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The use of linear membership function in transportation problem in "GETEX – Spa" unit of Maghnia

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Abstract

In this paper, we try to apply the fuzzy goal programming model to solve the problem of transportation and distribution in order to deliver the products within the specified time and with lower cost. This is done using linear membership functions which depend on fuzzy set theory due to the ambiguity which characterizes the operating conditions of the transport network from storage depots to reception centers. We note that the unit manager was not able to determine the cost and delivery time from one point to another, but rather presented them as intervals only. The same goes for the quantities supplied and demanded. Using the fuzzy goal programming model allowed us to develop a transportation plan that allows us to accurately determine the delivery time, total cost and quantities to be transported from storage warehouses to order centers at using the LINGO program.

Keywords: Transportation problem, fuzzy goal programming, linear membership function.

JEL Classification Codes: C61, C52, C44.

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Introduction

The objective of any company is to satisfy the demand of consumers at time and with a higer quality. The company must ensure efficient movement and timely availability of the product from the source of distribution to the location of distination (customer). For this reason, it is necessary to have a transportation path that helps to achieve this objective. Because any delay in the livraison of goods decrease the value of the product and consequently the loss of the loyalty of consumers, the transportation problem is interested on minimization transportation cost and transportation time. So we can say that transportation problems occupy a very important place in economic life.

A transportation problem is well-known a special case of linear programming problem in which the objective is to minimize the cost of transportation of the product (goods, raw materials, …) from set of sources to set of destinations (Amrit Das, 2021).

In mathematics and economics, the study of optimal transportation and allocation of resources is known as the transportation theory (Mitali and al 2019). The problem of optimal transport, was firstly introduced by French mathematicien Gaspard Monge in 1871 (in military application) when the goal was to find the most economical way to transport a certain amount of sand from a quarry to a construction site (Quentin Merigot, 2020). Then, transportation problem was developed by Hitchocok in 1941 when he presented a study entitled « The Distribution of a Product from several sources to numerous localities »(NAIM Ilham, 2015) and in 1963, Dantzig primarily developed an efficient method for transportation problem derived from the simplex algorithm (Mitali and al, 2019). In the beginning, the problem of transportation problem is to determining the quantity transported from sources to several destinations. The capacities of sources and destinations are different and in addition to this there is a penalty associated with transporting unit of production from any source to destination, this penalty may be generally cost (V. J Sudhakar, 2010).

It usually aims to minimize the total transportation cost but there are other objectives that can be set are a minimization of the total delivery time, a maximization of the profit, a minimization of degree of risk, etc (Wuttinan Nunkaew, 2009)

Problematic of the Study

How can we apply the fuzzy goal programming model to determine the quantities transported from the warehouses of GETEX-SPA company to different destinations in a fuzzy environment?

Hypotheses

- Goal programming is an elastic model that can be applied in many types of economic problems
- All variables are quantitatives
- This model can be applied with any type of information

Importance of the study

Drawing the attention of officials and managers to the importance of resorting to quantitative methods and highlighting their effectiveness in representing various economic issues or phenomena and resolving transportation problems in the event that the necessary information are not available, which makes the study environment ambiguous. The importance of this research also lies in proposing the adoption of these methods as a policy or strategy by the company and not considering them merely features that characterize companies of developed countries only.

Objective of the study

This study aims to present the ability of fgp model to solve the transportation problem in a fuzzy environment where we present the steps for applying the ZiMMermn model using linear membership functions in detail. It also explains the role that goal programming models play in solving the transportation problems in a fuzzy environment as a result of the lack of clarity about the unit transportation costs, the time required between each two variables, and how to reach the optimal solution or obtaining a solution that is more satisfying to the manager.

Methodology

To analyze the problematic of our study, we adopt the descriptive analytical methodology where we present some specific concepts related to the study, then we applied these concepts to a national company as a case study.

Previous Studies

(Kumar, 2010) suggested tackling the transportation issue involving trapezoidal fuzzy numbers for both supplies and demands, with a fuzzy membership function defined for the objective. Employing the zero suffix approach, they aimed to identify the optimal compromise solution for a two-stage fuzzy transportation problem with multiple objectives.

