CHAPTER IV

MATHEMATICAL FORMULATION

1.1 MATHEMATICAL MODELING

Over the past few decades, there has been a considerable increase in the use of mathematical analysis, both for practical and theoretical problems in many disciplines. Applicable mathematics could refer to the use of mathematics in many varied areas. Mathematical Modeling by which we mean the construction of a mathematical model to describe the situation under study. This process of changing a real life problem into a mathematical one is not at all easy. This is an attempt to convert real problem in mathematical formulation and its solution.

The process of applying mathematics to real world problems may be summarized in flow chart.

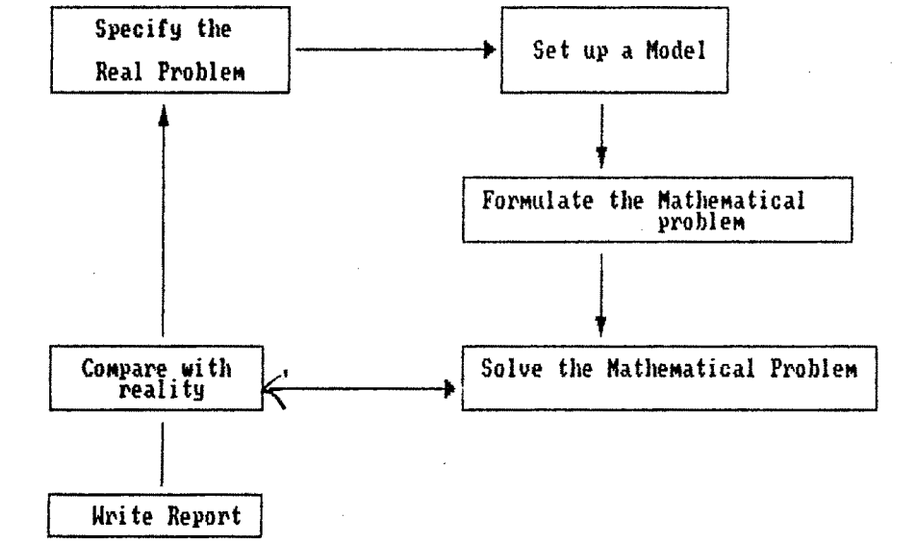
Following is the process for problem formulation.

i) Take time to get to know the problem situation really well.

ii) If appropriate, get out of the office and have a look at the problems situation speak to the people involved.

iii) Together with your 'client', reach a clear agreed statement of the problem.

iv) Decide on the aspects of the problem with which your model is going to deal.


Specify the
Real Problem
Set up a Model
Formulate the Mathematical problem
Compare with reality
Solve the Mathematical Problem
Write Report
Real World
Mathematical World

MODEL VALIDATION

At various stages in the process of constructing and using a mathematical model it is important to check that the model behaves as expected and that it reflects adequately the real system which is being modeled. This testing of the model is called validation, and it can be carried out in the following stages.

a) During model construction.

b) On Completion of the model

c) On implementation of the model

Mathematical Model is a set of statements about a set of variables. These statements are normally in the form of mathematical relationships between the variables and by analyzing these relationships we are able to make further statement about the variables in the model.

2.3 LINEAR PROGRAMMING MODEL :

Commensurate with the objectives the procurement, processing and distribution activites were considered collectively, for optimization of operations.

Under miximization problem, the decision required to be taken were what and how much of the dairy products giving highest covering contribution were to be manufacture, packaged and ultimately sold and distributed through different marketing systems subject to various restrictions.

There are two types of milk one standardized and second whole milk or blended form the milk. All the milk collected can't be sale off. Therefore it is necessary to use for milk products. For this purpose a linear programming model was specially designed and is presented in following matrix form.

Linear Programming model developed for profit maximization of dairy plant subject to restrictions such as resources, labour hours, machine hours, working capital , transportation system etc.

DEFINITIONS OF VARIABLES

For the purpose of a linear programming model it is necessary to define the variables and parameters. Thesse parameters plays an important role in the model. To develop relations between these following variables are defined.

1. C_j's means covering contribution. In other words Net gain after sale or sales price minus variable cost of production. Sales price includes transportation, discounts, tanes, etc.

2. b_j's beings parameters indicates the availability of resources. It also denotes the restrictions such as total man hours, machine minutes, related to processing and production of milk products.

3. a_{ij}'s technological coefficients or parameters defining per unit requirements of products and other activities for resources and restrictions.

4. X_j's are decision variables in the linear programming model. Decision variables X_j's are quantity of milk and milk products. How much the milk products to be produce to a maximize the obejective fuction.

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