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THEME:

"ORGANIZATION OF WORK THROUGH METHODS ENGINEERING AND STUDY OF TIMES TO INCREASE PRODUCTIVITY IN THE POST-HARVEST AREA OF THE LOTTUS FLOWERS FLORAL COMPANY"

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SUMMARY

The present study was carried out in the flower company "LOTTUS FLOWERS", located in the sector of the Esperanza-Ibarra. The research was carried out using the methodology of work organization, method engineering and time study. The main objective of the work is to increase productivity, optimizing times and reducing distances that the worker travels.

In the beginning, the collection of the necessary bibliographical information was made to support the theoretical and scientific bases regarding the engineering of methods and study of times. The initial situation of the company was determined by the use of the process diagrams, which allowed visualizing the activities in each of the workstations of the post-harvest area, such as: Reception of roses, dehorning, classification, boncheo , Stems cutting, quality control and packing. In addition, time was taken in each of the stages of the processes mentioned above.

Based on the initial diagnostic data the company produced 11,893 stems per day, and a demand of 12500 stems per day. Improvements were made in the physical distribution of the post-harvest area, standardization of times and new work methods, achieving a cycle time decrease of 2.01 minutes per unit to 1.79 minutes per unit, resulting in Increased production capacity to 13400 stems per day and increasing productivity by 12.67% which was the main objective of this work.

As a result of the research it was possible to improve the production processes that contribute to the increase of productivity and to meet the current demand, objectives of the present work.

KEYWORDS

Engineering of methods, study of times, standard time, productivity.

1 INTRODUCTION

Lottus Flowers is a flower company that has been developing its activities in the empirical way, therefore there are disorder in the processes that causes delays in the production order. In the post-harvest area, no studies have been developed to determine the standard time of production, nor does it have an established method for the development of the tasks.

The organization of work (OT) uses techniques such as method engineering and time studies. Method engineering is a thorough and systematic inspection of all direct and indirect operations, to find improvements that facilitate the performance of work in terms of the safety and health of the worker, and allow it to be carried out in less time, with Lower investment per unit ie higher profitability. The time study is the technique of measurement of the work that is used to record the times and the work rhythms corresponding to the elements of a defined task, performed in determined conditions, to analyze the data in order to find out the time required to carry out a Task in accordance with a pre-established implementation rule.

2 MATERIALS AND METHODS

The tools and methods used to increase productivity in the post-harvest area of the company Lottus Flowers was the engineering of methods and study times.

2.1 Time study equipment

Since the tools play a very important role, it is convenient to know them and they are:

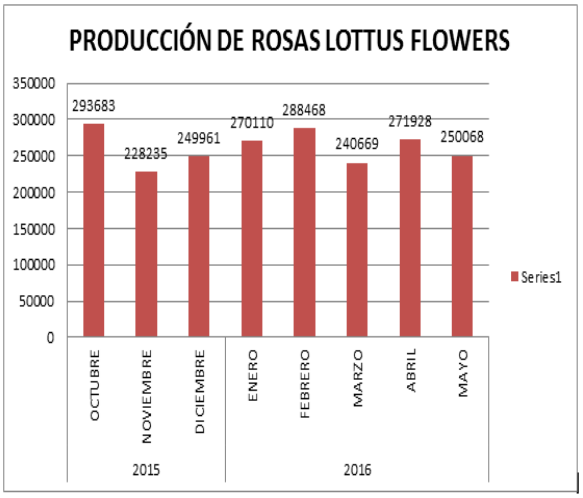
- Stopwatch
- Observation board
- Observation sheet
- Cinematographic camera

2.2 Metodology

2.2.1 Monthly production volume.

The company Lotus Flowers has historical data of production of monthly stems per variety of roses, as shown in figure 2.1.

Gráfica 2.1: Monthly stems production



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Based on the historical data of the monthly production, the production of stems day and hour is calculated.