(Mitali Madhumita ACHARYA, 2018) introduced a multi-criteria stochastic transportation challenge wherein the supply and demand factors adhere to extreme value distributions. Their findings suggested that transforming the stochastic transportation problem into a deterministic multi-objective mathematical programming problem could effectively address the distribution of vegetables and fruits in the market, especially when demand and destination variables vary.

(Deshabrata Roy Mahapatra, 2010) Their attention is directed towards tackling a multi-objective stochastic transportation dilemma encompassing inequality-based constraints, wherein all parameters (both supply and demand) are log-normally distributed variables. The objectives, inherently non-commensurable and conflicting, receive their focus. Additionally, they introduce two distinct categories of probabilistic constraints, emphasizing their practical significance.

Firstly. Transportation problem with single objective

Firstly, the TP was a problem with single objective. The problem was the dermination of quantities that will be transported from a set of sources to a set of destination in order to minimize costs, time, …, etc. The mathematic modelization of this problem with linear programming is as follow :(Osuji, 2014)

$$
(1)\begin{cases}
Min\ Z = \sum_{i=1}^{m}\sum_{j=1}^{n} c_{ij}x_{ij} & (1) \\
\quad subject\ to: & \\
\sum_{j=1}^{n} x_{ij} \le a_i \qquad i = 1, \dots, m & (2) \\
\sum_{i=1}^{m} x_{ij} \ge b_j \qquad j = 1, \dots, n & (3) \\
\sum_{j=1}^{n} a_i = \sum_{j=1}^{n} b_j & (4) \\
\qquad x_{ij} \ge 0 &
\end{cases}
$$

x_{ij}: the quatity transported c_{ij}: unit cost

a_i: i^{th} source b_j: j^{th} destination

The equation (1) noted the objective function of TP
The equation (2) noted the row restrictions
The equation (3) noted the column restrictions
The equation (4) noted the balanced condition
However, in reality we cannot base on this type of model to solve TP because the company is not trying to achieve a single objective but must achieve several contradictory objectives. For this reason TP have been extanded to multi objectives transportation problem (MOTP).

Secondly. Multi Objective Transportation Problem

The MOTP is a special type of multi-objective linear programming problem in which objective functions conflict with each other (Sankar Kumar Roy, 2018). Many researchers discussed about MOTP, we cite some works : (Isermann, 1979) proposed an algorithm in which the set of all efficient solutions for a linear multiple-objective transportation problem can be enumerated. (Ringuest, 1987) presented in 1987 two interactive algorithms which take advantage of the special form of the multiple objective transportation problem. Diaz presented in 1978 an alternative algorithm to obtain all non dominated solutions for MTOP, which dependent on satisfaction level of the closeness of any compromise solution to the ideal solution and in (1979) he developed a procedure to obtain all non dominated solution for MOTP (Lakhveer Kaur, 2018). (Lee, 1973) propose the utilization of goal programming approach in order to allow for the optimization of multiple conflicting goals while permitting an explicit consideration of the existing decision environment. (Gen, 2000) present a genetic algorithm with spanning tree representation for solving bicriteria fixed charge transportation problem. A transportation problem with multiple objective can be written as follow (Osuji, 2014) :

$$(2)\quad \begin{cases} Min\ Z^r = \sum_{i=1}^{m}\sum_{j=1}^{n} c_{ij}^r x_{ij} \quad r = 1,2,\dots,k & (1) \\ \textbf{subject to:} & \\ \sum_{j=1}^{n} x_{ij} = a_i \quad i = 1,\dots,m & (2) \\ \sum_{i=1}^{m} x_{ij} = b_j \quad j = 1,\dots,n & (3) \\ x_{ij} \geq 0 & \end{cases}$$

The subscript on Z^r and superscript on c_{ij}^r are related to the r^{th} penalty criterion. Without loss of generality, it may be assumed that $a_i \geq 0$ and $b_j \geq 0 \quad \forall\, i\, j$ and the equilibrium condition $\sum_{j=1}^{n} a_i = \sum_{i=1}^{m} b_j$ is satisfied

Thirdly. Goal Programming:

