

# **Feed resources for milk production and their nutritive values**

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## **FEED REQUIREMENTS FOR DAIRY COWS**

### **1 Energy**

Ruminants need a daily supply of all nutrients required for maintenance and production: milk, meat, growth and pregnancy. Quantitatively any type of nutrient can limit performance levels, but the most likely to be in short supply are energy and protein, this is especially true for high and average yielding cows. Both energy and protein must be considered. For energy, the feeding system uses the metabolisable energy (ME) in the feed as a basis to formulate rations. The ME is the energy remaining in the digested foodstuffs after the loss in faeces, urine, gases and body heat. The basic unit used to measure the energy content is the Megajoule (MJ).

### **2 Protein**

The digestible **crude protein (DCP)** is widely used to evaluate protein requirements, and it corresponds to the crude protein that remains after losses in the faeces. However, a new system has been introduced which takes into account the degradability of the protein in the ration during digestion. It is a better system to calculate requirement levels, especially for high-yielding cows which have been shown to benefit from protein that escape microbial degradation in the rumen and is absorbed as amino-acids in the small intestine. Following this approach crude protein can be split into Rumen degradable Nitrogen ( RDN ) and **Undegraded** Dietary Nitrogen (UDN). Fish meal is for example considered as a good source of UDN.

Inorganic nitrogen sources from plants as well as other non-protein nitrogen, such as urea, are completely degraded by microbes in the rumen. Hence, the RDN is broken down by rumen microbes and used for their protein synthesis by the microbes. Later in the digestion process the microbes are themselves digested and the microbial protein becomes available to the animal. Nevertheless this microbial synthesis is only optimal when the animal receives sufficient energy supplements. Therefore, if sufficient RDP is not available, the rate of digestion of fibrous as well as concentrate rich diets will be reduced. This leads to a reduction in intake, lower energy supply and reduced milk production.

On the other hand, some protein nitrogen can resist microbial breakdown in the rumen and can pass directly to the cows intestine. This feed protein fraction is called by-pass protein which is especially profitable for high-yielding cows. At a low level of productivity a cow can meet her protein requirements entirely from microbial protein and the diet only needs to contain degradable protein. This explains why such a cow can be fed with urea or chicken manure instead of high quality protein can meet the protein requirements. It is therefore important to have the optimum balance of UDP and RDP in the diet. Figure 19 illustrates the increasing requirements for both as milk yield increases.

### **3 Minerals and Vitamins**

The major mineral requirements for dairy cows are calcium and phosphorus. The calcium phosphorus ratio is important, and an imbalance can cause infertility. There are reserves of both elements in the skeleton. Pasture is often deficient in minerals, mainly in phosphorus. In some grazing areas, particularly uplands, dairy cows are subject to a mineral deficiency ( especially during lactation ), thus obvious phosphorus deficiency symptoms are frequently observed (probably caused by very acid soil ); these symptoms include sore legs, animals will limp, show long hooves and depraved appetite (pica). Seashells and fish meal are good mineral sources. Magnesium is frequently required to prevent hypomagnesaemia on grazing animals. All the required minerals can be successfully incorporated in feed blocks supplements.

Animals feeding on green pasture normally receive all vitamins that are needed. Vitamin supplements are often added to balanced rations prepared as feed to be used in animals housed and reared in intensive systems. Vitamin A is one of the most important vitamins in animal nutrition. This vitamin is found in the carotenoid pigment of green plants; Vitamins D, E and K are also present in green plants.

### **4 Nutritional Requirements**

As mentioned above, nutritional needs of cows depend on age, live weight and production levels. The requirements of ME and DCP for maintenance, milk production, pregnancy and live weight change are supplied in table below:

**Table 1. Nutrients requirement of metabolisable energy (ME), in Megajoule(MJ), and crude protein (CP) for maintenance of each cow according to body weight.**

BODY WEIGHT KILOGRAM (KG)	ENERGY REQUIREMENTS MJ ME/DAY	PROTEIN REQUIREMENTS KG CP/DAY
300	34.6	0.288
350	38.8	0.324
400	42.9	0.358
450	46.9	0.391
500	50.8	0.423
550	54.5	0.454

**Table 2. Metabolisable Energy (ME) and crude protein (CP) for production per Kilogram of milk depending on fat content.**

FAT CONTENT (PERCENTAGE)	METABOLISABLE ENERGY (MJ ME/KG OF MILK)	CRUDE PROTEIN (KG/KG OF MILK)
3.4	4.9	0.081
3.6	5.0	0.082
4.0	5.3	0.085

**Table 3. Additional Metabolisable Energy (ME) and Crude Protein (CP.) Requirements for Pregnancy and Live weight changes of dairy cows.**

**4 - 6 weeks before calving**

**Additional Metabolisable Energy      15 - 20 MJ / Day**

**Additional Crude Protein                0.24 - 0.32 Kg CP / Day**

**Allowance for visual assessment by adding 5 to 20 MJ per Day**