Tabla 2.1: Monthly production volume

$Poducción\ mensual\ promedio\ de\ tallos = \frac{2093122\ Unidades\ producidas}{8\ meses}$ $=261640\ Tallos\ /mes$
$Poducción\ diaria\ promedio\ de\ tallos = \frac{261640\ (\frac{Unidades\ producidas}{mes})}{22\ días\ laborables}$ $=11893\ Tallos\ /día$
$Poducción\ horas\ promedio\ de\ tallos\ = \frac{11893\ (\frac{Unidades\ producidas}{día})}{8(\frac{horas}{día})}$ $=1486\ Tallos/hora$

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2.3 Time study in the post-harvest area

Operation selection

With the information of the descriptions of the post-harvest process proceed to define the operations that are the following:

• Receiving screens

• Defoam

• Classification

• Boncheo

• Cutting of stems

• Quality control and hydration

• Packing

Number of observations

To calculate the number of observations of the element, we use the statistical method of Abaco de Lifson where we have to make 10 preliminary observations.

Once the 10 initial samples are taken, the upper value (S) and the lower value (I) are calculated with a risk of 2%, ie R = 0.02 and an error of e = 5% of the value, replacing the values In the formula we obtain the value of B of the element belonging to flower bonque, as shown below:

$$B = \frac{S - I}{S + I} = \frac{3{,}0 - 1{,}8}{3{,}0 + 1{,}8} = 0{,}30$$

Finally, with the value of B, draw the line in Figure 2.1 of Abaco de Lifson to obtain the number of observations. Using the abacus figure Lifson gives a result of 30 observations for the first element belonging to boncheo. And this way is calculated for the rest of the stages of the process.

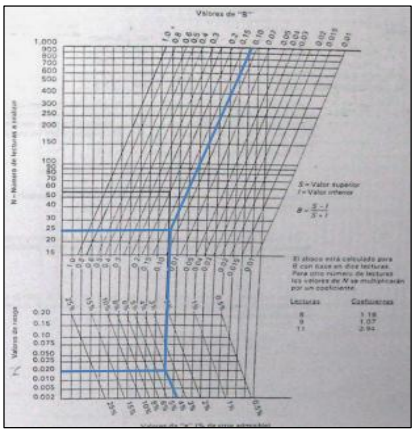

Figure 2.1: Abaco of Lifson

Valuation factor

For the evaluation of the rhythm the first thing that was done was to observe the performance of the operator in his task, later to qualify according to his skill, effort, conditions and consistency by means of the technique of valuation Westinghouse. The Westinghouse method allows us to know the normal

working time, ie the time required by an operator to perform some type of task. In the same way, an example of calculation of valuation factor pertaining to the boncheo process is shown..

Table 2.2: Boncheo valuation factor

VALORACIÓN DEL RITMO DEL TRABAJADOR (BONCHEO)							
TRAB. H/M	N°	ACTIVIDADES	HABILIDAD	ESFUERZO	CONDICIONES	CONSISTENCIA	TOTAL
Trabajador-mujer	14	Retirar las flores de la lira de clasificación	0,06	0,05	0,02	0,01	1,14
	15	Trasladar a la mesa de boncheo	0,06	0,05	0,02	0,01	1,14
	16	Colocar las flores en la lámina corrugada	0,06	0,05	0,02	0,01	1,14
	17	Asegurar con grapas	0,06	0,05	0,02	0,01	1,14
	18	Colocar etiqueta de medida	0,06	0,05	0,02	0,01	1,14
TOTAL DE FACTOR DE VALORACIÓN							1,14

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Supplement

A supplement is the time granted to the worker in order to compensate for delays, delays and contingent elements that are a regular part of the task. Table 2.3 shows the supplement calculation in the boche process.

Table 2.3: Supplement in the boncheo process

SUPLEMENTOS EN EL PROCESO DE BONCHEO																
			CONSTANTES		VARIABLES										TOTAL	%
TRAB. H/M	N°	DESCRIPCIÓN DEL ELEMENTO	NP	F	T.P	P.A	L.P	I.L	C.A	T.V	T.A	T.M	M	T		
Trabajador-mujer	14	Retirar las flores de la lira de clasificación	7	4	4	1	0	0	0	0	0	4	4	1	25	0,25
	15	Trasladar a la mesa de boncheo	7	4	4	1	1	0	0	0	0	4	4	1	26	0,26
	16	Colocar las flores en la lámina corrugada	7	4	4	1	0	0	0	2	0	4	4	1	27	0,27
	17	Asegurar con grapas	7	4	4	1	0	0	0	0	0	4	4	1	25	0,25
	18	Colocar etiqueta de medida	7	4	4	1	0	0	0	0	0	4	4	1	25	0,25
TOTAL SUPLEMENTO															128	0,26

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Standard Time

Once the observed time, factor of assessment and the supplement has been determined, the standard time is calculated in each of the phases of the process.