Goal programming (GP) is one of the techniques that was proposed after the second world war. This technique has been widely applied by many researchers due to its flexibility and the possibility of representing many decision-making issues. It was firstly introduced by Charnes and Cooper in the early 1960s (Belaid Aouni, 2001). Many researchers applied GP to solve several real problems notably TP. Ijiri mentioned about transportation problem in his book- Management Goals and Accounting for Control (Singh, 2015). Followed by (Lee S. M., 1973) when he utilized in his study the GP approach because it allows the optimization of multiple conflicting goals while permitting an explicit consideration of the decision environment. Konstantinos G and al (Konstantinos G. Zografos, 1991) used an interactive GP algorithm to solve multiobjective hierarchical model for locating public facilities on a transportation network and (Ramadan S and al, 1994) proposed development of a linear goal programming model for solving transshipment problems with flexible supply and demand constraints.

A classical structure of the multi-objective programming model is as follows (Charnes, 1968) :

$$(3)\begin{cases} \min |f_i(x) - g_i| \\ subject\ to: \\ Cx \leq c \\ x_j \geq 0 \quad (j = 1,2,\dots,n) \end{cases}$$

Where $f_i(x)$ and g_i are respectively the level of aspiration (the goal) and the level of realisation of th objective j (for j=1,2,…,n)

x_j : decision variables

a_{ij} : technological factors

Cx : matrix of coefficients of constraints

c : is a right-hand side values of model.

This mathematical model can be written as follows (Martel, 1990) :

$$(4)\begin{cases} \min Z = \sum_{i=1}^{p} (\delta_i^+ + \delta_i^-) \\ subject\ to: \\ \sum_{j=1}^{n} a_{ij}x_j - \delta_i^+ + \delta_i^- = g_i \\ Cx \leq c \end{cases}$$

δ_i^+ represents the excess level of realization over the goal of objective j and δ_i^- represents the corresponding shortfall.

Fourthly. Fuzzy Goal Programming:

The previous model received several criticisms despite its flexibility and ease of application in various fields. The reason is the nature of today's business life, which demands precision, quality and speed at the same time. In addition, there is an important factor that has led to the adoption of new advanced methods in the world of multi-criteria analysis; artificial intelligence which has become an essential factor and a challenge for different decision-makers because of the instability of the information available on the one hand or the absence and impossibility of obtaining information necessary to explain the phenomenon or the problem economical posed. This led to the birth of fuzzy models. Zimmerman was the first to pose the fuzzy goal programming model by integrating the membership functions proposed by Lotfi Zadeh

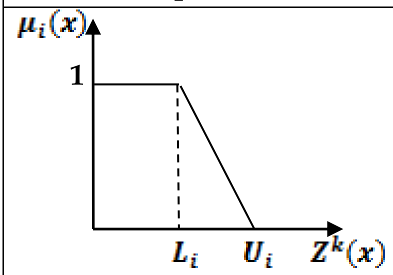
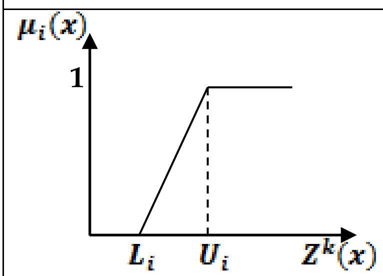
The FGP model proposed by Zimmermen can be written as follows (Zimmermann, 1978):

$$(5)\begin{cases} opt\ Z^k \cong CX \\ subject\ to: \\ \mathrm{AX_i} \lesseqgtr \mathrm{b_i} \\ \quad x \geq 0 \end{cases}$$

Where the symbol ≅ is the fuzzy version of = and refers to the fuzzy suction level.

In order to solve this mathematical model, Zimmermann (1978) proposed the use of membership functions for each objective and for each constraint as follows:

Table 1 : types of linear membership function

Membership function	**Analytical definition**
	$\mu_i = \lambda = \begin{cases} 1 & if\ Z^k(x) \leq L_i \\ \dfrac{U_i - Z^k(x)}{U_i - L_i} & if\ L_i \leq Z^k(x) \leq U_i \\ 0 & if\ Z^k(x) \geq U_i \end{cases}$
	$\mu_i = \lambda = \begin{cases} 1 & if\ Z^k(x) \geq U_i \\ \dfrac{Z^k(x) - L_i}{U_i - L_i} & if\ L_i \leq Z^k(x) \leq U_i \\ 0 & if\ Z^k(x) \leq L_i \end{cases}$

Source : Linag-Hsuan Chen, F.-C. T. (2001). Fuzzy goal programming with different importance and priorities. European Journal of Operational Research , 550

U_i, L_i are the upper and lower bounds of the membership functions.

