

Least Cost Ration Formulation for Dry Pandharpuri Buffalo



Statistics

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ABSTRACT

The aim of this study was to develop an optimization of feed formulation for dry Pandharpuri buffalo by using linear programming problem. The least cost ration plan formulated for daily feeding of dry Pandharpuri buffalo included hybrid napier, groundnut leaves, dry maize and crushed maize. The least cost ration only used the 4 ingredients as compared with 16 in the original feeding plan and also per day feeding cost was reduced.

Introduction

Buffalo is backbone of the farmers economy. Proper management is very important in optimizing animal diet. The livestock ration formulation minimizes feed cost subject to nutritional requirements. This approach allows the farm manager to make livestock feeding decisions based on the relative prices and nutrient content of available feed products. The Buffalo can efficiently utilize the roughages and crop by products. In Maharashtra, there are different types of buffalo breeds viz. Nagpuri, Murrah, Marathwadi, Murrah grade and Pandharpuri.

Pandharpuri buffalo is one of the breed preferred by farmers in its breeding tract viz. Solapur, Kolhapur, Sangli and their adjoining districts. It is well suited in dry region and medium rainfall. The buffaloes owned by different categories of farmers is faced with several problems such as poor growth, higher age at puberty, age at calving, longer intercalving, low fertility, reproductive problem etc. [2]. This may be attributed to the improper and poor housing as well as neglected management. No study has until now been reported from network project on buffalo improvement project, Kolhapur that emphasizes cost minimization for feeding of dry Pandharpuri buffalo.

The length of lactation period in buffaloes varies from 8 to 10 months. The average calving interval and dry period for Pandharpuri buffalo 453.38 ± 15.13 days and 160 days respectively. Thus, a dry buffalo has to be maintained for an average period of about 5 months or 2 to 8 months before the next calving. The dry buffalo needs only maintenance ration and no extra feeding of concentrate is required. The variation between farms, between years and between months influenced dry period significantly. Linear programming is the common method of least cost feed formulation which compares the nutrients required by the animal to the nutrients supplied by the available feed ingredients and combines them to obtain a balanced diet at the least possible cost. The main goal of the study is to reduce the feeding cost of dry Pandharpuri buffalo.

In point of view, the present study was undertaken to formulate least cost ration plan for dry Pandharpuri buffalo by using Linear Programming Problem.

Material and Methods

The present study based on secondary data were obtained from Network Project on Pandharpuri buffalo, Zonal Agricultural Research Station, Shendapark, Kolhapur on farm animals and different types of feeds and fodder offered daily to animals in the year 2010. The farmer would encounter three different physiological conditions is a fully grown up buffalo having

average weight of 400 kg is considered wherein animal does not produce milk, produce different levels of milk with certain amount of fat and is in third trimester of pregnancy needs extra nutrient supplements. In this case, dry buffalo considered for study and needs only maintenance ration. The LP model of feed formulation used for this study has 16 decision variables and 07 constraints.

The minimum requirement of specified nutrients viz. DCP, TDN and Dry matter used in diet obtained from standard tables suggested by ICAR, New Delhi [7],[8],[9]. The optimal plan for feeding dry Pandharpuri buffalo were developed by thumb rule [4]. The cost minimization problem were formulated by using the simplex method of linear programming [3]. The TORA software was used for data analysis [10]. The LP model is as follows:

Objective function is

$$\text{Minimize } z = \sum_{j=1}^n C_j x_j$$

Subjected to the linear constraints such as

$$\sum_{j=1}^n a_{ij} X_j \geq B_i, i = 1, 2, \dots, 7.$$

Non negativity $x_j \geq 0$,

Where,

Z= total cost of feed in Rs. ,

X_j = Qty. of j^{th} feed material in the feed in per kg,

C_j = Per kg cost of feed material X_j in rupees.

a_{ij} = Amount of i^{th} nutrient available in one kg of X_j feed material ,

$B_1, B_2, B_3, B_4, B_5, B_6$ and B_7 are required level of nutrients such as :

B_1 = Digestible Crude Protein (DCP)

B_2 = Total Digestible nutrients (TDN)

B_3 = Total Dry matter (TDM)

B_4 = Requirement of Leguminous fodder

B_5 = Requirement of Non - Leguminous fodder

B_6 = Dry matter supplied by Dry roughages

B_7 = Dry matter supplied by Concentrates

Table 1 - Optimal plan compared with existing plan for dry Pandharpuri Buffalo (2010).

