FEEDING STANDARDS

DEPT OF ANIMAL NUTRITION

Co.V.Sc. & A.H., Jabalpur

FEEDING STANDARDS

Feeding standards are statements or quantitative descriptions of the amounts of one or more such nutrients needed by animals.

Feedings standards are the tables, which indicate the quantities of nutrients to be fed to the various classes of livestock for different physiological functions like growth, maintenance, lactation, egg production and wool growth.

The nutrient requirements are generally expressed in quantities of nutrients required per day or as a percentage of diet.

For dairy animals, nutrient requirements are generally expressed as separate body functions but in case of poultry and pigs, combined requirements of maintenance and other body functions are given.

Name of the country	Protein	Energy
NRC (USA)	CP, DCP	TDN, DE, NE
ARC (UK)	DCP, AP	DE, ME
SCANDINAVIA	DTP	FEED UNIT
GERMAN	DCP	SE
INDIA	*DCP*	*TDN, ME*

Classification

Comparative type
Hay Equivalent standard
Scandinavian "feed Unit"
Standard

Production-value type
Kellner
Armsby
Agricultural and Food
Research Council

Digestible-Nutrient system
- **Grouven's**
- **Wolff's**
- **Wolff's Lehmann**
- **Haeckers's**
- **Savage**
- **Morrison**
- **National Research Council**
- **Indian**

HAY STANDARD

- German scientist Thaer, different feeds should be compared using meadow hay as a unit.
- This standard provided that 100 lbs. of meadow hay was equal in nutritive value to 91 lbs. of clover hay or 200 lbs. of potatoes

SCANDINAVIAN "FEED UNIT" SYSTEM

- Professor Fjord formulated
- In this system only one factor, namely, the feed unit was taken into account.
- The value of one pound of common grain such as corn, barley or wheat, is given as one unit value and the value of all other foods is based upon this.
- According to this standard one feed unit is required for each 150 lbs of body weight and an additional unit for every three pounds of milk production.
- As the grains are of different types in different countries, the feed units should also be different.
- Hence the Scandinavian units are not applicable in our country unless experiments are conducted here with our own grains.

GROUVEN'S FEEDING STANDARD

- In 1859 Grouven, a German chemist published his feeding standard with crude protein, carbohydrates and fat contained in the feed as the basis of the standard.
- According to this standard a cow weighing 1,000 lbs. should be fed 28.7 lbs. of dry matter containing 2.67 lbs. of crude protein 0.6 lb. of crude fat and 14.55 lbs. of crude carbohydrates.
- Very soon after standard of Grouven, Henneberg and Stohmann found that the total nutrient contained in a feed did not form an accurate guide to its value.
- The proportion of digestible parts varied with different feeds and hence the digestible nutrient would be more valuable.
- So due to this defect Grouven's feeding standard was abandoned.

WOLFF'S FEEDING STANDARD

- Dr. Emil von Wolff (German Scientist) -based on digestible protein, digestible carbohydrates and digestible fats contained in a feeding stuff.
- This standard though an improvement over the standard of Grouven, it does not consider the quantity and quality of milk produced and the maintenance and production requirement were not considered separately. Keeping these shortcomings in mind Professor Kuhn published feeding standards in 1867 based upon the maintenance and production requirements along with quantity of milk production.

WOLFF'S LEHMANN FEEDING STANDARD

- Dr. G. Lehmann of Berlin modified Wolff's standard in 1896.
- He took into account the quantity of milk produced, but he failed to take into account the quality of milk.

HAECKER'S FEEDING STANDARD

- Keeping in view the demerits of Wolff Lehmann standard, Haecker (1903)
- first time considered the quantity as well as the quality of milk produced in formulating a milk standard.
- He took into account the allowance for the percentage of fat in the milk in addition to the requirement for maintenance, production and total milk yield.
- He was also the first to separate the requirements for maintenance from the requirements of production (milk yield).
- His standards included digestible crude protein, carbohydrates and fats.

SAVAGE FEEDING STANDARD

- He expressed his standard in terms of DCP and TDN and further showed that about 2/3 requirement of the dry matter should be met by feeding roughages and the remaining 1/3 from concentrates.
- Fat content of the milk was also considered.

