LINEAR PROGRAMMING FOR OPTIMAL BUSINESS SOLUTIONS

VANITHA.R

Research Scholar, Dept of Mathematics, Mother Teresa Women's University, Kodaikanal-624101

ABSTRACT

The popular tool linear programming [LP] is applied to maximize and optimal profit and contain cost aspects. LP is used to solve operational solutions, handle operational problems, and adjust expected outcome of the focused study. LP helps to seek optimal output and delivers what they look for. Before the advent of computer and software this LP applied considering various linear inequalitiesbest finding the "best" value obtainable under those conditions. LP uses algebraic relationships to elaborate used mathematical technique. LP assists the management experts to arrive operational plan formanagers to optimize allocate resources. In business application various management functions are often used to take business decisions for example production capacity, use of resources, marketing, finance, etc. The production process can often be described with a set of linear inequalities called constraints. The profit or cost function to be maximized or minimized is called the objective function. Understanding the progression of judgment the most advantageous levels with the system of linear discrimination is called linear programming.
**Keywords:** Linear programming, Business applications, performance

1.1.   INTRODUCTION

LP is a special case, technique used to get BEST OUTCOME through mathematical model by using linear relationships. Linear programming refers that, "Linear programming, mathematical modeling technique in which a linear function is maximized or minimized when subjected to various constraints.

LP is used for business planning and takes into consideration "Quantitative Decisions" and widely applied in industrial engineering application and little social and physical sciences [1].It is portray complex relationship by linear functions to find "optimum points". The important word in the previous sentence is depicted. The real relationships might be much more complex – but we can simplify them to linear relationships [2].

Figure No.01. Linear programming problem
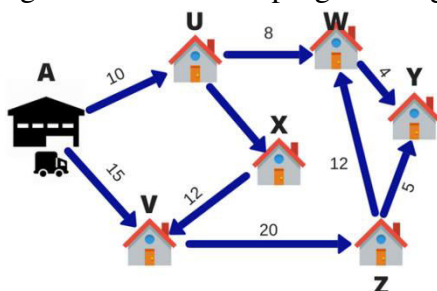
(Source: www.analyticsvidhya.com)

In operations research (OR) subject LP is applied to find "optimal solutions". The question of why LP is that, to find best, best economic optimal solution, within stated constraints and subject to limitations. For smooth and better and best and ideal efficient. Areas of application can be listed are hereunder namely:

- Agriculture
- Distribution
- Energy etc
- Engineering
- Food
- Inventory
- Production
- Transportation

In linear programming finding a linear function either maximizing value or minimizing value which are subject to certain constrains, which may be equalities or unequal. That is in business application certain firm decision must be made due to dynamic changes in overhead, operational costs. It is necessary to minimize cost conditions of the firm and maximize profit which is prime important of every firm goal. A linear programming is said to be is a subset of mathematical model and subsequently it becomes part of OR. A LP problem differs from the general variety in that a mathematical mode or description of the problem can be stated using relationships which are "straight-line" or linear. Linear Programming is the part of mathematics deals with the study of optimization problems with required number of constraints and objective.

1.2. TRACING THE HISTORY LP AND BUSINESS APPLICATIONS

In modern business this mathematical modelingare used day-to-day basis. If you see dating back 1947 no one much familiar LP and its applications. Currently it is used wider in business application. It is an oldest method of mathematical modeling. The LP method is to make a linear function with more than one variable subject to a set of inequality constraints[3]. LP is applied in real settings namelya). Optimal product mix b). Revenue maximization c). Best allocation of capital d). Designing work force model e) cost-efficiency and f) Production plans.In retrospect it can be understood that:

- In business is an applied optimization solution for both increasing profitability and cost minimization.
- In production management it is applied for determining the optimal allocation of resources like materials, machines, minimum production management it is applied for determining the optimal allocation of resources like materials anpower, by a firm to optimize its revenue and also for product smoothing.
- It assists to choose the wise decisions on "Best course of alternative" among alternative.
- It applies the problem related to portion of finite limited resources with competitive activitieswith "most optimal manner".
- It helps to take smart decisions while arriving solutions with constrains

- It is used business function like marketing, production, finance & personnel etc. The problem areas in business are classified into business decisions like (a) Core product-mix b) Investment management planning (c) Blending strategy (d) Marketing & Distribution management.
- Linear programming is a method of finding the optimal solution for given real life problem. Linear programming techniques have been applied in many fields.
- LP - is an optimization technique, where the underlying objective is either to maximize the profits or to minim is the Cost.
- Many organizations provide jobs that are to be done in shifts, it is very important to schedule the employers in proper shifts to benefit both employer and the employee to get optimum output from the employers so as to improve the output of the company.
- Allocation of capital to obtain maximum, allocation of jobs, use of machines, optimal use, relationship jobs, workers higher level of productivity, issues related break downs, line balancing and idle time, media-mix decisions, minimum operating costs, product mix schedule, warehouse management, less transportation costs.
- The objectives and constraints are expressed in the form of linear function. Linear programming problems can be used to solve many problems a). Transportation b). Production c). Commodity pricing

