

Nutrition Calculation In Cattle Farms

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Abstract

Nutrition Calculation in Cattle Farms focuses on maintaining good nutrition in cows. Providing correct nutrition in feed will help in increasing the productivity and yield from the animal. There is a lack of predefined system that calculates the energy required, depending on the ingredients selected. This has resulted in development of a new system. The system uses data such as protein, energy, cost and nutrition of cows. The main aim is to maintain the nutrition of cows by providing adequate nutrition. This paper mainly focus on adding ingredient of the feed and calculating the total cost, energy and protein per bag of feed. The user can also change the amount of ingredient that are used in the feed and re-do the feed formulation.

Keywords: Linear Programming Problem (LPP), Operation Research, Ingredient, Nutrition, Cattle, Protein, Energy, Cost.

I. INTRODUCTION

Use of biology in IT industry has increased a lot. The system helps a farmer or diary managers, to manage his farm or diary and also to take care of cows in a better way with new and advanced feeding strategies. They can get information about cows and how well they can be maintained. The site will also provide information such as nutrition level of food provided to cows and many more information that are needed to successfully maintain a farm. Based on the study made on the previously designed system, we are trying to make users friendlier to the system along with combining all the features in the system. The system contains information about different breeds of cows, nutrition and food that are best for cows, raw materials used for food

production and diseases that affect cows. Bio informatics is an interdisciplinary scientific field that develops methods and software tools for efficiently storing, retrieving, organizing and analysing biological data. And Analysing biological data to produce meaningful information involves writing and running software programs.

Existing System

The existing System mainly concentrates their feed formulation for poultry. They do not have a well defined method for feed formulation for cows. The existing system has proved to be accurate and precise for poultry.

Proposed System

The proposed system concentrates on cows. The feed formulation is performed for cows. The main aim of proposed system is to maintain feed for reducing the production cost. The System has the ability to calculate the feed formula as well as manipulate the Feed formula and generate the result instantly when the values are changed. The main objective of this system is to create a module that can create a best result for the provided data.

Applications and contribution

The main application of the system is in cattle farms. The designing is done for calculating protein, energy and cost based on the ingredients used in feed. The System will also find its application in feed manufacturing companies and small scale industries.

II. METHODOLOGY

The fundamental concept which is used for implementation is LPP. The main concept used is Standard form of Linear Programming. This method is used to find optimal solution to a problem among a list of solutions. These problems can be expressed in canonical form. Many practical problems in operations research can be expressed as linear programming problems.

A Linear Programming Problem has following parts:

- **A linear function that is to be maximized:**

e.g.

$$f(x_1, x_2) = c_1x_1 + c_2x_2$$

- **Problem constraints:**

e.g.

$$a_{11}x_1 + a_{12}x_2 \leq b_1$$

$$a_{21}x_1 + a_{22}x_2 \leq b_2$$

$$a_{31}x_1 + a_{32}x_2 \leq b_3$$

- **Non-negative variables:**

e.g.

$$x_1 \geq 0$$

$$x_2 \geq 0$$

Concept:

Standard form of LPP works on many decision variables.

General Mathematical Model of an LPP:

Optimize (Max or Min) $Z = C_1 X_1 + C_2 X_2 + \dots + C_n X_n$

Subject to constraints,

$$a_{11}X_1 + a_{12}X_2 + \dots + a_{1n}X_n (\leq) b_1$$

$$a_{21}X_1 + a_{22}X_2 + \dots + a_{2n}X_n (\leq) b_2$$

$$a_{31}X_1 + a_{32}X_2 + \dots + a_{3n}X_n (\leq) b_3$$

$$a_{m1}X_1 + a_{m2}X_2 + \dots + a_{mn}X_n (\leq) b_m$$

And X_1, X_2, \dots, X_n

Algorithm: Step 1:

Identify and define the decision variables associated with the problem.

Let x_1, x_2 and x_3 be the number of ingredients.

q_1, q_2 and q_3 are the respective quantity of the ingredient. p_1, p_2 and p_3 are the respective proteins of the ingredient. e_1, e_2 and e_3 are the respective energy of the ingredient. c_1, c_2 and c_3 are the respective cost of the ingredient.

Step 2:

Define the objective function.

Since the objective is to increase the profit we use maximization. Maximization of profit:

$$\text{Max Profit} = 3x_1 + 2x_2 + 4x_3$$

Where 3, 2 and 4 are q_1, q_2 and q_3 respectively.

The quantity must be selected based on the least cost of the ingredient.

Step 3:

State the required constraints to which the objective function is to be optimized.

We need to perform optimization for the following:

Quantity

$$q_1 + q_2 + q_3 = 100$$

Where the capacity of each bag of the feed is 100kg.

Protein

$$(q_1 * p_1) + (q_2 * p_2) + (q_3 * p_3) \leq P$$

Where P is the total protein level, which should come to a specific value. The value must not have too much variation from the protein value.

