OPTIMAL ALLOCATION OF ECONOMIC RESOURCES USING GOAL PROGRAMMING APPROACH

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ABSTRACT

The economic development process in most of the countries has an important role for the industrial sector. As it is an important sector in the development of economic sectors as well as financing many types of development programs. The vital productive unit in the economic and industrial sector is the productive industrial establishment. Therefore, we see it plays an important role in the use of economic resources available by the state or the private sector to achieve the optimal use of the provision of basic needs of the individual.

The optimal planning of economic resources requires decision makers in the industrial establishment to use quantitative methods and mathematical methods in the preparation and design of strategies and optimal plans.
In this research, the method of goal programming is used. It is a more flexible quantitative method than the linear programming method, whereby the decision maker can build a mathematical model for allocating economic resources by reducing the deviation in each goal that decision maker seeks to achieve it according to the available resources. We have seen from the practical application that the industrial facility can build a goal programming model with two goals, one for maximizing the profits and the other for reducing the time required for the production units according to available resources.

Keywords—Economic resources, ;optimal allcotion; lineaer goal programming.

1-INTRODUCTION

Economic development requires the advancement of sectors economic and industrial sectors in particular process processors are based on the development of this sector by optimal use of available resources provides the best way to exploit such resources in such a way as to avoid the loss of those resources and provides an opportunity to achieve technical efficiency.

Quantitative approaches paly important role in determining the optimal plan and optimal strategies according to available economic resources. Linear programming approach is the most technique used to find theoptimal allocation of economic resources. Aljbory[5] used linear programming model to minimize the cost and maximize the profit General Company for Vegetable Oils. Mathematical programming formulation has presented by Altai[6] to minimize the cost inthe General Company for Dairy Products. Abudalsada[7] proposed a linear programming model to achieve the optimal allocation in Glasshouse Farm

In Nahrawan. Abdulmajeed[8] presented a mathematical formulation for Production plan in Al-Nu'man General Company. The optimal allocation of economic resources was also studied by [9], [10], [11] using linear programming approach. Moreover, new formulations and applications for programming problems have been studied by [2],[3],[4].

On the other hand, the goal programming approach is used to solve many decision making problems. In this approach the decision maker aims to formulate the problem using two types of constraints: goal constraints and system constraints and the objective function is to minimize the deviation of the goals. Also, this approach is more flexible than the linear programming approach. For more details see [1],[12],[13],[14].

In this paper, we propose the goal programming approach to determine the optimal allocation of economic resources in Wasit General Company for Textile Industries.

2-GOAL PROGRAMMING APPROACH

Charnels and Cooper [12],[13],[14] presented the general goal programming model as follows:

Minimize: $U = \sum_{i=1}^{m} d_i^+ + d_i^-$(1)

S.T.

Goal constraints: $\sum_{j=1}^{n} a_{ij}\, x_j - d_i^+ + d_i^- = b_i$, for I = 1,………,m

System constraints: $\sum_{j=1}^{n} a_{ij}\, x_j \begin{bmatrix} \leq \\ = \\ \geq \end{bmatrix} b_i$, for I = m+1,…………., m+p

With $d_i^+ , d_i^- , x_j \geq 0$, for I = 1,……….., m; for j = 1,……..,n

Where

U = represents the objective function

a_{ij} = represents the coefficient of the decision variables.

x_j = represents the decision variable.

b_i = represents the right hand side .

d_i^-= represents the negative deviational variable.

d_i^+ =represents positive deviational variable.

Table 1 shows the deviation cases:

Table 1 the deviation cases

Minimize	Constraint type
d_i^-	$\geq b_i$
d_i^+	$\leq b_i$
$d_i^+ + d_i^-$	$= b_i$

There are two types of goal programming model as follows:

2.1-**Lexicographic Goal Programming Model**

$$U = \sum_{i=1}^{m} Pi\, d_i^+ + d_i^- \qquad (2)$$

S.T. :

Goal constraints: $\sum_{j=1}^{n} a_{ij}\, x_j \; - \; d_i^+ + d_i^- = b_i$, for I = 1,………,m

System constraints: $\sum_{j=1}^{n} a_{ij}\, x_j \begin{bmatrix} \leq \\ = \\ \geq \end{bmatrix} b_i$, for I = m+1,…………., m+p

With d_i^+ ,d_i^- , $x_j \geq 0$, for I = 1,……….., m; for j = 1,……..,n

Where p represent the priority of the goal.