Sr. No.	Source of Nutrients	Existing plan		Optimum Plan*	
		Qty.(Kg)	Cost (Rs.)	Qty.(Kg)	Cost (Rs.)
1	green jawar	3.25	2.92	-	-
2	green maize	3.07	3.07	-	-
3	hybrid napier	3.50	1.58	6.60	2.97
4	green grass	1.77	0.89	-	-
5	sugarcane	4.39	6.58	-	-
6	lucerne	1.40	2.24	-	-
7	groundnut leaves	2.35	1.06	1.60	0.72
8	dry jawar	1.53	3.36	-	-
9	dry maize	1.24	0.31	6.14	1.54
10	hay	1.84	0.83	-	-
11	maize straw	1.60	0.88	-	-
12	staylo grass	0.53	0.42	-	-
13	cotton cake	0.34	2.74	-	-
14	concentrate	0.32	3.23	-	-
15	crushed maize	0.30	1.22	3.50	14.00
16	min mix	0.05	0.50	-	-
			31.83		19.23

Table 2 - Level of slack / surplus activity and dual price for dry Pandharpuri Buffalo diet nutrients.

Sr. No.	Particulars	Level of slack-/Surplus+ activity*	Dual Price * (Rs./day)
1	Digestible Crude Protein	0.17*	0.00
2	Total Digestible Nutrients	3.35*	0.00
3	Total Dry Matter	0.00	0.28
4	Requirement of Leguminous fodder	0.00	0.38
5	Requirement of Non - Leguminous fodder	0.00	0.41
6	Dry matter supplied by dry roughages	1.75*	0.00
7	Dry matter supplied by concentrates	0.00	3.75

*The TORA software Windows version 2.2, Feb. 2006 is used for evaluating these values.

Results and Discussion

The existing feeding of dry Pandharpuri buffalo compared with the optimal plan. Results indicated (Table 1) that least cost feeding plan reduces per day cost of feeding by Rs. 12.60. The least cost ration used only 04 ingredients compared with 16 in the original feeding plan, and 9.64 kg less was needed to meet cal-

culated requirements than what was originally fed to dry buffalo. The principle component of the least cost ration was hybrid napier, groundnut leaves, dry maize and crushed maize. Groundnut leaves and hybrid napier were supplied energy to the animals. Dry maize and hybrid napier supplied dry matter, protein , energy and minerals to the animals. The result of present study were similar to those of [5]. While crushed maize supplied dry matter and protein to animals.

The dual price under the given set of conditions indicates the potentiality of nutrients (Table 2). It was observed that, the activities in the solution at non - zero values have zero dual prices. The supply of DCP, TDN and dry matter supplied by dry roughages are surplus, amounting to 0.17, 3.35 and 1.75 kg respectively with zero dual price. For DCP and TDN similar results were reported by [6] and [2] for pandharpuri buffalo heifers feeding during rabi season. The surplus quantity of DCP, TDN and dry matter supplied by dry roughages indicated that, the least cost combination of feeds and fodder after meeting all the requirements also exceed the DCP, TDN, and dry matter supplied by dry roughages by 0.17, 3.35 and 1.75 kg respectively without any cost implication.

In the case of total dry matter , requirement of leguminous fodder, Non - Leguminous fodder and dry matter supplied by concentrates observed that their slack or surplus activities at zero level it means that how much the cost of ration would be reduced when the constraint relaxed by one unit. A decrease in one unit (kg) of requirement of total dry matter, leguminous fodder, non leguminous fodder and dry matter supplied by dry roughages was reduced cost of optimal plan by Rs. 0.28, Rs.0.38, Rs.0.41 and Rs.3.75 respectively It is indicated that for every decrease in one unit restrictions, cost will reduce by Rs. 0.28, Rs.0.38, Rs.0.41 and Rs.3.75 respectively and vice versa.

Conclusion

It is concluded that least cost ration plan formulated by linear programming technique for daily feeding of dry Pandharpuri buffalo included 6.60 kg Hybrid Napier, 1.60 kg Groundnut leaves, 6.14 kg Dry maize, and 3.50 kg Crushed maize. The least cost feeding plan reduced the ration cost for dry Pandharpuri buffalo from Rs. 31.83 to Rs. 19.23 The least cost ration only used the 4 ingredients as compared with 16 in the original feeding plan. Per day feeding cost was reduced by Rs. 12.60 for dry Pandharpuri buffalo.

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