Energy

$$(q_1 \cdot e_1) + (q_2 \cdot e_2) + (q_3 \cdot e_3) \leq E$$

Where E is the total energy level, which should come to a specific value. The value must not have too much variation from the energy value.

Cost

$$(q_1 \cdot c_1) + (q_2 \cdot c_2) + (q_3 \cdot c_3) = C \text{ Where } C \text{ is the total cost.}$$

Step 4:

Add the non-negative constraints from the consideration. The negative values of the decision variables do not have any valid physical interpretation.

The constraints x_1 , x_2 and x_3 must be positive values. i.e. $x_1, x_2, x_3 \geq 0$

Table 1: Table showing the feed ingredients which are commonly used in South India:

Sl no	Ingredients	Protein(%)	Energy TDN(%)
1	Groundnut Cake	43	71
2	Gingilly Cake	32	73
3	Coconut Cake	20	70
4	Cotton Seed Cake (Undecorticated)	22	70
5	Cotton Seed Cake (Decorticated)	35	72
6	Sunflower Cake (Decorticated)	35	72
7	Sunflower Meal	40	75
8	Wheat	12	79
9	Maize	9	80
10	Rice Bran	8	65
11	De oiled rice bran	12	60
12	Rice polish	10	75
13	Wheat bran	14	65
14	Maize bran	8	65
15	Black gram husk	14	65

Implementation

The implementation for the project mainly circles around the following Syntax: The basic table for the formulation is as follows:

Total Cost:

$$(37*30) + (20*25) + (40*20) + (2*20) + (1*20) = 2470 \text{Rs/Kg}$$

Result:

1 bag=100Kg

Energy Level : 67.49% of TDN Protein Level : 25.71%

Total Cost : 2470 Rs

Ingredient	Quantity (In kg)	Protein (%)	Energy (TDN)	Cost (per kg)
Groundnut cake	30	43	71	30
Gingilly oilcake	27	32	73	25
Rice bran	40	8	65	20
Mineral mix	2	7	21	20
Salt	1	6	20	20

Since groundnut cake is much expensive than other ingredients, we can reduce the quantity of groundnut cake and increase the quantity of rice bran.

Thus the table can be reframed as:

Total Quantity:

$$30+27+40+2+1=100\text{kg}$$

Total Protein:

$$(30*43) + (27*32) + (40*8) + (2*7) + (1*6) = 24..94\% \text{ Total Energy:}$$

$$(30*71) + (27*73) + (40*65) + (2*21) + (1*20) = 67.63\% \text{ of TDN Total Cost:}$$

$$(30*30) + (27*25) + (40*20) + (2*20) + (1*20) = 2435 \text{Rs/Kg}$$

Result:

1 bag=100Kg

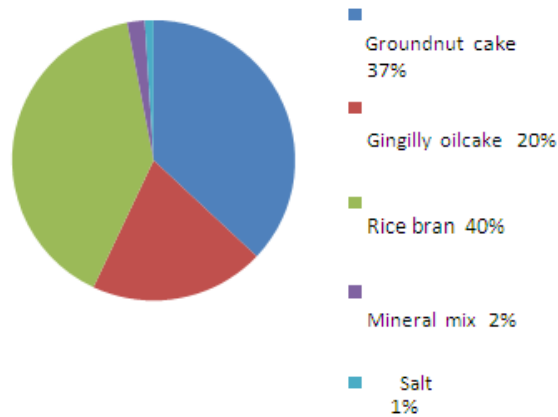
Energy Level :67.63 % of TDN Protein Level :24.94 %

Total Cost :2435 Rs

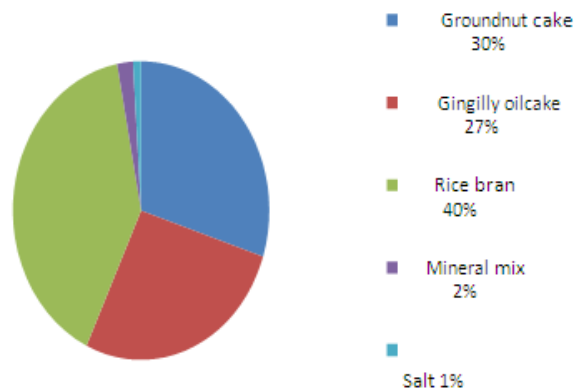
The result shows that the new feed formula will provide a value that will come closer to previously calculated value. The result has led to reduction of cost per bag of the feed.

Comparison of feed ingredient percentage :

Based on Previously calculated data



Based on Newly calculated data



IV. CONCLUSION

We have analyzed all the information and data that are related to the system. The analyzed data and information will be included effectively in the system. The system will be more accurate with available data and more precisely in the System. The system will provide more user friendliness to the users and will be more effective in calculations and data analysis. The system will provide details of better health to the animal with updated nutrition levels. The system will help to correctly ascertain the final energy level, protein level and the total cost of the product. This paper has presented the use of Linear Formulation for finding the feed formulation in cattle farms. The formulation algorithms implemented in such a way that it can find out the total cost, total protein and total energy.

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