2.2-**Weighted Goal Programming Model**

In this mathematical model, the decision maker can set up weight for each goal. The mathematical formulation for this type is given as follows:

$$\text{Minimize: } U = \sum_{i=1}^{m} w_i^+ d_i^+ + w_i^- d_i^- \qquad (3)$$

S.T.

Goal constraints: $\sum_{j=1}^{n} a_{ij}\, x_j - \; d_i^+ + d_i^- = b_i$, for I = 1,………,m

System constraints: $\sum_{j=1}^{n} a_{ij}\, x_j \begin{bmatrix} \leq \\ = \\ \geq \end{bmatrix} b_i$, for I = m+1,…………., m+p

With d_i^+ ,d_i^- , $x_j \geq 0$, for I = 1,……….., m; for j = 1,……..,n

3-CASE STUDY

The proposedgoal programming approach is applied in Wasit General Company for Textile Industries to determine the optimal allocation of economic resources. We extend the linear programming formulation that is presented by Albermany [11] to a new mathematical formulation using goal programming approach based on the objectives of the company and according to the available economic resources. This company has two goals, first goal is to achieve a maximum profit and the second goal is to minimize the total time of the production units. The decision maker has the following three strategies based on goal programming approach:

Case 1: In this case, the priority is to achieve the maximum profit first and then minimize the total time of production units.
G1: Min d_1^-
G2: Min d_2^+

S.T

S_1: $-11X_1 + 61X_2 + 201X_3 + 77X_7 + 94X_5 + 187X_6 + 64X_7 + d_1^- - d_1^+ = 1193834000$

S_2: $0.019X_1 + 0.010X_2 + 0.010X_3 + 0.013X_4 + 0.016X_5 + 0.016X6 + 0.011X_7 + d_2^- - d_2^+ = 11149.0900$

C_1: $0.186X_1 + 0.147X_2 + 0.105X_3 + 0.029X_4 + 0.130X_5 + 0.105X6 + 0.147X_7 \leq 590895$

C_2: $0.1X_1 + 0.1X_2 + 0.1X_3 + 0.1X_4 + 0.1X_5 + 0.1X6 + 0.1X_7 \leq 773955$

C_3 : $0.007X_1 + 0.007X_2 + 0.007X_3 + 0.007X_4 + 0.007X_5 + 0.007X6 + 0.007X_7 \leq 553245$

C_4 : $0.005X_1 + 0.005X_2 + 0.005X_3 + 0.005X_4 + 0.005X_5 + 0.005X6 + 0.005X_7 \leq 2396209$

C_5 : $0.004X_1 + 0.004X_2 + 0.004X_3 + 0.004X_4 + 0.004X_5 + 0.004X6 + 0.004X_7 \leq 1261163$

C_6 : $0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 69147700$

C_7 : $0.004X_1 + 0.004X_2 + 0.004X_3 + 0.004X_4 + 0.004X_5 + 0.004X6 + 0.004X_7 \leq 157248$

C_8 : $0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 252720$

C_9 : $0.002X_1 + 0.002X_2 + 0.002X_3 + 0.002X_4 + 0.002X_5 + 0.002X6 + 0.002X_7 \leq 269568$

C_{10} : $0.02X_1 + 0.02X_2 + 0.02X_3 + 0.02X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 533520$

C_{11} : $0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 1422720$

C_{12} : $0.386X_1 + 0.386X_2 + 0.288X_3 + 0.843X_4 + 0.288X_5 + 0.288X6 + 0.386X_7 \leq 29484000$

C_{13} :$0.013X_1 + 0X_2 + 0.013X_3 + 0X_4 + 0.013X_5 + 0.013X6 + 0X_7 \leq 599040$

C_{14} :$0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0.014X_5 + 0.014X6 + 0X_7 \leq 449280$

C_{15} :$0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

C_{16} :$0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

C_{17} :$0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 121680$

C_{18} :$0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 243360$

C_{19} :$0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 243360$

C_{20} :$0.1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 486720$

C_{21} :$0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0.017X_5 + 0.017X6 + 0X_7 \leq 121680$

C_{22} :$0X_1 + 0X_2 + 0X_3 + 0X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 243360$

C_{23} : $0.033X_1 + 0.033X_2 + 0.033X_3 + 0.033X_4 + 0.033X_5 + 0.033X6 + 0.033X_7 \leq 1235520$

$X_1, X_2, X_3, X_4, X_5, X_6, X_7, d_2^-, d_2^+ \geq 0$

Case 2::In this case, the priority is to achieve the minimum total time of production units first, then the maximum profit.

