Ration balancing in practice

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Ration Balancing In Practice

OBJECTIVE

- **To impart the knowledge on ration formulation for dairy cattle through practical approach**

Introduction

- Ration is the feed allowed for a given animal during a day 24 hours and may be given in single time or multiple times.
- Balanced ration is a ration, which provides the essential nutrients to the animal in such proportion and amounts that are required for the proper nourishment of the particular animal for 24 hours

Desirable Characteristics of A Ration

- Should be properly balanced
- Must be palatable
- Variety of feed in the ration
- Contain enough of mineral matter
- Fairly laxative
- Fairly bulky
- Contain sufficient green fodder
- Avoid sudden changes in the ration
- Maintain regularity in feeding
- Must be properly prepared
- Should not be too bulky
- Economy in labour and cost

General Principles of Computation Of Ration

- Ration formulation is a process by which different feed ingredients are combined in a proportion with proper amount of nutrients for particular stage of production.

  Requires the knowledge about nutrients, feedstuffs and animal in the development of nutritionally adequate rations at a reasonable cost.

- The ration should not cause any serious digestive disturbance
- The nutrient requirements can be arrived using feeding standards (BIS/ICAR/NRC).
- The list of commonly available feeds in that region is prepared

Steps In Formulating a Ration

- Calculate the dry mater intake (DMI)
- Calculate the nutrient requirements
- Determine the amounts of available ingredients that must be fed to fulfil the animal's nutrient requirements within its expected DMI limits.

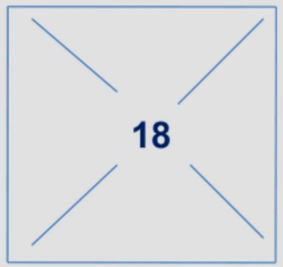
Methods to Formulate the Ration

- Pearson square method
- Algebric method
- Trial and error method
- Linear programming

Ration Formulation : Pearson Square Method

- The nutrient requirement is noted in the middle of the square, this value must be intermediate between the two values that are used on the left side of the square which are actually the nutrient content of the two ingredients that are to be used

Ration formulation with 18 % protein by pearson square method using maize (9% protein) and soybean oil cake (44% protein) (Using 2 feed ingredients)



Ration for 100 kg

Maize = 26/35 x 100 = 74.29 parts
SBOC = 9/35 x 100 = 25.71 parts

Checking the ration containing 18 % protein

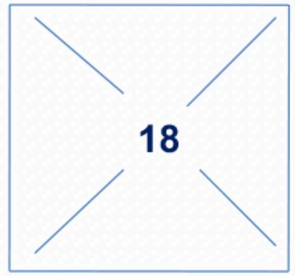
Maize= 74.29 parts x 9/100 = 6.69 %
SBOC = 25.71 x 44/100 = 11.31 %
18.00

More number of feed ingredients can also be used for ration formulation by using this method

Ration Formulation : Pearson Square Method

- **Ration formulation with 18 % protein using maize (9% protein), de-oiled rice bran (DORB) (10 % protein), gingelly oil cake (GOC) (40 % protein) and soybean oil cake (SBOC) (44% protein) (Using morethan two feed ingredients)**

Let assume maize and DORB in one group and SBOC and GOC in another group. The average protein content of maize and DORB = (9+10)/2= 9.5; SBOC and GOC = (44 + 40)/2 = 42



24

8.5

32.5

Final formulated ration containing 18 % protein

Maize = 36.92 parts
De-oiled rice bran = 36.93 parts
Gingelly oil cake = 13.07 parts
Soybean oil cake = 13.08 parts

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100 parts

Ration for 100 kg

Maize + DORB = (24/32.5) x 100
= 73.85 parts
GOC + SBOC = (8.5/32.5) x 100
= 26.15 parts

Checking the ration containing 18 % protein

Maize + DORB = 73.85 parts
Maize = 73.85/2 = 36.92 x 9 /100 = 3.32 %
DORB = 73.85/2 = 36.93 x 10 /100 = 3.69 %
GOC + SBOC = 26.15 parts
GOC = 26.15/2 = 13.07 x 40/100 = 5.23 %
SBOC = 26.15/2 = 13.08 x 44/100 = 5.76 %

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18 %

Ration Formulation : Algebric Method

- This is an alternative method for the pearson square method using a simple algebraic equation. Here, a particular nutrient requirement is satisfied using a combination of two feed ingredients like maize (9 % protein) and soybean oil cake (44 % protein)

Ration formulation with 18 % protein by equation method

Let assume X is maize and Y is SBOC

X + Y = 100 ---------- equation (1)

Protein content of maize and SBOC is 9 and 44 % respectively

Hence, (9/100) X+ (44/100) Y = 18

0.09 X+ 0.44 Y = 18 ---------- equation (2)

Equation (2) x100 = 9 X + 44 Y = 1800 ---------- equation (3)

