Land fact

Assessing Hay Quality for Livestock Production (LF-AP-N-3)

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Introduction

Pastures and crops are utilised as the main source of nutrition for a number of livestock species. Therefore, providing animals with the best quality feed available is important, particularly for growing stock, as quality will ultimately drive production. By paying careful attention to the quality of hay, you can minimise the need to purchase concentrate feeds (grains) to meet animals' nutritional requirements, and also ensure healthy livestock.

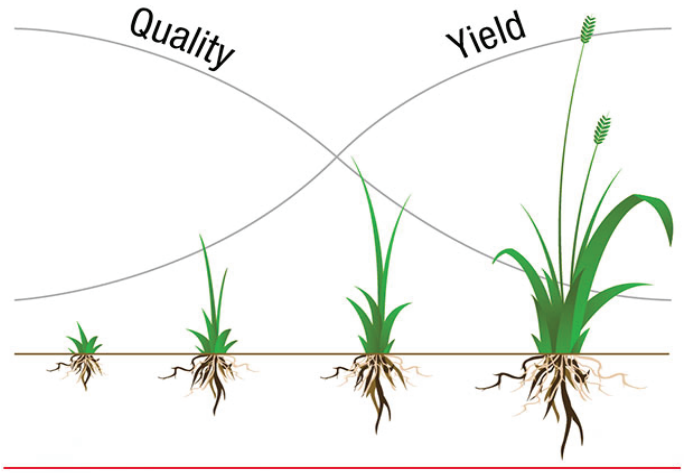
Hay quality refers to the ability of that hay to meet the nutritional needs of a particular animal. A hay that meets the nutritional requirements of a dry cow would certainly not meet those of a lactating cow. You need to consider the requirements of your animals when you are evaluating hay quality. Individual animal performance is reflected by the quality of a hay.

What affects quality?

Timing

One of the factors that affects the quality of hay is the stage of maturity of the plant when it was cut. When forage plants are in a vegetative growth phase, they are at their best quality. This is early on in the growing season when the plants are young and actively growing. This is characterised by leafy growth, and the plants contain high concentrations of protein, minerals, sugar and starches. As the plants grow, they enter a reproductive phase which is marked by elongated stems and the development of seed heads which result in the highest yield, but lower quality. The dry matter in mature plants contains less nutrients and more fibre. The greater the fibre content of the hay, the less digestible it is. The best quality hays, therefore, contain more leaves and fewer seed heads and stems.

FIGURE 1 Interaction of forage quality and yield



Source: University of Minnesota Extension

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Digestibility

Digestibility is a useful measure of quality.
It is positively related to energy content (MJ ME/kg DM).

The higher the digestibility, the higher the energy content.

Digestibility is positively related to protein. When digestibility of the plant is high, protein content will also be high.

Digestibility also relates to speed of digestion (the movement of feed through the animal). Feed higher in digestibility will be digested more rapidly by the animals, which allows for higher intake, leading to increased animal production.

Digestibility is an animal's ability to utilise feed in a manner that provides necessary nutrients for the animal's bodily functions (growth, maintenance, pregnancy and lactation). If a feed is less digestible, an animal will have to eat more of it to meet its nutritional requirements. There is then a chance that the animal will satisfy their appetite before they meet their nutritional requirements and this is when weight loss occurs.

Cutting and baling methods

Hay quality also depends on how it was harvested, handled and stored. When the forage is cut and conditioned, the conditioning process mildly squashes the plant material. This promotes faster and more even drying of the plant material, resulting in better quality hay.

The leaf to stem ratio is also an indicator of hay quality.

This will be influenced by plant species, stage of maturity, seasonal conditions up to time of bailing, plant disease, insect damage and moisture at bailing. As the leaf to stem ratio decreases (less leaf, more stem) the hay quality decreases. Similarly, hay that is cut late in the growing season and is relatively mature, will have much higher NDF (Neutral Detergent Fibre – see later for explanation) levels, which in turn means lower protein and energy levels. Under these conditions hay may only be suitable for a maintenance ration due to its lower quality.

Hay quality can also vary with different forage species.

Legumes in general are harder to dry than grasses due to their thicker, coarser stems. The risk with legume hay is that leaving it in a paddock for a period of time long enough to dry the stems, risks over drying the leaves (most nutritious part). It can then get to a point where the leaves shatter and break off the stems. As the leaves then don't make it into the bale of hay, this lowers the quality.

Hay storage

How well your hay is likely to age depends on storage. If hay is left outside, its quality will deteriorate faster than if it has been stored in a shed and protected from the weather.

Contaminants in hay

Weeds usually have lower feed value, and some species can also be toxic to livestock. Good quality hay comes from a healthy crop or pasture that has no to minimal weeds in them. Hay balers may also pick up foreign objects - for example, pieces of poly pipe, wire, sticks, stones, dirt clumps and general rubbish can sometimes make their way into hay. These can be a huge threat to animal health, which is why it is important that good quality hay be free from foreign objects. Dirt clumps/soil can also increase the inorganic ash content and chemical residues in the hay bale.

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Assessing hay quality

Generally, you are able to get a sense of the quality of hay with a visual assessment. The following characteristics can give you an indication of the hay quality:

Maturity – better quality hay will have a high proportion of leaves in the bale, with minimal coarse stems or seed heads.

Condition – there will be minimal dust or mould in good quality hay.

Colour and smell – good quality hay will be a nice, green colour and have a sweet, fresh smell. Be careful when smelling hay (use your discretion).

Touch – good hay will be soft and leaves won't shatter when handled.