G1: Min d_2^+

G2:Min d_1^-

S.T

S_1: $-11X_1 + 61X_2 + 201X_3 + 77X_7 + 94X_5 + 187X_6 + 64X_7 + d_1^- - d_1^+ = 1193834000$

S_2: $0.019X_1 + 0.010X_2 + 0.010X_3 + 0.013X_4 + 0.016X_5 + 0.016X6 + 0.011X_7 + d_2^- - d_2^+ = 11149.0900$

C_1: $0.186X_1 + 0.147X_2 + 0.105X_3 + 0.029X_4 + 0.130X_5 + 0.105X6 + 0.147X_7 \leq 590895$

C_2: $0.1X_1 + 0.1 X_2 + 0.1X_3 + 0.1 X_4 + 0.1 X_5 + 0.1 X6 + 0.1 X_7 \leq 773955$

C_3 : $0.007X_1 + 0.007X_2 + 0.007 X_3 + 0.007 X_4 + 0.007X_5 + 0.007 X6 + 0.007 X_7 \leq 553245$

C_4 : $0.005X_1 + 0.005 X_2 + 0.005 X_3 + 0.005 X_4 + 0.005 X_5 + 0.005 X6 + 0.005 X_7 \leq 2396209$

C_5 : $0.004X_1 + 0.004 X_2 + 0.004 X_3 + 0.004 X_4 + 0.004 X_5 + 0.004X6 + 0.004 X_7 \leq 1261163$

C_6 : $0.025X_1 + 0.025X_2 + 0.025 X_3 + 0.025 X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 69147700$

C_7 : $0.004X_1 + 0.004 X_2 + 0.004 X_3 + 0.004 X_4 + 0.004 X_5 + 0.004X6 + 0.004 X_7 \leq 157248$

C_8 : $0.025X_1 + 0.025X_2 + 0.025 X_3 + 0.025 X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 252720$

C_9 : $0.002X_1 + 0.002X_2 + 0.002X_3 + 0.002X_4 + 0.002X_5 + 0.002X6 + 0.002X_7 \leq 269568$

C_{10} : $0.02X_1 + 0.02X_2 + 0.02X_3 + 0.02X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 533520$

C_{11} : $0.025X_1 + 0.025X_2 + 0.025 X_3 + 0.025 X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 1422720$

C_{12} : $0.386X_1 + 0.386X_2 + 0.288X_3 + 0.843X_4 + 0.288X_5 + 0.288X6 + 0.386X_7 \leq 29484000$

C_{13} :$0.013X_1 + 0X_2 + 0.013X_3 + 0X_4 + 0.013X_5 + 0.013X6 + 0X_7 \leq 599040$

C_{14} :$0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0.014X_5 + 0.014X6 + 0X_7 \leq 449280$

C_{15} :$0.025X_1 + 0X_2 + 0 X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

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C_{16} :$0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

C_{17} :$0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 121680$

C_{18} :$0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 243360$

C_{19} :$0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 243360$

C_{20} :$0.1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 486720$

C_{21} :$0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0.017X_5 + 0.017X6 + 0X_7 \leq 121680$

C_{22} :$0X_1 + 0X_2 + 0X_3 + 0X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 243360$

C_{23} : $0.033X_1 + 0.033X_2 + 0.033X_3 + 0.033X_4 + 0.033X_5 + 0.033X6 + 0.033X_7 \leq 1235520$

$X_1, X_2, X_3, X_4, X_5, X_6, X_7, d_2^-, d_2^+ \geq 0$

Case 3: In this case, the two goals have the same priority.
G: Min $d_1^- + d_2^+$

S.T

S_1: $-11X_1 + 61X_2 + 201X_3 + 77X_7 + 94X_5 + 187X_6 + 64X_7 + d_1^- - d_1^+ = 1193834000$

S_2: $0.019X_1 + 0.010X_2 + 0.010X_3 + 0.013X_4 + 0.016X_5 + 0.016X6 + 0.011X_7 + d_2^- - d_2^+ = 11149.0900$

C_1: $0.186X_1 + 0.147X_2 + 0.105X_3 + 0.029X_4 + 0.130X_5 + 0.105X6 + 0.147X_7 \leq 590895$

