

# **Unit C: Meeting Nutritional Needs of Animals**

## **Lesson 3: Meeting Energy and Protein Requirements**

# Terms

- Carbohydrates
- Crude fiber
- Feed units milk production
- Lipid
- Nitrogen-free extract
- Non-protein nitrogen

# What are the energy requirements for cattle?

- Energy contents of a feedstuff can be divided into two groups.
  - Carbohydrates—*Carbohydrates* are sugars and starches derived from cereals, tubers, roots, and other substances such as cellulose and lignin from plant cell walls, vessels, and woody tissues.
    - Energy from carbohydrates provides the requirement for maintenance and production.
    - If there is a surplus of energy, it is stored as body fat.

# What are the energy requirements for cattle?

- Carbohydrates are composed on crude fiber and nitrogen-free extract.
  - Crude fiber—*Crude fiber (CF)* is difficult to digest but very important for the functioning rumen and production of milk. Feed should contain high amounts of crude fiber.
  - Nitrogen-free extract—*Nitrogen-free extract (NFE)* consists of sugars, starches, and sugar-like substances. These are much easier to digest than CF.

# What are the energy requirements for cattle?

- Lipids (fats) or Ether Extract (EE)—*Lipids* also provide energy, as much as 2.25 times more than from carbohydrates.
  - Fat soluble vitamins A, D, E, and K are found in the lipid portion. Because of these vitamins, feed must have some fat. However, if excess exists, feed intake will be decreased and the rumen function will be disturbed.
  - Roughages are known to have low fat content. Those feedstuffs derived from oilseeds (soy, cotton) are more desirable.

# What are the energy requirements for cattle?

Energy requirements for dairy production are expressed in *Feed Units Milk production (FUM)*.

The FUM of a feedstuff is a figure which indicates how much kg barley equals the amount of net energy for milk production in 1 kg of feedstuff.

As a rough rule, a 600 kg cow producing 15 liters per day requires for maintenance 5013 FUM and 460 FUM for producing 1 kg milk.

For each 50 kg weight plus or minus 600 kg a correction has to be made: for FUM  $\pm 300 / 50$  kg weight.

# What are the energy requirements for cattle?

- For calculating the requirements for FUM, use the following equation:

$$\text{FUM} = (\text{maintenance} + \text{milk production}) = (5013 + 440 \text{ M} + 0.7293 \text{ M}^2)$$

- For practical use, we can approach the FUM calculation by the next equation  $\text{FUM} = 5000 + 460 \text{ M}$

# What are the energy requirements for cattle?

- In the equations above M is the milk production in kg per day expressed in kg Full Cream Milk (FCM). FCM milk has a fat content of 4% per kg.
- To calculate the FCM amount for milk with a deviation in fat content, use the following equation:

$$\text{FCM 4\% fat} = (0.4 + 0.15F) * m$$

F = Fat content %

m = real milk production



# What are the protein requirements for cattle?

- Proteins are the building blocks in an animal. It is required for growth, maintenance, reproduction, and lactation.
  - Every animal must have a constant supply of protein to maintain good health. If this requirement is not met, calves will be smaller at birth and slower growing.

# What are the protein requirements for cattle?

- Other negative effects from protein deficiency include:
  - Low milk production
  - Less protein in the milk
  - Loss of body weight in early lactation
  - Increased risk of infections and metabolic diseases
  - Low fertility

# What are the protein requirements for cattle?

- Crude protein is comprised of true protein and inorganic nitrogen salts, and other substances.
- Nitrogen in a feed that does not come from protein is considered *non-protein nitrogen (NPN)*. This nitrogen is degradable.

# What are the protein requirements for cattle?

- Ruminants can utilize NPN efficiently.
- This allows producers to use less expensive forms of nitrogen.
- One such feedstuff is urea.
- There are precautions, however, when using non-protein nitrogen.
- NPN can only be used in low level production systems with high amounts of poor quality roughage.
- If NPN is used in a high level production system, the animal will steal protein as an energy source, resulting in a protein deficiency.

# What are the protein requirements for cattle?

- Crude Digestible Protein (DCP) requirements are expressed in grams. As a very rough rule, a 600 kg cow requires for maintenance 390 grams protein and 63 grams protein for producing 1 kg milk.
  - For each 50 kg live weight plus or minus 600 kg a correction has to be made: for DCP  $\pm 25 / 50$  kg weight.

# What are the protein requirements for cattle?

- For calculating the requirements for DCP we can use the following equation:

$$\text{DCP} = (\text{maintenance} + \text{milk production}) = [(3.33 \text{ G} + 1000) * 0.13] + 63 \text{ M}$$

G = live weight

M = kg FCM

- For practical use we can approach the DCP calculation by the next equation

$$\text{DCP} = 390 + 63 \text{ M}$$

# Review/Summary

1. What are the energy requirements for cattle?
2. What are the protein requirements for cattle?