Equation (1) x 9 = 9 X + 9 Y = 900 ---------- equation (4)

Equation (3) --- (4) = 35 Y = 900 Y= 900/35 = 25.71

Apply Y value in Equation (1) = X + 25.71 = 100 X = 100 --- 25.71 = 74.29

Ration for 100 kg

X= Maize = 74.29 parts

Y=SBOC = 25.71 parts

Checking the ration containing 18 % protein

X = Maize = 74.29 parts x 9/100 = 6.69 %

Y = SBOC = 25.71 parts x 44/100 = 11.31 %

Total protein content in the ration = 18 %

More number of feed ingredients can also be used for ration formulation by using this method

Ration Formulation : Algebric Method

- **Ration formulation with 18 % protein using maize (9% protein), de-oiled rice bran (DORB) (10 % protein), gingelly oil cake (GOC) (40 % protein) and soybean oil cake (SBOC) (44% protein) (Using morethan two feed ingredients)**

Let assume maize and DORB in one group and SBOC and GOC in another group. Average protein content of maize and DORB = (9+10)/2 = 9.5; SBOC and GOC = (44 + 40)/2 = 42

Let assume X is maize and DORB and Y is SBOC and GOC

X + Y = 100 ---------- equation (1)

Protein content of maize and DORB = 9.5 % and SBOC and GOC = 42 %

Hence, (9.5/100) X + (42/100) Y = 18

0.095 X + 0.42 Y = 18 ---------- equation (2)

Equation (2) x100 = 9.5 X + 42 Y = 1800 ---------- equation (3)

Equation (1) x 9.5 = 9.5 X + 9.5 Y = 950 ---------- equation (4)

Equation (3) --- (4) = 32.5 Y = 850 → Y= 850/32.5 = 26.15

Apply Y value in Equation (1) = X + 26.15 = 100 → X = 100 --- 26.15 = 73.85

Ration for 100 kg

X= Maize + DORB = 73.85 parts Maize = 73.85/2 = 36.92 parts; DORB = 73.85/2 =36.93 parts

Y= GOC + SBOC = 26.15 parts GOC = 26.15/2 = 13.07 parts; SBOC = 26.15/2 =13.08 parts

Checking the ration containing 18 % protein

Maize = 36.92 x 9 /100 = 3.32 %

DORB = 36.93 x 10 /100 = 3.69 %

GOC = 13.07 x 40/100 = 5.23 %

SBOC = 13.08 x 44/100 = 5.76 %

18 %

Final formulated ration with18 % protein

Maize	= 36.93 parts
De-oiled rice bran	= 36.92 parts
Gingelly oil cake	= 13.08 parts
Soybean oil cake	= 26.15 parts
	100 parts

More number of feed ingredients can also be used for ration formulation by using this method