C_2: $0.1X_1 + 0.1X_2 + 0.1X_3 + 0.1X_4 + 0.1X_5 + 0.1X6 + 0.1X_7 \leq 773955$

C_3 : $0.007X_1 + 0.007X_2 + 0.007X_3 + 0.007X_4 + 0.007X_5 + 0.007X6 + 0.007X_7 \leq 553245$

C_4 : $0.005X_1 + 0.005X_2 + 0.005X_3 + 0.005X_4 + 0.005X_5 + 0.005X6 + 0.005X_7 \leq 2396209$

C_5 : $0.004X_1 + 0.004X_2 + 0.004X_3 + 0.004X_4 + 0.004X_5 + 0.004X6 + 0.004X_7 \leq 1261163$

C_6 : $0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 69147700$

C_7 : $0.004X_1 + 0.004X_2 + 0.004X_3 + 0.004X_4 + 0.004X_5 + 0.004X6 + 0.004X_7 \leq 157248$

C_8 : $0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 252720$

C_9 : $0.002X_1 + 0.002X_2 + 0.002X_3 + 0.002X_4 + 0.002X_5 + 0.002X6 + 0.002X_7 \leq 269568$

C_{10} : $0.02X_1 + 0.02X_2 + 0.02X_3 + 0.02X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 533520$

C_{11} : $0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 1422720$

C_{12} : $0.386X_1 + 0.386X_2 + 0.288X_3 + 0.843X_4 + 0.288X_5 + 0.288X6 + 0.386X_7 \leq 29484000$

$C_{13}: 0.013X_1 + 0X_2 + 0.013X_3 + 0X_4 + 0.013X_5 + 0.013X6 + 0X_7 \leq 599040$

$C_{14}: 0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0.014X_5 + 0.014X6 + 0X_7 \leq 449280$

$C_{15}: 0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

$C_{16}: 0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

$C_{17}: 0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 121680$

$C_{18}: 0.025X_1 + 0X_2 + 0X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 243360$

$C_{19}: 0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 243360$

$C_{20}: 0.1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 486720$

$C_{21}: 0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0.017X_5 + 0.017X6 + 0X_7 \leq 121680$

$C_{22}: 0X_1 + 0X_2 + 0X_3 + 0X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 243360$

$C_{23}: 0.033X_1 + 0.033X_2 + 0.033X_3 + 0.033X_4 + 0.033X_5 + 0.033X6 + 0.033X_7 \leq 1235520$

$X_1, X_2, X_3, X_4, X_5, X_6, X_7 \geq 0$, d_1, d_2 are free variables

S_1: $-11X_1 + 61X_2 + 201X_3 + 77X_7 + 94X_5 + 187X_6 + 64X_7 + d_1^- - d_1^+ = 1193834000$

S_2: $0.019X_1 + 0.010X_2 + 0.010X_3 + 0.013X_4 + 0.016X_5 + 0.016X6 + 0.011X_7 + d_2^- - d_2^+ = 1097250$

$C_1: 0.186X_1 + 0.147X_2 + 0.105X_3 + 0.029X_4 + 0.130X_5 + 0.105X6 + 0.147X_7 \leq 590895$

$C_2: 0.1X_1 + 0.1X_2 + 0.1X_3 + 0.1X_4 + 0.1X_5 + 0.1X6 + 0.1X_7 \leq 773955$

$C_3: 0.007X_1 + 0.007X_2 + 0.007X_3 + 0.007X_4 + 0.007X_5 + 0.007X6 + 0.007X_7 \leq 553245$

$C_4: 0.005X_1 + 0.005X_2 + 0.005X_3 + 0.005X_4 + 0.005X_5 + 0.005X6 + 0.005X_7 \leq 2396209$

$C_5: 0.004X_1 + 0.004X_2 + 0.004X_3 + 0.004X_4 + 0.004X_5 + 0.004X6 + 0.004X_7 \leq 1261163$

$C_6: 0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 69147700$

$C_7: 0.004X_1 + 0.004X_2 + 0.004X_3 + 0.004X_4 + 0.004X_5 + 0.004X6 + 0.004X_7 \leq 157248$

$C_8: 0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 252720$

$C_9: 0.002X_1 + 0.002X_2 + 0.002X_3 + 0.002X_4 + 0.002X_5 + 0.002X6 + 0.002X_7 \leq 269568$