MORRISON FEEDING STANDARD

- called “Modified Wolff and Lehmann standard”.
- These standards were expressed in terms of Dry Matter (D.M.), Digestible Protein (D.P.) and Total Digestible Nutrients (T.D.N.).
- Morrison indicated the nutrient requirement of animals in a range rather than in one figure.
- Morrison also included allowances for Ca, P and Carotene besides digestible carbohydrates, digestible proteins and net energy in therms.
- **The average of Morrison standards has been accepted for Indian livestock**.

NATIONAL RESEARCH COUNCIL (N.R.C.) STANDARD

- The standard includes digestible protein and total digestible nutrients and also includes the recommended requirements for ca, P, carotene and vit. D for dairy cattle, beef cattle, pigs, poultry, sheep, dogs, horses, laboratory animals etc.
- Today in a number of countries N.R.C. standards are followed where they use ME for poultry, DE for swine and horses, DE, ME and TDN for sheep, ME, TDN and NE_m and NE_g for beef cattle and for dairy cattle,

INDIAN STANDARDS

- **Sen and Ray standard**
- Dr. K. C. Sen- standards for Zebu cattle and buffaloes, based on Morrison's recommendations, where they adopted the average of maximum and minimum values recommended by Morrison.
- Later on Sen, Ray and Ranjhan (1978) revised the Sen and Ray (1964) standard on the basis of experimental trials conducted in Indian animals.
- These modified values are still functioning in many of our established dairy farms.

ICAR feeding standard

- Considering the fact that nutrient needs of livestock and poultry breeds under tropical environments are different from those developed in temperate climate
- I. C. A. R-1985 Chairman Dr. K. Pradhan
- BASED ON DM, DCP, TDN, Calcium and Phosphorus intake.

USEFULLNESS AND LIMITATIONS OF FEEDING STANDARDS

- Feeding standards serve as a guide in feeding animals and in estimating the adequacy of feed intakes and of feed supplies for groups of animals .
- In practical feeding operations, it is frequently desirable to take economic factors into account. Thus, modifications may be called for in the interest of obtaining the rate of gain or level of milk production that seems the most economical in terms of current feed costs and the market price of the product.
- No standard can be a complete guide to feeding because other factors such as palatability and the physical nature of the ration must also be taken into account.
- Further, environment may change nutrient requirement.

Merits and Demerits of various feeding standards

- **Energy evaluation**
- It is not tenable to consider one nutrient more important than another, Since all must be available to the animal in adequate amounts if efficient production is to be maintained. However, an animal's requirement for energy is the primary consideration from a quantitative and economic position.
- The best unit for expressing the energy value is the one which takes into account all the losses incurred by the animal in utilising the energy present in feeds.

TDN and DE Systems

Merits

- TDN is a measure of apparent DE but is expressed in units of weight or percent rather than energy per se.
- Provides a relative measure of the DE content of feed:1 kg TDN =4.409 Mcal DE.
- It is easy to determine.
- DE can readily be determined by using a bomb calorimeter to measure the GE of feed and faeces. No chemical analysis are required.
- Demerits
- TDN systems takes into account only the losses of nutrients in the faeces but not the other losses from the body.

- TDN system overevaluates the energy value of poor quality roughages in relation to concentrates specially so in hot environment because
  - TDN does not consider large amounts of energy wasted in the digestion of fibrous feeds in the form of gases and heat increment
  - EE of forages largely comprise other than true fat. So a kg of TDN in roughages has less value for productive purpose than a kg of TDN in concentrate.
- Certain species of forage were found to have high GE & high TDN values due to essential oils but low ME values.
- The measurement of DE takes into account the losses only through faeces.

SE and ME system

- TDN system in the USA, Canada and India &SE system in Europe have been widely used since early 1900s.
- Its common to use ME as a measure of feed value for poultry because their faeces and urine are excreted through a common orifice; it is actually easier to determine ME than DE for them.

ME system

Merits

- ME represents a more accurate measure since losses in urinary and gaseous products of digestion are also accounted for.
- ME provides a more satisfactory measure of nutritive value than do TDN or DE
- ME is cheaper and easier to obtain than NE values.
- The efficiency of utilisation of ME takes into consideration the purpose for which it is fed, level of feeding and caloric density of the diet.

Demerits

- The requirement of the animal and feed value are given in terms of NE and ME, respectively.
- The large differences in the efficiency of utilisation of ME are primarily due to wide variation in the energy losses as heat increment.