The standard time allows us to calculate the time that a worker uses to perform the normal activities plus the times used to recover from the fatigue produced by the work itself and by the complementary activities that it is obliged to perform. The following is the standard time formula:

$$TS = TO * FV * (1 + SUPLEMENTO)$$

Table 2.4 shows the standard time results for each of the process steps:

Table 2.4: Standard Time

Tiempo estándar	
Subproceso	TS
Recepción de mallas de rosas	0,83
Deshoje	0,96
Clasificación	2,83
Boncheo	1,89
Corte de tallos	0,94
Control de calidad e hidratación	0,96
Empaque	5,64

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2.3.1 Productivity current method

Production capacity

The production capacity or production volume is calculated in the boncheo process. Based on the standard time used by a single worker, which is 1.89 min for each bonche (25 stems), it is possible to determine the number of units produced per hour and day.

Table 2.5: Production capacity with standard time

$Poducción\ \ de\ tallos\ en\ hora\ = 60\ min * \frac{25\ tallos}{1{,}89\ min} * 2\ trabajadores$ $= 1587\ Tallos/hora$
$Poducción\ de\ tallos\ al\ día\ = 1587\ \frac{tallos}{hora} *\ 8\ horas$ $=12696\ Tallos/día$
$Poducción\ de\ tallos\ al\ mes\ = 12696\ unidades * 22\ días$ $=279312\ Tallos\ /mes$

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2.4 Proposed design of the new working method in the post-harvest area of the post-harvest area Lottus flowers.

Distribution of plant

Through the engineering of methods and time studies it was possible to determine that the distribution of the post-harvest plant is not adequate, therefore, changes were made to the dehorning, sorting, boncheo and encapuche workstation that will help To

reduce the distances that travels the worker as well as the time that occupies.

2.4.1 Rotation of Jobs

The classification process and boncheo are activities in which a monotonous and repetitive work is carried out which generates work stress in the operators. One of the alternatives to reduce work stress is to plan the rotation of the job during the day, one day, or each week in a different location, that is to say the person who is classifying will happen to bonchar and the one who is bonchando will begin to classify which will reduce monotonous and repetitive work.

2.4.2 Uses of personal protective equipment

In order to perform the tasks in a more efficient and safe conditions, operators are obliged to use the appropriate personal protective equipment. Operator safety is considered a very important factor in improving task performance.

2.4.3 Standardization of time with the new method

For the determination of the standard time, the same steps of the time study were followed. The results of the time study with the new working method are shown below.

Enhanced Method Observed Time

Likewise, to determine the observed time, a sample of 30 readings was taken and the average of those data were taken.

Table 2.6: Observed Time

Observed Time	
Process	**Observed Time (min)**
Reception of meshes	0,50
Deshoje	0,64
Classification	0,08
Boncheo	1,32
Cutting of stems	0,68
Quality control and hydration	0,65
Packing	3,98

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Improved Method Valuation Factor Calculation

In the same way, making use of the values factor workers of each stage of the process improved.

Table 2.7: Valuation factor

Valuation factor	
Process	**FV**
Reception of meshes	1,13
Deshoje	1,12
Classification	1,13
Boncheo	1,14
Cutting of stems	1,12
Quality control and hydration	1,12
Packing	1,11

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Improved Method Supplement Calculation

To calculate the supplement, the improved conditions of each of the stages of the process were taken into account. The sample results in Table 2.8.

Table 2.8: Supplements

Supplements	
Process	**Supl**
Reception of meshes	0,24
Deshoje	0,22
Classification	0,17
Boncheo	0,19
Cutting of stems	0,17
Quality control and hydration	0,22
Packing	0,21

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Standard time calculation with the new method

Using the observed time, factor, and supplement was calculated the standard time of new working method in the post harvest area.