$C_{10}: 0.02X_1 + 0.02X_2 + 0.02X_3 + 0.02X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 533520$

$C_{11}: 0.025X_1 + 0.025X_2 + 0.025X_3 + 0.025X_4 + 0.025X_5 + 0.025X6 + 0.025X_7 \leq 1422720$

$C_{12}: 0.386X_1 + 0.386X_2 + 0.288X_3 + 0.843X_4 + 0.288X_5 + 0.288X6 + 0.386X_7 \leq 29484000$

$C_{13}: 0.013X_1 + 0X_2 + 0.013X_3 + 0X_4 + 0.013X_5 + 0.013X6 + 0X_7 \leq 599040$

C_{14} :$0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0.014X_5 + 0.014X6 + 0X_7 \leq 449280$

C_{15} :$0.025X_1 +0X_2 + 0 X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

C_{16} :$0.025X_1 +0X_2 + 0 X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 121680$

C_{17} :$0.017X_1+0X_2 + 0 X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 121680$

C_{18} :$0.025X_1+0X_2 + 0 X_3 + 0X_4 + 0.025X_5 + 0.025X6 + 0X_7 \leq 243360$

C_{19} :$0.014X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 243360$

C_{20} :$0.1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X6 + 0X_7 \leq 486720$

C_{21} :$0.017X_1 + 0X_2 + 0X_3 + 0X_4 + 0.017X_5 + 0.017X6 + 0X_7 \leq 121680$

C_{22} :$0X_1 + 0X_2 + 0X_3 + 0X_4 + 0.02X_5 + 0.02X6 + 0.02X_7 \leq 243360$

C_{23} : $0.033X_1 + 0.033X_2 + 0.033X_3 + 0.033X_4 + 0.033X_5 + 0.033X6 + 0.033X_7 \leq 1235520$

$X_1 ,X_2,X_3, X_4, X_5, X_6, X_7 , d_2^-, d_2^+ \geq 0$

Now, we solved this model using WINQSB, and we get the following results:

Table (1) shows case 1 results

	Goal Level	Decision Variable	Solution Value	Unit Cost or Profit c(j)	Total Contribution	Reduced Cost	Allowable Min. c(j)	Allowable Max. c(j)
1	G1	X1	0	0	0	367.06	-367.06	M
2	G1	X2	0	0	0	220.40	-220.40	M
3	G1	X3	5,627,571.50	0	0	0	-M	14.00
4	G1	X4	0	0	0	55.51	-55.51	M
5	G1	X5	0	0	0	154.86	-154.86	M
6	G1	X6	0	0	0	14.00	-14.00	M
7	G1	X7	0	0	0	140.40	-140.40	M
8	G1	X8	0	0	0	0	0	M
9	G1	X9	0	0	0	0	0	M
10	G1	n1	62,692,092.00	1.00	62,692,092.00	0	0	M
11	G1	p1	0	0	0	1.00	-1.00	M
12	G1	n2	0	0	0	0	0	M
13	G1	p2	45,126.63	0	0	0	0	20,100.00
14	G2	X1	0	0	0	0.00	-M	M
15	G2	X2	0	0	0	0.00	-M	M
16	G2	X3	5,627,571.50	0	0	0	-M	M
17	G2	X4	0	0	0	0.01	-M	M
18	G2	X5	0	0	0	0.00	-M	M
19	G2	X6	0	0	0	0.01	-M	M
20	G2	X7	0	0	0	0.00	-M	M
21	G2	X8	0	0	0	0	0	M
22	G2	X9	0	0	0	0	0	M
23	G2	n1	62,692,092.00	0	0	0	-M	M
24	G2	p1	0	0	0	0	-M	M
25	G2	n2	0	0	0	1.00	-1.00	M
26	G2	p2	45,126.63	1.00	45,126.63	0	0	M
	G1	Goal	Value	(Min.) =	62,692,092.00	(Alternate	Solution	Exists!!)
	G2	Goal	Value	(Min.) =	45,126.63			

