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Proteins are important building blocks of animal tissues.

The majority of animal tissues and organs **need proteins and other elements as their building blocks**. Therefore, proteins are needed for the **growth and regeneration of tissues**.

However, **proteins are usually the most expensive element in animals' diets** and **unfortunately they cannot be replaced by any other element**. Unluckily carbohydrates, which can be converted into lipids (fat deposition) and lipids into carbohydrates, no element can be converted into proteins.

Therefore, proteins must be present in the diet.

Due to the importance and high price of proteins in animal nutrition, in this article we present and describe some affordable protein sources. The approximate nutritional value for crude proteins (CP) is also given. The availability and price of the protein sources mentioned below will vary in different countries. Finding your best option is crucial for a successful and profitable farming.

The most common protein sources

1. **Oilcakes** (the by-product of the oil extraction of oilseeds) **are optimal sources of proteins**. Their protein content is very high and since they are crops by-products they are usually

affordable. **Soybean meal** (50%), **cottonseed cake** (45%), **sunflower meal** (35%), **oil palm kernel expeller** (18%), **rape seed meal** (40%) and **copra meal** (23%) are some of the most used oilseed cakes. However, if there is a lack of a well-established oil industry in the country, oilcakes need to be imported and this increases their price significantly.

2. **Breweries and bioethanol production by-products** such as **dry distiller's grain** (30%), **brewer's grain** (25%) and **maize gluten feed** (20%) can also be used as good source of proteins. Their availability and affordability depends again on the presence of the main industry.
3. **Local shrub pods** such as **camel thorn pods** (*Acacia erioloba*) (14%), arabic gum tree/ scented thorn (*Acacia nilotica*) (18%), sickle bush pods (*Dichrostacys cinerea*) (25%), prosopis pods etc. are an available an inexpensive source of protein. If the species is responsible for or suspected to cause bush encroachment, the **pods should be proper hammer milled to avoid spreading the seeds through the faeces** (watch out: the seeds would grow even better after being fed to animals!).
4. **Some leaves and straws** such as **cassava leaves** (25%) and legumes can be used as protein sources if any of the afore-mentioned sources are available. **Groundnut straw** (12%) **also contain higher protein content than cereals**.
5. **Non-Protein Nitrogen (NPN)**. **Ruminants contain numerous microorganism in the rumen that are able to use nitrogen to produce proteins**, this is why non-protein nitrogen (NPN, mainly urea) is usually added to ruminant feed. Although adding urea is a cheaper strategy than adding natural proteins, farmers should keep in mind that the results are not comparable! **Do not forget to add some readily available sugar source** (molasses, prickly pear) for

the microorganism to get energy to use these Nitrogen to produce their proteins!

6. For monogastric animals (swine and poultry) the **use of insects and worms**, such as **mealworm** (*Tenebrio molitor*) (52,8%) and black soldier fly (*Hermetia illucens*) (42,1%) as well as fish meal can be good alternatives.

Regarding how to measure the protein content, as we mentioned last week when we've discussed about the importance of understanding the laboratory analysis, **crude protein (CP)** is the traditional way of determining the **protein content**. For complete feeds the values should be around 14%. If we instead consider the feed as a supplement for grazing animals in the dry season, then the protein content should be higher, around 18%.

As we also mentioned, this way of measurement is being substituted by **true protein**, due to the fact that crude protein estimates the protein content measuring the nitrogen content, therefore the NPN is also read as protein. Hence we must be **extremely careful** when analysing feeds that contain NPN.

When urea is added to a low protein feed, very high values of CP can be obtained (up to 18% CP).

Remember, the true protein content of the feed is low, it is only that the nitrogen contained in the urea is read as a protein. The best would be to analyse the feed for true protein, but if there is no laboratory in your area that can perform these analyses, you should analyse the feed before adding the urea and estimate that urea will only "slightly" increase the protein content.