μ_i is the membership function where $\mu_i = \lambda$ represents the degree of satisfaction of the decision maker. $\lambda \epsilon [0 , 1]$

Fifthly .Model Implementation

In this part we try to solve a transportation problem at the Textiles and Leathers Group "GETEX – Spa" unit of Maghnia. It is a public industrial group specializing in the production and marketing of textile products. The problem is to determine the quaities that will be transported from 3 sources to 5 destinations in a fuzzy environment. The data of this transportation problem is in the following table :

Table 2 : transportation data

W_j \ D_i		Skikda [1800,1900]	Arzew [500,600]	Tlemcen [600,700]	Hassi Messaoud [250,350]	Annaba [1400,1600]
W_1: [2800 ,3200]	Time*	[29 , 31]	[5 , 9]	[4 , 6]	[28 , 32]	[32 , 38]
	Costs**	[4 , 5]	[0.5,1.5]	[0.1 , 1]	[4 , 5]	[4 , 5]
W_2 :[800,1000]	Time*	[28,32]	[6 , 8]	[2 , 4]	[27 , 33]	[34 , 36]
	Costs**	[15 , 16]	(3 , 4]	[1 , 2]	[15 , 16]	[16 , 17]
W_3 : [900 ,1100]	Time*	[26 , 34]	[5 , 7]	[3 , 5]	[29 , 31]	[33 , 37]
	Costs**	[13 , 14]	[2 , 3]	[1 , 2]	[13 , 14]	[14 , 15]

* in minutes, ** in 1000 Algerian dinars

D_i and W_j represent consequently destinations and warehouses.

The problem is to determine the quatities that will be transported from the three warehouse to the five destinations with the minimum of costs and minimum of time.

Using the data given in the table, the multi objective capacitated transportation problem with mixed constraints can be given as:

$$(6)\quad \begin{cases} Min\, Z_1 = \sum_{i=1}^{m}\sum_{j=1}^{n}\left[c_{L_{ij}}, c_{R_{ij}}\right] x_{ij} \\ Min\, Z_2 = \sum_{i=1}^{m}\sum_{j=1}^{n}\left[t_{L_{ij}}, t_{R_{ij}}\right] x_{ij} \\ subject\ to: \\ \sum_{j=1}^{5} x_{1j} \le 3200, \quad \sum_{j=1}^{5} x_{1j} \ge 2800, \quad \sum_{j=1}^{5} x_{2j} \le 1000 \\ \sum_{j=1}^{5} x_{2j} \ge 800, \quad \sum_{j=1}^{5} x_{3j} \le 1100, \quad \sum_{j=1}^{5} x_{3j} \ge 900 \\ \sum_{i=1}^{3} x_{i1} \le 1900, \quad \sum_{i=1}^{3} x_{i1} \ge 1800, \quad \sum_{i=1}^{3} x_{i2} \le 600 \\ \sum_{i=1}^{3} x_{i2} \ge 500, \quad \sum_{i=1}^{3} x_{i3} \le 700, \quad \sum_{i=1}^{3} x_{i3} \ge 600 \\ \sum_{i=1}^{3} x_{i4} \le 350, \quad \sum_{i=1}^{3} x_{i4} \ge 250, \quad \sum_{i=1}^{3} x_{i5} \le 1600 \\ \sum_{i=1}^{3} x_{i5} \ge 1500 \\ x_{ij} \ge 0 \end{cases}$$