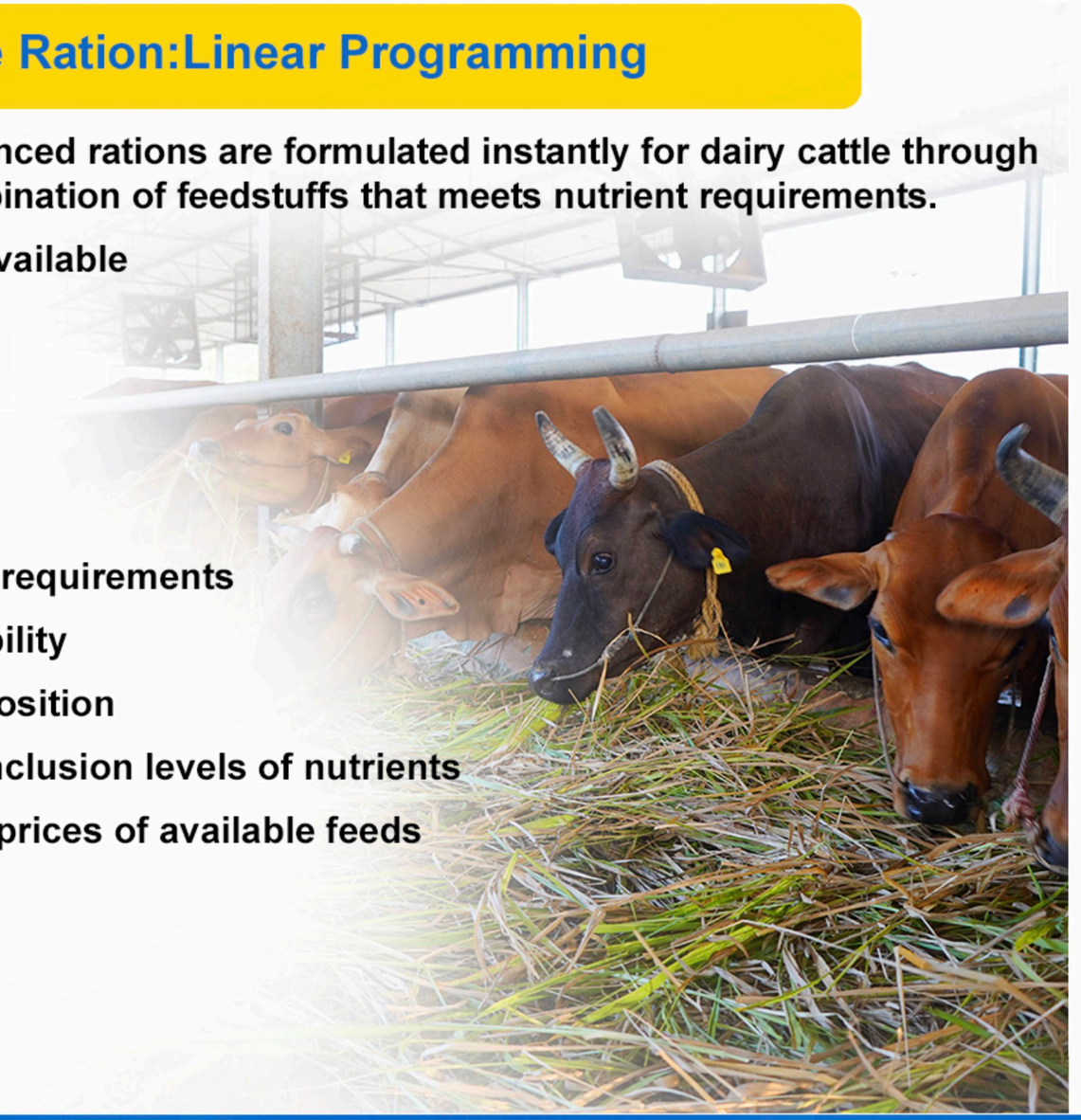
Methods to Formulate the Ration:Trial and Error Method

- 1. Fix the nutrient requirements for the feed to be formulated
- 2. Slack space for mineral mixture 1-2 %, common salt 0.5-1 % and feed additives 0.5%
- 3. Fix the level of cereal byproducts like DORB to the maximum inclusion level
- 4. Calculate the TDN, CP, Ca and P from the above ingredients
- 5. Subtract Values arrived in step 4 from total requirement of feed.
- 6. This gives you quantity of nutrients that has to be met from cereal grains and oil cakes.
- 7. Calculate the level of addition of cereal grains and oilcakes by trial and error method (adding and deleting)
- 8. Calculate the total nutrients supplied as TDN, CP, Ca and P
- 9. Make minor adjustments
- 10. Calculate the deficit of nutrients
- 11. Supplement deficit of feed ingredients
- 12. Finally arrive formulation with required nutrients

Methods to Formulate the Ration:Linear Programming

- Computerized least cost balanced rations are formulated instantly for dairy cattle through Linear programming by combination of feedstuffs that meets nutrient requirements.
- Several software packages available

- Basic requisites are
  - Computer facilities
  - Trained personnel
  - Information on nutritional requirements
  - Information on feed suitability
  - Information on feed composition
  - Maximum and minimum inclusion levels of nutrients
  - Information on prevailing prices of available feeds



Methods to Formulate the Ration: Mobile Application

- There are more number of mobile application are available for getting formulated ration based on the milk production
- Mobile App on “Samacheer theevanam” was developed – download and use

Calculation of Body Weight

- Nutrient requirements can be calculated by requirement per kg body weight (BW)
- Protein and energy requirement is related to metabolic body weight.

CALCULATION OF BW:

- Where it is not possible to weigh the animals, the body weight can be calculated by using Shaeffers formula.

FOR CATTLE:

$W = LG^2/300$ Where, W = Body weight in pounds (2.2 pounds = 1 kg); L= Length of the animal in inches (From the point of the shoulder to the point of the buttock); G = Girth in inches (Circumference measured just behind the point of elbow).

FOR BUFFALOES:

W= GL/ Y Where, W = Weight of the animal in seers (1 seer is equal to 0.93 kgs); L = Length of the animal in inches; G = Girth of animal in inches;
Y = Constant : When G is below 65 → Y is 9.0
When G is between 65 and 80 → Y is 8.5
When G is above 80 → Y is 8.0

METABOLIC BW: Body weight to the power of $W^{0.75}$. This is calculated by multiplying three times and square rooting two times of BW.

Eg. For 400 kg BW = 400 x 400 x 400 = √64000000 → √8000 → 89.44