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How does chopping improve forage utilization?

For more than thirty years research projects and practical demonstrations have shown that chopping forages improves animal production. The equipment available to accomplish this task continues to improve to the point where precision chopping and blending of forages and grain is now possible.

Understanding how this improvement happens will assist us in making the most of forage supplies particularly where quality and quantity are strained.

How does chopping improve forage utilization?

For this answer we can look at the way an animal's body reacts to the ration it receives. We are considering a mature animal eating unprocessed forages as would be the case in a winter ration for a gestating cow or ewe. The principle action is to chew repeatedly what is being fed until it is reduced below the minimum size which can escape the rumen. Regurgitation and further chewing continues to occur which also adds saliva containing recycled urea. Once a forage particle is one millimeter or smaller it can pass through the rumen mat and enter the small intestine. At this point it has lost buoyance and will descend through the rumen mat. Buoyancy comes from gasses trapped in the cells of the forage. This process of chewing and rumination is separating fibers containing carbohydrates and protein and allowing the rumen bacteria access, to attach to, and penetrate the fibres and begin producing energy in the form of volatile fatty acids. The energy is consumed along with recycled urea, free ammonia, and amino acids to produce more rumen bacteria. As managers we know we must meet the daily nutrient requirements of the animal and this is dependent on the speed at which forages leave the rumen, the size of the rumen, and the level of indigestible substances in the forage.

An animal eats to feel full and next to feel good. Examination of the rumen contents of grazing animals shows that they select higher digestible plants out of the pasture through selective grazing. Essentially they are sorting the pasture plants and picking what they want to eat. The same can be seen when dry forages are fed in unprocessed forms. A common observation is that leaves and other less fibrous material is consumed before longer stem more fibrous material. This practice is a learned behaviour and is done to support a faster rumen comfort and rate of passage so the animal can eat more in a day. It becomes evident that chopping forages supports a quicker rate of passage by presenting particles which need less chewing and rumination to reach the size necessary to leave the rumen. In addition the process of chopping opens the forage stems to bacteria allowing digestion to begin quicker. Digestion is the process of extracting nutrients which the body can utilize for maintenance and growth. Long hay presents natural barriers to penetration which take longer for rumen bacteria to overcome slowing digestion and rate of passage.

Forage test results report the carbohydrate portion as Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF). These are not actual nutrients, but rather categories of carbohydrates. NDF contains both cellulose and hemicellulose while ADF contains hemicellulose and lignin. NDF predicts intake amounts and ADF predicts digestibility. When the diet is high in NDF and ADF the cells of the digestive organs expand because they have to work longer and harder to extract nutrients from the forages being consumed. We note that the nutrient requirements for maintenance are also related to body size and diet, and require a significant part of the daily nutrient intake. The larger the weight of the digestive



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organs the more dietary nutrients required to maintain health and function. So medium and low quality forages benefit most from chopping because rate of passage is increased due to the reduced size of dietary particles being consumed which increases net daily intake of nutrients.

All models of the CFR Bale Pro® can be fitted with Highline's patented Feed Chopper™, Metered Grain Insertion (MGI™) grain tank, and scale kit providing the most advanced forage processing machines available today.

In summary precision chopping of forages:

- help the rumen bacteria process the diet by opening up the high fibre material.
- speeds up the rate at which the diet leaves the rumen increasing the amount of food the animal can eat daily.
- homogenizes the plant material in the windrow thoroughly mixing small and large particles.
- benefits medium and low quality forages most but allowing greater net daily intake of nutrients.

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