Table 2.9: Standard Time

Standard Time	
Process	**TS**
Reception of meshes	0,71
Deshoje	0,82
Classification	2,65
Boncheo	1,79
Cutting of stems	0,89
Quality control and hydration	0,88
Packing	5,34

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2.4.4 Productivity method proposed

In order to determine the productivity, the standard time of the boncheo process, which is 1.79 min for each bonche (25 stems), is taken as a basis, by means of which the number of units produced per hour and day can be determined.

Table 2.10: Productivity new method

$Poducción\ \ de\ tallos\ en\ hora\ = 60\ min * \frac{25\ tallos}{1{,}79\ min} * 2\ trabajadores$ $= 1675\ Tallos/hora$
$Poducción\ de\ tallos\ al\ día\ = 1675\ \frac{tallos}{hora} *\ 8\ horas$ $=13400\ Tallos/día$
$Poducción\ de\ tallos\ al\ mes = 12176\ unidades * 22\ dias$ $=294800\ Tallos\ /mes$

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3 RESULTS

In the following tables you can see the result of the reduction of times, the increase of productivity and the reduction of the distance traveled in the area of post-harvest Lottus Flowers.

Table 3.1: Standard Time

STANDARD TIME (MIN)		
Process	**Standard time initial method**	**Proposed standard method time**
Reception of meshes	0,83 min	0,71 min
Deshoje	0,96 min	0,82 min
Classification	2,83 min	2,65 min
Boncheo	1,89 min	1,79 min
Cutting of stems	0,89 min	0,94 min
Quality control and hydration	0,96 min	0,88 min
Packing	6,49 min	5,21 min

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Table 3.2: Productivity

PRODUCTIVIDAD (UNIDADES/TURNO)		
Diagnóstico del volumen de producción.	Producción en tiempo estándar con método inicial	Producción en tiempo estándar con método propuesto
11893 tallos/día	12696 tallos/día	13400 tallos/día

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Table 3.3: Increased Productivity

VARIACIÓN DE LA PRODUCTIVIDAD				
Método	Fórmula	Cálculo	% de variación	Tendencia
Diagnóstico del volumen de producción vs productividad en TS de método inicial	$\Delta P_{2\text{-}1} = \frac{P2-P1}{P1} * 100$	$\Delta P_{2\text{-}1} = \frac{12696-11893}{11893} * 100$	6,75 %	↑
Productividad en TS de método inicial vs productividad en TS de método propuesto	$\Delta P_{3\text{-}2} = \frac{P3-P2}{P2} * 100$	$\Delta P_{3\text{-}2} = \frac{13400-12696}{12696} * 100$	5,54%	↑

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Table 3.4: Distance traveled

DISTANCE TRAVELED (METERS)	
INITIAL METHOD	PROPOSAL OF THE METHOD
58,7 meters	48,8 meters

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4 CONCLUSIONS

The theoretical foundations that were used to support the research were the methodology of engineering methods such as: process diagram,

path and time study that allowed a process survey of the post-harvest area Lottus Flowers, also allowed to analyze and To determine the existing shortcomings, including the inadequate distribution of jobs as well as the time of transport that caused delays in operations.

• With the diagnosis of the current situation, it was possible to show that the production volume in the post harvest area is 11893 stems per day with a time of 2.02 min per bonch (25 stems). The calculation of time per unit is determined based on the monthly production volume therefore the time is not standard, therefore a study of times was realized to determine the standard time with the initial method, resulting in 1.89 min By bonche (25tallos) and achieving a production of 12696 stems per day.

• There was an improvement in the distribution of jobs with which the optimization of spaces was achieved and reduced the distance that the worker travels in the operating cycle of about 58.7 meters to 48.8 meters.

• The job rotation planning proposal reduced monotonous work and improved the supplement, which helped to reduce the runtime from 2.02 min / u to 1.79 min / u. Therefore, using the proposed standard time of the method, it was possible to improve production at 13400 stalk / day and meet the demand of 12500 stems / day. The new method of work managed to increase productivity by 12.29%.

• The time line production rose with the initial method was 14.05 min / u, the unit correspond to the bonche containing 25 stems inside, plus with the new working method is reduced to 13.08 min / uy It is possible to optimize the 0.97 min which means that you save a 7% in each cycle.

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