21	2	100,10
November 21	2	103,01
December 21	2	105,92

Table 12. The Calculation of Dynamic Program Each Stage

Stage 5, b5 =2				
x4	S5(bi)		Optimal Solution	
	x5 = 1	x5=2	f5(x4)	x5
1	2.359.201	2.708.333,33	2.359.201	1
2	2.684.201	2.600.000,00	2.600.000	1
Stage 4, b4 =2				
x3	S4(bi)		Optimal Solution	
	x4 = 1	x4=2	f4(x3)	x4
1	4.689.283	5.308.333,33	4.689.283	1
2	5.014.283	5.200.000,00	5.014.283	1
Stage 3, b3 =2				
x2	S3(bi)		Optimal Solution	
	x3 = 1	x3=2	f3(x2)	x3
1	6.990.246	7.722.616,53	6.990.246	1
2	7.315.246	7.614.283,20	7.315.246	1
Stage 2, b2 =1				
x1	S2(bi)		Optimal Solution	
	x2 = 1	x2= 2	f2(x1)	x2
1	9.262.091	10.023.579,73	9.262.091	1
2	9.587.091	9.915.246,40	9.587.091	1
Stage 1, b1 =2				
x0	S1(bi)		Optimal Solution	
	x1 = 1	x1= 2	f1(x0)	x1
2	11.829.817	12.187.091,20	11.829.817	1

3.4 *Lifting the Constraints*

Based on the calculation results, in each packing process using the Backward Recursive Dynamic Program method, the results obtained for each process and for each month are shown in *Table 13*.

In the sugar packing process, the initial number of labors was 5 (five) people. Meanwhile, based on the calculation results of the Dynamic Program method, the optimal number of labors was found to be 4 (four) people. Thus it is recommended to reduce 1 (one) labor in the sugar packing process.

In the label packing process, the initial number of labors was 1 (one) person. Based on the results of calculations using the Dynamic Program method, the optimal number of labor is 1 (one) person, so the number is appropriate.

In the sachet packing process, the initial number of labors was 10 (ten) people. Based on the results of calculations using the Dynamic Program method, the optimal number of labors was 7 (seven) people. Thus it is recommended to reduce 3 (three) labors in the sachet packing process.

In the mica/box packing process, the initial number of workers was 2 (two) people. Based on the results of calculations using the Dynamic Program method, the optimal number of labor is 1 (one) person. Thus it is recommended to reduce 1 (one) labor in the mica/box packing process.

Table 13. Calculation Results and Comparison of Optimal Number of Labors

Process	Month	Initial Labor	Ideal Labor	Optimal Labor	Information
Sugar Packing	August 21	5	5	4	Reduce 1
	September 21		5	4	Fixed
	October 21		5	4	Fixed
	November 21		5	4	Fixed
	December 21		5	4	Fixed
Label Packing	August 21	1	1	1	**Suitable**
	September 21		1	1	Fixed
	October 21		1	1	Fixed
	November 21		1	1	Fixed
	December 21		1	1	Fixed
Sachet Packing	August 21	10	8	7	**Reduce 3**
	September 21		8	7	Fixed
	October 21		8	7	Fixed
	November 21		8	7	Fixed
	December 21		8	7	Fixed
Mica/Box Packing	August 21	2	2	1	**Reduce 1**
	September 21		2	1	Fixed
	October 21		2	1	Fixed
	November 21		2	1	Fixed
	December 21		2	1	Fixed

4. DISCUSSION

After carrying out the 4 (four) process stages of TOC, namely identification of constraints, exploitation of constraints, subordination and synchronization of constraints, and lifting of constraints, it is recommended to reduce some of the labors in 3 (three) parts of the packing process which are sugar packing, sachet packing, and mica/box packing.

Even though there will be additional working time in the form of overtime, the costs incurred will be less than if it had the current number of labors. In Table 14 it can be seen that Weeka Wedang Uwuh can save is Rp. 21,500,302.00 if the optimal number of labors is applied. It is in line with several studies on the application of dynamic programming methods related to production planning which show better results when compared to the system implemented by the company [23].

Table 14. Difference in Costs Before and After Calculation (in rupiah)

No	Process	Before	After
1	Sugar Packing	10.080.000,00	8.342.473,00
2	Label Packing	1.920.000,00	1.920.000,00
3	Sachet Packing	65.000.000,00	46.407.408,00
4	Mica/Box Packing	13.000.000,00	11.829.817,00
	Total	**90.000.000,00**	**68.499.698,00**
	Difference	**21.500.302,00**	

The result shows that it is necessary to develop a system that can identify constraints in real time by utilizing advanced technology. It is in line with research [24 ,25] which created a Due Date Control (DDC) which was considered one of the competitive capabilities of a company. Based on advanced interconnected technology in Industry 4.0, DDC can collect processing information accurately and in real time to integrate with production systems. It is an intelligent system-based feedback control that can be designed to control process plans.

5. CONCLUSION

From the calculation, it can be concluded that, 1. The optimal number of labors at Weeka Wedang Uwuh will be obtained by reducing the workforce. It is because the costs incurred will be smaller compared to maintaining the current number of labors. 2. The savings are Rp. 21,500,302.00 if Weeka Wedang Uwuh has an optimal number of labors compared to the number of labors it currently has. 3. The optimal number of labors for the sugar packing process from August 2021 to December 2021 is fixed at 4 (four) people. Meanwhile, the label packing process from August 2021 to December 2021 is fixed at 1 (one) person. The sachet packing process from August 2021 to December 2021 is fixed at 7 (seven) people. And the mica/box packing process from August 2021 to December 2021 is still 1 (one) person. 4. The labor reduction process will all be carried out in August 2021. In the sugar packing process, the reduction is 1 (one) person, in the sachet packing process 3 (three) people, and in the mica/box packing process 1 (one) person.

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