Where :

$$c_{ij} \quad \begin{bmatrix} [4, 5] & [0.5, 1.5] & [0.1, 1] & [4, 5] & [4, 5] \\ [15, 16] & [3, 4] & [1, 2] & [15, 16] & [16, 17] \\ [13, 14] & [2, 3] & [1, 2] & [13, 14] & [14, 15] \end{bmatrix}$$

$$t_{ij} \quad \begin{bmatrix} [29, 31] & [5, 9] & [4, 6] & [28, 32] & [32, 38] \\ [28, 32] & [6, 8] & [2, 4] & [27, 33] & [34, 36] \\ [26, 34] & [5, 7] & [3, 5] & [29, 31] & [33, 37] \end{bmatrix}$$

So the model (6) can be written as follow :

$$
(7)\quad \begin{cases}
Min\, Z_1^{cR} = \sum_{i=1}^{3}\sum_{j=1}^{5}(c_{R_{ij}}.x_{ij}) \\
Min\, Z_2^{tR} = \sum_{i=1}^{3}\sum_{j=1}^{5}(t_{R_{ij}}.x_{ij}) \\
Min\, Z_1^{cc} = \sum_{i=1}^{3}\sum_{j=1}^{5}(c_{c_{ij}}.x_{ij}) \\
Min\, Z_2^{tc} = \sum_{i=1}^{3}\sum_{j=1}^{5}(t_{c_{ij}}.x_{ij}) \\
subject\ to: \\
\sum_{j=1}^{5} x_{1j} \le 3200, \quad \sum_{j=1}^{5} x_{1j} \ge 2800, \quad \sum_{j=1}^{5} x_{2j} \le 1000 \\
\sum_{j=1}^{5} x_{2j} \ge 800, \quad \sum_{j=1}^{5} x_{3j} \le 1100, \quad \sum_{j=1}^{5} x_{3j} \ge 900 \\
\sum_{i=1}^{3} x_{i1} \le 1900, \quad \sum_{i=1}^{3} x_{i1} \ge 1800, \quad \sum_{i=1}^{3} x_{i2} \le 600 \\
\sum_{i=1}^{3} x_{i2} \ge 500, \quad \sum_{i=1}^{3} x_{i3} \le 700, \quad \sum_{i=1}^{3} x_{i3} \ge 600 \\
\sum_{i=1}^{3} x_{i4} \le 350, \quad \sum_{i=1}^{3} x_{i4} \ge 250, \quad \sum_{i=1}^{3} x_{i5} \le 1600 \\
\sum_{i=1}^{3} x_{i5} \ge 1400 \\
x_{ij} \ge 0
\end{cases}
$$

Where : $c_{R_{ij}} = \begin{bmatrix} 5 & 1.5 & 1 & 5 & 5 \\ 16 & 4 & 2 & 16 & 17 \\ 14 & 3 & 2 & 14 & 15 \end{bmatrix}$ $\quad t_{R_{ij}} = \begin{bmatrix} 31 & 9 & 6 & 32 & 38 \\ 32 & 8 & 4 & 33 & 36 \\ 34 & 7 & 5 & 31 & 37 \end{bmatrix}$

$$c_{c_{ij}} = \begin{bmatrix} 4.5 & 1 & 0.55 & 4.5 & 4.5 \\ 15.5 & 3.5 & 1.5 & 15.5 & 16.5 \\ 13.5 & 2.5 & 1.5 & 13.5 & 14.5 \end{bmatrix}$$

$$t_{c_{ij}} = \begin{bmatrix} 30 & 7 & 5 & 30 & 35 \\ 30 & 7 & 3 & 30 & 35 \\ 30 & 6 & 4 & 30 & 35 \end{bmatrix}$$

After solving the model (7), we find the following result :

Table 3 : payoff matrix

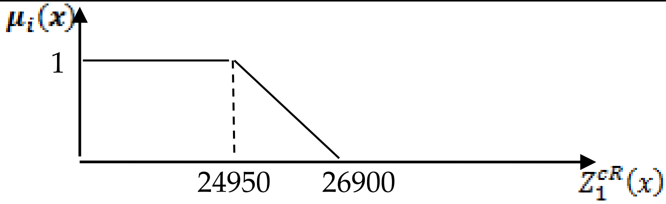
	Z_1^{cR}	Z_2^{tR}	Z_1^{cc}	Z_2^{tc}
X_1^{cR}	24950	125300	22625	116100
X_2^{tR}	26900	121800	25400	115300
X_1^{cc}	24950	125300	22625	116100
X_2^{tc}	26200	123150	24700	115150