Foreign material – the hay should be free from foreign objects such as sticks, stones, and rubbish. Also look out for weeds that can be toxic to livestock or spread to your farm.

Visual assessment can help you to identify hay that is poorer quality, but it won't help you to assess the feed value. For a measurement of the nutritional content of the hay, you need a laboratory testing service for the analysis . When purchasing hay, most reputable dealers will have a feed test available. Ask if a feed test has been conducted and if you are able to see the analysis. If an analysis hasn't been undertaken, ask if they are willing to submit a sample to be analysed. The feed analysis report will have will have results for all or some of the following:

Dry Matter % (DM) – is the proportion of the sample that is left after the water is extracted from it. This component contains the protein, energy, vitamins and minerals needed by animals for maintenance and production.

Neutral Detergent Fibre % (NDF) – is the most common measure of fibre used in animal feed analysis. It measures the most structural component of a plant. NDF is a predictor of voluntary intake as it reflects the amount of forage an animal can consume. Lower NDF values are more favourable because when forage plants age with maturity, NDF values increase.

Acid Detergent Fibre % (ADF) – a measure of the least digestible plant components. ADF values are negatively related to digestibility and energy. Feed with low ADF % are higher in digestible energy.

Crude Protein % - measures the nitrogen component in the feedstuff, and includes true protein and non-protein nitrogen sources.

Inorganic Ash % - is a measure of the inorganic matter contained in the feedstuff.

Organic Matter % - is everything that is present in the feedstuff, except ash.

DMD (Dry Matter Digestibility) % - the amount of the feedstuff that is digestible by the animal.

DOMD (Digestible Organic Matter in the Dry Matter) % - the proportion of organic matter in the dry matter that can be digested by the animal.

Metabolisable Energy (MJ ME/kg DM) – the amount of energy that is available in the feedstuff to an animal for maintenance, production and reproduction.

All of these values are expressed as a percentage of dry matter, except for metabolisable energy, which is expressed as MJ ME/kg DM (megajoules of metabolisable energy per kg of dry matter).

How do I take an accurate sample?

The feed analysis of hay will only be as accurate as the sample taken. To get an accurate sample, use a hay corer that takes a core from a bale of hay. "Grab" samples of hay are less accurate at determining the overall quality of hay unless sufficient grab samples are taken to represent the hayIf grab samples are to be used, samples from inside the bale of hay rather than from the edges, need to be taken. A number of core samples will contain a better distribution of plant material, and will result in a more accurate feed analysis. Samples should be taken from the end of square bales, and from the side of round bales and hay stacks. To obtain an accurate estimate of the feed value of the hay, 20-30 percent of the bales must be sampled.

Once you take the sample, it is best to send it straight away to the laboratory for analysis to reduce the risk of deterioration. Taking and submitting samples early in the week is advised.

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Cost of good v poor quality hay

Hay can be an expensive commodity but proves even more costly if the feed test analysis shows the hay is low quality. You may also affect livestock production by not matching hay quality with the nutritional requirements of the animal.

For example - two lots of vetch hay have been purchased, both at $230/t*. Feed quality analysis of both lots showed metabolisable energy values of 8.5 MJ ME/kg DM for one sample and 10.2 MJ ME/kg DM for the other sample.
A lactating 500kg cow, for example, needs 110 MJ ME/kg DM (with a 6 week old calf at foot) on a daily basis.
The cost difference is as follows.

Requirements:

Sample 1 8.5 MJ ME/kg DM
500kg lactating cow needs 13kg hay/day
= $2.99/day or $20.93/week (hay at $230/t*)

Sample 2 10.2 MJ ME/kg DM
500kg lactating cow needs 11kg hay/day
= $2.53/day or $17.71/week (hay at $230/t*)

**pricing accurate as of February 2022. Price quoted per tonne is ex farm.*

The hay that tested higher in MJ ME/kg DM, means you won't be required to feed the cow as much. By purchasing the better quality hay at the same price per tonne, there is a saving of $3.22/cow/week, or $38.64/cow over a 12 week period. If you are feeding 100 cows, by purchasing the better quality hay at the same price per tonne, you will be saving $3864.00 in that 12 week feeding period. By knowing the nutritional analysis of the hay, you are able to give the animals their exact requirements, which takes the guesswork out of how much to feed different classes of stock, and in turn will save money.

Getting a feed analysis done may cost time and money, but can certainly prove valuable and would be offset in terms of matching the nutritional requirements of animals to the quality of hay.

References

BENNET, T. Hay Quality, Sheep Connect SA [online]. Available at: sheepconnectsa.com.au/management/nutrition/hay-quality

MAJEWSKI, C. Hay Quality. University New Hampshire Extension, [online]. Available at: extension.unh.edu/sites/default/files/migrated_unmanaged_files/Resource000028_Rep28.pdf

NSW DPI Feed Quality Service (2007) Interpreting The Feed Analysis Report, [online]. Available at: dpi.nsw.gov.au/__data/assets/pdf_file/0005/595256/Interpreting-the-feed-analysis-report.pdf

RASBY, R. DR and Martin, J. Understanding Feed Analysis. University of Nebraska-Lincoln, [online]. Available at: beef.unl.edu/learning/feedanalysis.html

WOHLTMAN, S. (2018) Maturities in forages and grasses and why it matters. Progressive Forage [online]. Available at: progressiveforage.com/forage-production/planting/maturities-in-forage-grasses-and-why-it-matters

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For further information on interpreting a feed analysis report, please refer to the NSW DPI Feed Quality Service Interpreting the Feed Analysis Report Fact Sheet, or call your Local Land Services Livestock Officer.

We're here to help!

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