Table(2)) shows case 1 results

	Constraint	Left Hand Side	Direction	Right Hand Side	Slack or Surplus	Allowable Min. RHS	Allowable Max. RHS	ShadowPrice Goal 1	ShadowPrice Goal 2
1	C1	590,895.00	<=	590,895.00	0	117,065.44	623,644.63	-1,914.29	0.10
2	C2	562,757.19	<=	773,955.00	211,197.83	562,757.19	M	0	0
3	C3	39,393.00	<=	553,245.00	513,852.00	39,393.00	M	0	0
4	C4	28,137.86	<=	2,396,209.00	2,368,071.25	28,137.75	M	0	0
5	C5	22,510.29	<=	1,261,163.00	1,238,652.75	22,510.25	M	0	0
6	C6	140,689.30	<=	69,147,696.00	69,007,008.00	140,688.00	M	0	0
7	C7	22,510.29	<=	157,248.00	134,737.72	22,510.28	M	0	0
8	C8	140,689.30	<=	252,720.00	112,030.71	140,689.28	M	0	0
9	C9	11,255.14	<=	269,568.00	258,312.86	11,255.14	M	0	0
10	C10	112,551.43	<=	533,520.00	420,968.56	112,551.44	M	0	0
11	C11	140,689.30	<=	1,422,720.00	1,282,030.75	140,689.25	M	0	0
12	C12	1,620,740.50	<=	29,484,000.00	27,863,260.00	1,620,740.00	M	0	0
13	C13	73,158.43	<=	599,040.00	525,881.56	73,158.44	M	0	0
14	C14	0	<=	449,280.00	449,280.00	0	M	0	0
15	C15	0	<=	121,680.00	121,680.00	0	M	0	0
16	C16	0	<=	121,680.00	121,680.00	0	M	0	0
17	C17	0	<=	121,680.00	121,680.00	0	M	0	0
18	C18	0	<=	243,360.00	243,360.00	0	M	0	0
19	C19	0	<=	243,360.00	243,360.00	0	M	0	0
20	C20	0	<=	486,720.00	486,720.00	0	M	0	0
21	C21	0	<=	121,680.00	121,680.00	0	M	0	0
22	C22	0	<=	243,360.00	243,360.00	0	M	0	0
23	C23	185,709.86	<=	1,235,520.00	1,049,810.13	185,709.88	M	0	0
24	C24	1,193,833,984.00	=	1,193,833,984.00	0	1,131,141,888.00	M	1.00	0
25	C25	11,149.09	=	11,149.09	0	-M	56,275.71	0	-1.00

Table (3)) shows case 2 results

	Goal Level	Decision Variable	Solution Value	Unit Cost or Profit c(j)	Total Contribution	Reduced Cost	Allowable Min. c(j)	Allowable Max. c(j)
1	G1	X1	0	0	0	0	0	M
2	G1	X2	0	0	0	0	0	M
3	G1	X3	1,114,909.00	0	0	0	-0.01	0
4	G1	X4	0	0	0	0	0	M
5	G1	X5	0	0	0	0	0	M
6	G1	X6	0	0	0	0	0	M
7	G1	X7	0	0	0	0	0	M
8	G1	X8	0	0	0	0	0	M
9	G1	X9	0	0	0	0	0	M
10	G1	n1	969,737,280.00	0	0	0	0	0.00
11	G1	p1	0	0	0	0	0	M
12	G1	n2	0	0	0	0	0	M
13	G1	p2	0	1.00	0	1.00	0	M
14	G2	X1	0	0	0	392.90	-392.90	M
15	G2	X2	0	0	0	140.00	-140.00	M
16	G2	X3	1,114,909.00	0	0	0	-M	72.82
17	G2	X4	0	0	0	261.30	-261.30	M
18	G2	X5	0	0	0	227.60	-227.60	M
19	G2	X6	0	0	0	134.60	-134.60	M
20	G2	X7	0	0	0	80.10	-80.10	M
21	G2	X8	0	0	0	0	0	M
22	G2	X9	0	0	0	0	0	M
23	G2	n1	969,737,280.00	1.00	969,737,280.00	0	0	M
24	G2	p1	0	0	0	1.00	-1.00	M
25	G2	n2	0	0	0	20,100.00	-20,100.00	M
26	G2	p2	0	0	0	-20,100.00	-M	M
	G1	Goal	Value	(Min.) =	0	(Alternate	Solution	Exists!!)
	G2	Goal	Value	(Min.) =	969,737,280.00			