The lower and upper value of any objective in model 7 are determined as follow :

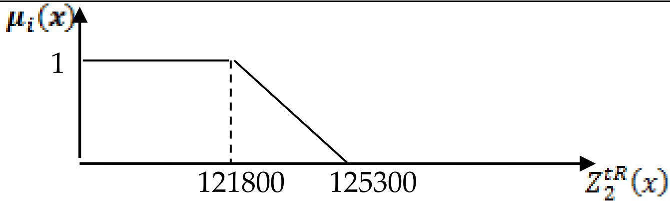
$$\begin{array}{ll} U_1^{cR} = 24950 & L_1^{cR} = 26900 \\ U_2^{tR} = 121800 & L_2^{tR} = 125300 \\ U_1^{CC} = 22625 & L_1^{CC} = 25400 \\ U_2^{tC} = 115150 & L_2^{tC} = 116100 \end{array}$$

The linear membership used are in the following table :

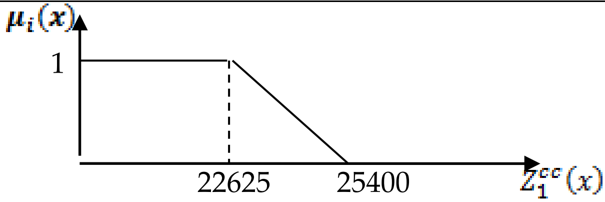
Table 4 :different linear membership function of the model (8)



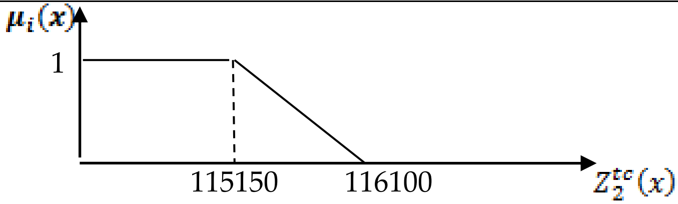
$$\lambda = \begin{cases} 1 & \text{if } Z_1^{cR}(x) \le 24950 \\ \dfrac{26900 - Z_1^{cR}(x)}{U_1^{cR} - L_1^{cR}} & \text{if } 24950 \le Z_1^{cR}(x) \le 26900 \\ 0 & \text{if } Z_1^{cR}(x) \ge 26900 \end{cases}$$



$$\lambda = \begin{cases} 1 & \text{if } Z_2^{tR}(x) \le 121800 \\ \dfrac{125300 - Z_2^{tR}(x)}{U_2^{tR} - L_2^{tR}} & \text{if } 121800 \le Z_2^{tR}(x) \le 125300 \\ 0 & \text{if } Z_2^{tR}(x) \ge 125300 \end{cases}$$



$$\lambda = \begin{cases} 1 & \text{if } Z_1^{cc}(x) \le 22625 \\ \dfrac{25400 - Z_1^{cc}(x)}{U_1^{cc} - L_1^{cc}} & \text{if } 22625 \le Z_1^{cc}(x) \le 25400 \\ 0 & \text{if } Z_1^{cc}(x) \ge 25400 \end{cases}$$



$$\lambda = \begin{cases} 1 & \text{if } Z_2^{tc}(x) \le 115150 \\ \dfrac{116100 - Z_2^{tc}(x)}{U_2^{tc} - L_2^{tc}} & \text{if } 115150 \le Z_2^{tc}(x) \le 116100 \\ 0 & \text{if } Z_2^{tc}(x) \ge 116100 \end{cases}$$