1.3.   REVIEW OF LITERATURE

- Singh, B. (1978) used Linear Programming technique to maximize regional income for threealternative irrigation situations.
- Panghal and Singh (1980) conducted, a study in the command area of siwani canal foroptimum allocation of water among various canal zones and among various crops in eachcanal zone using L.P. technique.
- Selvarajan and Subramanian (1981) attempted to find the effects of optimization, waterresource augmentation on cropping pattern, intensity, labour utilization and income of arepresentative farm of Parambikulam Aliyar Project region of Tamil Nadu.
- Rai and Singh (1982) used the L.P. technique to examine the income and employment effectsof new crop production techniques with live stock in dairy farming areas of Haryana.
- Bogahawatte (1984) conducted a study in three rain fed villages in the Morergole District inSri Lanka and examined through a Linear Programming model, which was formulated to testthe hypothesis that cropping enterprises interact with live stock production.
- Keith Butter Worth (1985) Integer Programming inAgriculture. This outlines economic climate, and usefulness of farm planning
- Bhogal et al. (1988) applied the L.P. technique to attain optimum crop and milk production.
- Gupta and Arora (1988) applied transportation technique to minimize the cost oftransportation of Soybean from different producing centers to various processing plants inUttar Pradesh.

- Madhusudan Ghosh (1990) Test of Profit- Maximization hypothesis in Indian Agriculture:A linear Programming Exercise. LP is used for the profit maximization hypothesis results for agro based economy.
- K. Srinivas Raju, D.Nagesh Kumar (2000): Irrigation planning of Sri Ram SagarProject using Multi Objective Fuzzy : Linear Programming.
- A.Ugur Gul, H. Hulusi Acar, Ozgur Topalak (2000): Determination of the Mechanizationlevel for Forestry Operations by Linear Programming.
- Bilge Bilgen, Irem Ozkarahan (2000). This approach is a mixed integer linear programming model helps to bulk grain coming collectively and distribution.
- Koltai and Terlaky (2000) Applies mathematical interpretation of using sensitivity analysis.
- Purshottom Nayak (2000). Allocative Efficiency in a traditional Orissan Agriculture: Alinear Programming Approach.
- Chinmoy Jana, and R.N. Chattopadhyay (2005). Direct energy optimization for sustainableagricultural operation – a fuzzy linear programming approach.
- Emin Zeki Baskent, Sedat Keles (2006). Developing Alternative Wood HarvestingStrategies with Linear Programming in Preparing Forest management Plans.
- Arsham (2013) this paper highlights the concept of "tabular interior boundary technique". It utilizes LP model and with the inclusion of "Standard Form", artificial variables and constraints, and Big-M. While these variants of the simplex successfully handle an array of constraint forms, they impose a burden and mathematical sophistication on manager that make difficult the success of LP applications.

1.4.   APPLICATION AND FIELDS OF LINEAR PROGRAMMING:
Real time applications like:
- Applied for solving complex situations problems.
- Assist management to take proper decisions.
- Decision is based on cost and benefit with suitable alternatives.
- Helps in simplicity and productive management of an organization which gives better outcomes.
- Highly useful in the allocation of resources.
- Improve objectivity of assessment of the situation.
- It helps to get "unify results" and design mechanism.
- Logistics and supply chain management, replacement and inventory modeling.
- LP assists in making adjustments according to changing conditions.
- LP helps in solving multi-dimensional problems
- LP is to gain computational advantages.
- LP is used for variety of applications in terms of socio-economic-technical and engineering applications.
- LP makes logical thinking and provides better insight into business problems.
- LP method is extended more flexible system.
- LP provides an information base for optimum alloca-tion of scarce resources.

- Meet overall objectives of the management.
- Plant Layout issues, scheduling of production techniques, repair systems.
- Provide clarity of thought and better appreciation of problem.
- Put across our view points more successfully by logical argument supported by scientific methods.
- Total Quality Management functions for better and improved quality systems

1.5.   LIMITATIONS OF LINEAR PROGRAMMING:

Linearity of relations of variables: The linearity cannot be obtained in all function since still some of the function are nonlinear in the surrounding environment.The assumptions of linear programming are also unrealistic: there is a change in relation between input,output gain, loss etc. The following points highlight important characteristicsviz; the objective function, constraints, linearity, finiteness and non-negativity.

1.6.   CONCLUSION

LP is applied several business applications modeling techniques,it incorporates objective function sometimes called as cost function minimum and maximum based on some constraints. This objective function consists on number of finite variables. LP is aiding business solutions for getting optimal profits subject available resources of the company. LP is planning process and decides course of action and linear programming is not mere technique which helps to choose the best available alternatives. Though it has got various limitations, it is treated as widely used tool.

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