

Using NIRS Leaf Percentage Analysis to Determine Harvest Efficiency

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Many farmers have harvested alfalfa and then found it did not have the expected forage quality. The common reason for low Relative Forage Quality (RFQ) is leaf loss before or during harvest. Further, leaf loss results in a yield loss that may not be noted. A new forage analysis, Leaf Percentage, may help to determine the cause. This analysis is an estimate of leaf percentage of pure alfalfa hay, haylage, or fresh forage developed by Forage Genetics International Research (David Weakley and Charles Rodgers).

The basic concept is alfalfa is about 50% leaves (+ 5%) and 50% stems, on a dry matter basis, at mid-bud to early flower. Lesser leaf percentages of harvested forage generally indicate leaf loss.

Leaves are about 30% crude protein and 500 to 550 Relative Forage Quality while stems are about 6% to 8% protein and 70 to 80 RFQ. Thus, the loss of leaves is both a yield loss and a forage quality loss.

The table (below) shows the amount of yield and quality loss when harvested forage is 40 or 30% leaves (representing a 10 or 20% leaf loss, respectively). Note, a 10% leaf loss can result in a 46 pt decline in Relative Forage Quality and 15 lb/acre reduced protein.

Assuming yield at 2 t/a dm, hay value at \$247/t, RFQ value of \$1/pt, and soybean meal at \$416.00/t, the economic value of the loss is presented in the right side of the table. A 10% leaf loss from a 2 ton/a yield represents a yield and quality loss of \$146.82/acre!

Leaf %	Change due to Leaf Loss			Calculated \$ Loss per Acre			
	Yield, t/a DM	RFQ ¹	Protein, lb ²	Yield	RFQ	Protein	Total
50	0.00	170	0	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00
40	-0.20	124	-15	\$49.40	\$ 92.00	\$ 5.42	\$146.82
30	-0.40	78	-30	\$98.80	\$184.00	\$10.83	\$293.63

¹Calculated as 170 minus leaf loss (from 50%) times 4.6 (RFQ change per 1% leaf content change).

²Calculated as yield loss times difference between D6 and 35% (assumed leaf protein content) times assumed bypass percentage (0.25, Robinson, Proceedings of California Alfalfa Symposium 1998).

In summary, examine the alfalfa hay you are making and determine if it has significantly less than 50% leaves. Each percent leaf loss results in approximately \$7 per ton loss from yield, forage quality, and protein content at current market prices.

This analysis can be particularly important if you have new equipment, new employees, or a new contract harvester to ensure that equipment is properly adjusted and operated to minimize your yield and quality loss during harvest.

Additionally, knowing the leaf percentage of alfalfa can be useful to the nutritionist. Quality alfalfa generally has a rate of passage in the cow of 5 to 6% per hour while the alfalfa stem material has a rate of passage of 3 to 4% per hour; thus, high stem percentage alfalfa (greater than 60%) will have lower rates of passage and reduced dry matter intake compared to leafy alfalfa. The undigested NDF (uNDF) of stems is also higher than that of leaves.