Table(4)) shows case 2 results

	Constraint	Left Hand Side	Direction	Right Hand Side	Slack or Surplus	Allowable Min. RHS	Allowable Max. RHS	ShadowPrice Goal 1	ShadowPrice Goal 2
1	C1	117,065.44	<=	590,895.00	473,829.56	117,065.44	M	0	0
2	C2	111,490.90	<=	773,955.00	662,464.13	111,490.88	M	0	0
3	C3	7,804.36	<=	553,245.00	545,440.63	7,804.38	M	0	0
4	C4	5,574.54	<=	2,396,209.00	2,390,634.50	5,574.50	M	0	0
5	C5	4,459.64	<=	1,261,163.00	1,256,703.38	4,459.63	M	0	0
6	C6	27,872.72	<=	69,147,696.00	69,119,824.00	27,872.00	M	0	0
7	C7	4,459.64	<=	157,248.00	152,788.36	4,459.64	M	0	0
8	C8	27,872.72	<=	252,720.00	224,847.28	27,872.72	M	0	0
9	C9	2,229.82	<=	269,568.00	267,338.19	2,229.81	M	0	0
10	C10	22,298.18	<=	533,520.00	511,221.81	22,298.19	M	0	0
11	C11	27,872.72	<=	1,422,720.00	1,394,847.25	27,872.75	M	0	0
12	C12	321,093.78	<=	29,484,000.00	29,162,906.00	321,094.00	M	0	0
13	C13	14,493.82	<=	599,040.00	584,546.19	14,493.81	M	0	0
14	C14	0	<=	449,280.00	449,280.00	0	M	0	0
15	C15	0	<=	121,680.00	121,680.00	0	M	0	0
16	C16	0	<=	121,680.00	121,680.00	0	M	0	0
17	C17	0	<=	121,680.00	121,680.00	0	M	0	0
18	C18	0	<=	243,360.00	243,360.00	0	M	0	0
19	C19	0	<=	243,360.00	243,360.00	0	M	0	0
20	C20	0	<=	486,720.00	486,720.00	0	M	0	0
21	C21	0	<=	121,680.00	121,680.00	0	M	0	0
22	C22	0	<=	243,360.00	243,360.00	0	M	0	0
23	C23	36,792.00	<=	1,235,520.00	1,198,728.00	36,792.00	M	0	0
24	C24	1,193,833,984.00	=	1,193,833,984.00	0	224,096,704.00	M	0	1.00
25	C25	11,149.09	=	11,149.09	0	0	56,275.71	0	-20,100.00

Table (5)) shows case 3 results

	13:59:35		Saturday	May	25	2019		
	Goal Level	Decision Variable	Solution Value	Unit Cost or Profit c(j)	Total Contribution	Reduced Cost	Allowable Min. c(j)	Allowable Max. c(j)
1	G1	X1	0	0	0	367.06	-367.06	M
2	G1	X2	0	0	0	220.40	-220.40	M
3	G1	X3	5,627,571.50	0	0	0	-M	14.01
4	G1	X4	0	0	0	55.52	-55.52	M
5	G1	X5	0	0	0	154.86	-154.86	M
6	G1	X6	0	0	0	14.01	-14.01	M
7	G1	X7	0	0	0	140.40	-140.40	M
8	G1	X8	0	0	0	0	0	M
9	G1	X9	0	0	0	0	0	M
10	G1	n1	62,692,092.00	1.00	62,692,092.00	0	0.00	M
11	G1	p1	0	0	0	1.00	-1.00	M
12	G1	n2	0	0	0	1.00	-1.00	M
13	G1	p2	45,126.63	1.00	45,126.63	0	0	20,100.00
	G1	Goal	Value	(Min.) =	62,737,220.00	(Alternate	Solution	Exists!!)