If we use the linear membership function, we solve the following model :

$$(8)\quad \begin{cases} Max\ \lambda \\ subject\ to: \\ Z_1^{cR} + 1950\lambda \leq 26900 \\ Z_2^{tR} + 3500\lambda \leq 125300 \\ Z_1^{cc} + 2775\lambda \leq 25400 \\ Z_2^{tc} + 950\lambda \leq 116100 \\ subject\ to: \\ \sum_{j=1}^{5} x_{1j} \leq 3200, \quad \sum_{j=1}^{5} x_{1j} \geq 2800, \quad \sum_{j=1}^{5} x_{2j} \leq 1000 \\ \sum_{j=1}^{5} x_{2j} \geq 800, \quad \sum_{j=1}^{5} x_{3j} \leq 1100, \quad \sum_{j=1}^{5} x_{3j} \geq 900 \\ \sum_{i=1}^{3} x_{i1} \leq 1900, \quad \sum_{i=1}^{3} x_{i1} \geq 1800, \quad \sum_{i=1}^{3} x_{i2} \leq 600 \\ \sum_{i=1}^{3} x_{i2} \geq 500, \quad \sum_{i=1}^{3} x_{i3} \leq 700, \quad \sum_{i=1}^{3} x_{i3} \geq 600 \\ \sum_{i=1}^{3} x_{i4} \leq 350, \quad \sum_{i=1}^{3} x_{i4} \geq 250, \quad \sum_{i=1}^{3} x_{i5} \leq 1600 \\ \sum_{i=1}^{3} x_{i5} \geq 1500 \\ x_{ij} \geq 0 \end{cases}$$

This model is solved by Lingo computer software, the results are :

$$x_{11} = 1781 \quad x_{14} = 21 \quad x_{15} = 1099 \quad x_{23} = 652$$
$$x_{24} = 147 \quad x_{31} = 18 \quad x_{32} = 500 \quad x_{34} = 80$$
$$x_{35} = 300 \quad \lambda = 0.67$$
$$Z_1 = [23278.47 \quad 25579.61]$$
$$Z_2 = [115455.95 \quad 122929.65]$$

Sixthly . Discussion :

from the results obtained, we note that the interval of variation of the total production costs is between 23,278 monetary units and less than

25,579.61, while the interval of variation of the total delivery time of the products of the three warehouses to the five centers is between 115455.95 and 122929.65 minutes.

In addition to this, the decision maker's degree of satisfaction is equal to 0.67, or 67%. This explains why the manager of the distribution unit is satisfied with the previous results at 67%, while the remaining percentage, estimated at 33%, expresses the degree of dissatisfaction of the decision maker with the previous results, and this is due to insufficient information and the results are inaccurate and based solely on conjecture, particularly in determining delivery intervals and cost intervals for transporting products from the warehouse to the center distribution or delivery.

We observe that despite the apparent lack of information in the problem's settings, satisfactory results have been obtained for the decision-maker. Research conducted by Kumar, Mitali, and Deshabrata addressed a situation where demand and destination values are imprecise. In contrast, our study focuses on a problem where all parameters, such as demand, destination, unit costs, and unit times, are presented as intervals rather than specific values, as in problems solved by multi-objective multi-choice programming. This suggests that the transportation problem can be solved regardless of the degree of uncertainty in the available information.

Here appears the role played by fuzzy objective programming methods. Despite the lack of information and the fact that it was not specified in a precise scientific manner by the process, we were able to obtain generally satisfactory results.

Conclusion:

We have tried in this paper to apply one of the most important scientific methods which has been widely accepted by many researchers recently. The reason for this is the variation of information and the inability to rely on it consistently throughout the study period, which makes the business environment a blurry and changing environment.

In order to prove the role of scientific methods and the need to use them to explain various phenomena which belong to the human sciences, including economic sciences, we attempted to apply the fuzzy multiple objective programming model to a very sensitive problem, that of the problem of transporting products at the lowest costs and reducing delivery times in the Getex spa institution, the Maghnia unit, in conditions characterized by ambiguity and inaccuracy. That is why we recommend the need to open in the company a department specialized in the accurate collection of various statistical data related to the institution, seeking the assistance of specialists in the field of statistics and planning, in rejecting traditional methods based on intuition and guesswork in collecting the necessary data and information using modern scientific methods in managing the various functions of the institution. We also recommend the need to open an administrative unit in the establishment which will serve as a link between the university and the establishment in order to benefit from university researchers on the one hand and to facilitate the proposal of solutions based on scientific methods of 'somewhere else. , and thus adopt those scientific methods that reduce a lot of time and effort in the management of transportation and distribution networks in order to deliver the products on time and thus maintain the reputation and position of the organization in the market.

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