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CROP RESIDUES FOR ANIMAL FEEDING

Crop Residues for Animal Feeding

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Introduction

To address problems associated with poverty and food shortages, scientists are investigating alternative food sources and evaluating present land use and utilization of food. Thus, feeding grains to ruminants is questioned because man, a monogastric, can utilize grains directly. On the other hand, ruminants are characterized by their ability to convert low quality roughage to products that are useful to man e.g. meat, milk, natural fibres, leather and manure. Ideally, ruminants should:

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- graze non-arable areas
- utilize crop residues.

When crops are reaped, residues become available. Thus, when reaping cabbages, discarded leaves comprise up to 6 tons of edible dry matter per ha. Often markets collapse (e.g. potatoes) and it is too expensive to send produce to market and this "waste" (crop residue) becomes available for animal feeding. Carrots damaged at harvesting or discarded because of poor quality, comprise a good ruminant feed when fed with carrot tops.

After reaping, the first decision the farmer has to make is whether the residues must be left on the land, *i.e.* ploughed in, or utilized in some other way. Composting the residues is another alternative. The decision to plough residues into the soil or composting it is usually affected by the need for roughage e.g. in times of drought and feed shortages, low nutritional value is less important than availability and relatively higher costs of feeds could make crop residues a viable proposition.

Crops and crop residues

Although almost any crop residue can be fed to livestock, the residues of maize, sugar cane, grain sorghum, soybean, wheat and vegetables are usually involved in animal feeding.

The first essential step when deciding to use any product as feed, is to prevent losses resulting from the presence of toxins and poisons. Poisoning can range from acute cases where animals die when ingesting the poison, to very low levels of poisoning where the consequence of ingesting a deleterious substance can only be measured as a negative effect on performance. Poor growth or a reduced ability to fatten can be the sole indicators that there is a problem, but, unfortunately, these symptoms are not specific to poisoning. Toxicity can arise when nutrients, although present and often required in the normal diet, fed in excess or in imbalance with other nutrients, result in poisoning of an animal's normal production systems. Poisons in feeds also include substances produced by the crop itself, poisons applied to the crop (e.g. insecticides or herbicides) and toxins produced by molds and fungi. Steps to prevent problems are:

- when a farmer is unfamiliar with the feeding qualities of the relevant crop residues, enquiries concerning the suitability of the residues as animal feed can be directed to an agricultural advisor or the literature could be consulted
- an effort must be made to find out if the residues were exposed to moisture for any length of time and if so, the residues must be examined for signs of fungal growth or, even better, the crop residue can be tested for fungal toxins
- farmers must always be aware of the potential danger lurking where man-made poisons are sprayed onto crops, and directions for the safe use of these products must be followed
- poor animal performance must always be investigated to find out possible causes.

Problems experienced when feeding crop residues include:

- bloat, although uncommon
- many crops are prone to regrowth and the young shoots cause prussic acid poisoning - the sorghums are known for this problem when late rains and high temperatures stimulate plant growth
- the brassicas (cabbage, cauliflower, brussel sprouts) all produce substances that block the uptake of iodine and when animals graze these crops or the residues for a long, uninterrupted period, iodine deficiency symptoms occur (e.g. abortions and death of young animals)
- some crops produce toxins, which include the trypsin inhibitors of soybeans (not a problem for ruminants) and solanin, which is present in the leaves of many plants, especially potatoes
- livestock can choke on tubers, maize cobs and other large pieces of food
- blockage of the oesophagus in ruminants, which happens when animals only succeed in partly swallowing solid pieces of food such as tubers of potatoes, carrots or radishes, results in severe bloat and death.

Prussic acid (hydrocyanic acid) poisoning can be prevented by feeding a sulphur-containing lick to the animals, or better, lace the drinking water with "hypo" (sodium thiosulphate). Poisoning with prussic acid can be avoided by preventing livestock from grazing sorghum that was frosted or the young regrowth of the crop. Where potato leaves are fed as a small proportion of the diet, animals do not ingest enough solanin to cause major upsets, although

production can be suppressed. Feeding of potato leaves should therefore only be undertaken in times of major food shortages. It is noteworthy that potatoes (which is a high energy feed for ruminants and monogastrics) that have been exposed to light and are greening, also produce toxic levels of solanin. It is good practice to chop up tubers of any crop (e.g. potatoes, carrots, radish) before feeding to prevent choking or blockage of the oesophagus.

Yield and quality

The quantity of available crop residues is affected by all the factors that normally affect the yield of a crop. Another important factor affecting the quantity of residue available for feeding, is that animals graze selectively, usually utilizing only certain parts of a plant or specific fractions of crop residues. When grazing residues, trampling contributes to the loss of edible material. Collecting the residues and processing it (e.g. milling) increases the amount of residue ingested by the animal, but is associated with reduced animal performance because animals are forced to eat lower quality material. Intake and quality can be improved by additives e.g. spraying residues with molasses or feeding a rumen-stimulating lick such as one containing urea.

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A number of factors affect the quality of residues, including:

- weathering occurs when left for a time before grazing commences, leaching of nutrients and damage by rain can severely reduce the nutritional value of crop residues
- mode of harvesting has been shown to affect quality of residues significantly, especially the amount of wastage of grain (more grain left on the land results in a higher quality residue) that takes place at harvesting as well as the extent to which the harvesting process shatters coarse plant parts such as stems
- cultivar plays a role
- plant density and crop yield has an effect
- with grain crops, where grain formation is limited by factors such as drought, the residues often are of higher quality because nutrients are not translocated from the stem and leaf to the grain.

Supplementation

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Conclusion

Crop residues are a valuable source of animal feed and utilizing the residues by grazing is very effective in returning plant nutrients to the soil. In the USA, pigs are often used with cattle to utilize crop residues, whereas in South Africa, beef cattle alone or cattle with sheep are more commonly used. It is important to bear in mind that crop residues are low quality feeds and should therefore not be used for high producing animals like lactating cows or animals being finished for slaughter. Strategies worthy of consideration include:

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- crop residues are retained for wintering beef cows or sheep (non-lactating)
- crops can be undersown with companion crops to enhance nutritional value of the residues
- supplements can be used to enhance nutritional value of the residues
- cattle or sheep can graze residues in addition to grazing quality pastures for a fixed period each day.

Excluding the first-mentioned strategy, little or no data is available on the best procedures to follow and for the time being, farmers will have to test some of these possibilities for their own situations.