DW n° 04: EXPENSES AND NEEDS OF THE ANIMAL

In zootechnics, the concept of expenditure means the amount of energy or matter (nitrogenous, mineral, etc.) used by an animal to maintain its body or to produce various products. At the same time, for their needs, animals must find in their food the constituents that allow the renewal of living matter, its possible increase (growth, gestation) and the synthesis of productions.

The quantities of assimilable nutrients necessary for all these activities define the needs. Net nutritional requirements therefore correspond to the physiological expenditure of the animal for its maintenance and production; expenditure that the animal covers from the nutrients provided by the ration. Food requirements include both nutritional needs and ingestion capacity. To this end, meeting the maintenance and production costs of animals is the basis of rational feeding. The development of a ration involves determining:

- The daily needs of each of his animals.
- Quantities of different foods distributed to each animal to cover these needs
- The method of food distribution (individual or collective).

1. NATURE OF EXPENDITURES AND NEEDS

1.1. Expenses: Depending on the animal, the expenditure is classified into two types: maintenance expenditure which is unproductive but unavoidable and production expenditure which is a productive expenditure but with variable returns.

1.1.1. Maintenance expenses: correspond to the ability of an animal to stay alive, without weight variation and without production of any kind. These are the expenses due to the basic functioning of the organism (basic metabolism) which correspond to the activity of cells and movements of organs (respiration, circulation, internal secretions, muscle tone, hair growth, minimal physical activity).

As these expenses are unproductive, the breeder tends to limit them, for example:

- By reducing heat loss from animals by using windbreak hedges.
- Also reducing thermal regulation costs due to excess heat by promoting shade for the animals.

- By placing the animals in rooms with a stable temperature.

1.1.2. Production expenses: correspond to the realization by an animal of the different productions: growth, fattening, gestation, lactation, egg production, wool, work (they are therefore linked to the synthesis of muscle, fat, fetus, milk, seminal secretions of male breeders, etc.).

NB: *All expenditures incurred by the animal lead to needs that vary depending on the species, physiological stage and production level. In other words, a given expenditure corresponds to a need.*

1.2. Needs: to live and produce, the animal has nutritional needs which are mainly: energy, nitrogen, vitamins, and minerals. We distinguish:

1.2.1. Maintenance requirements: These needs correspond to the quantity of energy and food material necessary to cover the maintenance costs of an animal under normal living conditions without production. "Inactive animal": zero balance without fixation or loss.

These needs vary with the weight of the animal.

1.2.2. Production needs: Production needs must cover the production costs of an "active animal" that produces one or more products (milk, meat, growth, gestation). These needs vary with the animal's performance.

2. DETERMINING THE NEEDS OF THE DAIRY COW

The needs of ruminants (energy, nitrogen and minerals) are given by the feed tables (INRA, 2007), they are expressed in UF, UFL, UFV, grams of MAD, g of PDI, g of Calcium, g of Phosphorus etc....

2.1. Maintenance needs of the dairy cow

Measurements carried out on a thousand dairy cows have shown that maintenance requirements are closely dependent on the metabolic weight of the animal. The following formulas express the daily maintenance requirements of the dairy cow as a function of the animal's live weight (LW):

* Energy: UF = 1.5+ LW / 200 UFL = 1.4 + 0.6 x LW/100

* Nitrogenous substances: MAD = 60 g/100 kg of LW

PDI = 100 + 0.5 LW

* Minerals: Ca = 6 g per 100 kg of weight

P = 4.5 g/100 kg of PV

2.1.2. Milk production requirements: Are determined by the expression of energy and nitrogen requirements for the synthesis of 1 kg of milk at 4% fat.

* Energy :0.4 UF/kg of milk at 4% fat.

0.43 UFL / kg 4% milk.

These values were determined from the net energy quantity (kcal) contained in 1 kg of milk at 4% fat and the metabolic yield KI. That is, 1 kg of milk at 4% fat (fat content) contains 750 net kilocalories, which corresponds to 0.4 UF and 0.43 UFL. In other words, for to synthesize one kg of milk with 4% fat, the cow must consume 0.4 UF or 0.43UFL contained in its feed ration.

* Nitrogenous substances: MAD: 60 g MAD/kg of milk at 4%.

PDI: 48 to 50 g/kg of milk at 4%

* Minerals: Ca: 3.5 to 4 g/kg of 4% milk.

P: 1.7 g/kg of 4% milk.

When the dairy cow produces milk that is not 4% fat, we "normalize" this milk by adjusting its butterfat content by applying the Gaine formula:

* Application of the Gaine formula:

When the fat content of milk expressed by the butterfat content (BF) is different from 4%, its energy content also varies. To take this into account, the quantities of milk (at x% fat) must be converted into milk at 4% BF using Gaine's formula:

$$Q \text{ (kg of milk at 4\%)} = (0.4 + 15\,x)\ L$$

Q: the quantity (in kg) of 4% fat milk.
X: the percentage of MG of the milk produced.

L: the quantity of milk at X% of TB.