Table (6)) shows case 3 results

	Constraint	Left Hand Side	Direction	Right Hand Side	Slack or Surplus	Allowable Min. RHS	Allowable Max. RHS	ShadowPrice Goal 1
1	C1	590,895.00	<=	590,895.00	0	117,065.44	623,644.63	-1,914.19
2	C2	562,757.19	<=	773,955.00	211,197.83	562,757.19	M	0
3	C3	39,393.00	<=	553,245.00	513,852.00	39,393.00	M	0
4	C4	28,137.86	<=	2,396,209.00	2,368,071.25	28,137.75	M	0
5	C5	22,510.29	<=	1,261,163.00	1,238,652.75	22,510.25	M	0
6	C6	140,689.30	<=	69,147,696.00	69,007,008.00	140,688.00	M	0
7	C7	22,510.29	<=	157,248.00	134,737.72	22,510.28	M	0
8	C8	140,689.30	<=	252,720.00	112,030.71	140,689.28	M	0
9	C9	11,255.14	<=	269,568.00	258,312.86	11,255.14	M	0
10	C10	112,551.43	<=	533,520.00	420,968.56	112,551.44	M	0
11	C11	140,689.30	<=	1,422,720.00	1,282,030.75	140,689.25	M	0
12	C12	1,620,740.50	<=	29,484,000.00	27,863,260.00	1,620,740.00	M	0
13	C13	73,158.43	<=	599,040.00	525,881.56	73,158.44	M	0
14	C14	0	<=	449,280.00	449,280.00	0	M	0
15	C15	0	<=	121,680.00	121,680.00	0	M	0
16	C16	0	<=	121,680.00	121,680.00	0	M	0
17	C17	0	<=	121,680.00	121,680.00	0	M	0
18	C18	0	<=	243,360.00	243,360.00	0	M	0
19	C19	0	<=	243,360.00	243,360.00	0	M	0
20	C20	0	<=	486,720.00	486,720.00	0	M	0
21	C21	0	<=	121,680.00	121,680.00	0	M	0
22	C22	0	<=	243,360.00	243,360.00	0	M	0
23	C23	185,709.86	<=	1,235,520.00	1,049,810.13	185,709.88	M	0
24	C24	1,193,833,984.00	=	1,193,833,984.00	0	1,131,141,888.00	M	1.00
25	C25	11,149.09	=	11,149.09	0	-M	56,275.71	-1.00

5-CONCLUSION

A qualitative approach has been presented to determine the optimal allocation of economic resources. Also, this approach is more flexible than linear programming approach, because the decision maker can set up more than one goal at same time and can determine the deviation of each goal. As we have seen in case 2 there is no deviation in goal 2 while in case 1 and case 3, there are deviations in the first goal and the second goal. This will enable the decision maker to choose his design of strategies and optimal plans by an efficient way.

REFERENCES

[1] Al-Salih, R. Solving linear Goal Programmingby Using the Matrices. Journal of ThiQarSiences, 2008, vol. 1, 1, 39-46.

[2] Al-Salih, R. andBohner, M. Separated and state-constrained separated linear programming problems on time scales. Bol. Soc. Parana. Mat. (3), vol. 38, 4: 181-195, 2020.

[3] Al-Salih, R. andBohner, M. Linear programming problems on time scales. Appl. Anal. Discrete Math., 12:192-204, 2018.

[4] Al Salih, R., Habeeb, A. and Laith, W. 2019. A Quantum Calculus Analogue of Dynamic Leontief Production Model withQuadratic Objective Function. Journal of Engineering and Applied Sciences, 14: 6415-6418.

[5] Aljbory, K. H. Select the optimal commodity using linear programming, MS. Thesis, Almustansiriya University 2001.

[6]Altai, Sh. Optimal allocation for economic resources using linear programming. MS. Thesis, Baghdad University, 2001.

[7]Abudalsada, B. Financial Economic Assessment of the Glasshouse Farm
In Nahrawan, to determine the optimal use of farm resources. PhD Thesis, Almustansiriya University, 2005.

[8]Abdulmajeed, S. Industrial Production Planning Using Linear programming approach, an appliedstudy in Al-Nu'man General Company. MS. Thesis, Almustansiriya University, 2004.

[9]Almisraky, J. Preparing and evaluating the production plan at the Diwaniya Textile Factory
Using quantitative input.MS. Thesis, Al-Qadisiyah University, 2001.

[10]Alsakini, A. Allocation of economic resources by using linear programming method. MS. Thesis, Baghdad University, 2008.

[11]Albermany, S.Using the linear programming method to determine the mixed
Optimal Production of WasitGeneral TextileIndustries. Journal of Administration and Economics, 2011,No. 63, 130-166.

[12]Charnes, A.; Cooper,W.W.; Learner, D.B.; Snow, E.F. Note on an application of a goal programming model for media planning. Manag. Sci. **1986**, 14, 431-436.

[13] Charnes, A.; Cooper, W.W.; DeVoe, J.; Learner, D.B.; Reinecke, W. A goal programming model for media planning. Manag. Sci. **1968**, 14, 423–430.

[14] Charnes, A.; Cooper, W. Management Models and Industrial Applications of Linear Programming; John Wiley and Sons: New York, NY, USA, 1961.