Yusuf - the prophet – was the first who
Presented and solved the linear programming problem

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Introduction

Linear programming is one the most important scientific discovery of the mid twentieth century. Its impact since 1950 has been extraordinary [(1)]. Today, Linear programming and the related development is network flow algorithms and integer and combinatorial programming make it possible for us to sole many of the complex optimization problems. A professional recognition was given to these areas by the Noble Prize Committee when it awarded the 1975 Noble Prize in economic problem of allocating resources [(2)] using linear programming.

Briefly, linear programming deals with the problem of allocating limited resources among competing activities in the best possible way (i.e. optimal). Linear programming uses a mathematical model to formulate the problem of concern and involves the planning of activities to obtain an optimal result.

The story of Yusuf (as in Quran) is called the most beautiful stories for many reasons (i) it is the most detailed of any in the Quran; (ii) it is full of human vicissitudes; (iii) it tells about the King's dream, which got an opportunity to Explain.

The main objective of the study is to provide a clearly documented coverage of the discovery that Yusuf (peace be upon him) was the first to present and solve (as in Quran) the linear programming problem when he explained the King's dream.

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The Linear Programming Model

The linear programming problem can be formulated by selecting the values of the decision variables x_1, x_2……x_j so as to the objective function will be:

Minimize $Z = c_1x_1 + c_2x_2 + \ldots\ldots + c_jx_j$ $\quad j = 1,2\ldots$

and the function constraints may be:

$a_{i1}x_1 + aj_2x_2 + \ldots\ldots + a_{ij}x_j \geq b_i$

for some values of i, and the non-negative constrains are:

$x_1 \geq 0$, $x_2 \geq 0$, …… $x_j \geq 0$

King's Dream [3-7]

Pharaoh* was holding a council with his confidential advisers in the presence of the cupbearer. The Pharaoh related his two times dream, i.e. seven fat kine being devoured by seven lean ones, and of seven fine full green ears of corn (presumably being devoured) by seven dry withered ears.

No one in the council apparently wanted to take the responsibility, either of interpreting the dream or of carrying out any measure consequent of interpretation.

Yusuf got the explanatory vision of the dream. He had not only shown what would happen, but rather he suggested the measures to be taken to deal with the forthcoming calamity/famine. He explained the sequence of events.

There will be seven years of abundant harvest. With diligent cultivation the government should get bumper crops. From the crops the people should use a little for their sustenance and store the rest in-the-ear, the better to preserve it from the pests that attach corn heaps when they have passed through the threshing floor.

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* He was probably a king of the Hyksos, Sometimes between the 19th and 17th Century.[3]

After seven of good crops there will be seven years of dreadful famine, which will devour all the stores which the people laid in good-year's crop. The people should be careful, even during the famine not to consume all the grain, and there should be special arrangement to save some amount of seeds, lest they should be helpless even when the Nile brought down abundant waters from the rains and its sources [3-7].

The King's Dream as a Linear Programming Model Suggested by Yusuf The Prophet

The problem by Yusuf the Prophet was to minimize the function

$$Z = \sum_{i=1}^{14} (c)_i$$

where $(c)_i$ is the consumption in year I subject to:

$(cp)_{i+1} = (\lambda)_i\ (s)_i$

$(sc)_i = (sc)_i + (cp)_i - (c)\ i - (s)_i$

where

$(s)_i$ = seed corn (the amount of corn planted)

$(cp)_i$ = corn produced in year i

$(sc)_i$ = stock of corn in year i

$(\lambda)_i$ = the coefficient of productivity of seed corn

The boundary conditions are in years 0 and 15.

Solution of the problem as suggested by Yusuf the prophet

Yusuf the prophet undoubtedly solved as difficult optimization problem (intertemporal optimization problem) when he advised the pharaoh with respect to agricultural policy in the expectation of seven fat years followed by seven lean years.

Preference was given to those coefficients which represent the solution when Yusuf interpreted the dream by saying "You shall leave in the ear, except a little of which you shall eat". Here he told them to save most of the crops for the seven years of dreadful famine except a little (i.e. min $\sum_{i=1}^{i=14} c_i$ as in the model).

Conclusion

This work is moderate attempt to track back the origin of linear programming. It is believed that this paper is a contribution to the history of the linear programming based on the story of Yusuf in the Holy Quran. It is found that Yusuf the Prophet is the first to present a Linear programming model.

References

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