Harvest Management: Prevent Forage Harvesting Losses
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Harvest Management:

Prevent Forage Harvesting Losses

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The harvesting system and management practices you use significantly affect the quantity and quality of forages you preserve during harvest. This report discusses origins of harvesting losses, how these losses can be prevented, and their effect on income from forage production.

Forages are generally harvested by three methods: field-cured hay, haylage and silage. For discussion purposes each are defined as follows:

a) hay—forage dried in the field to dry matter of 75% or greater

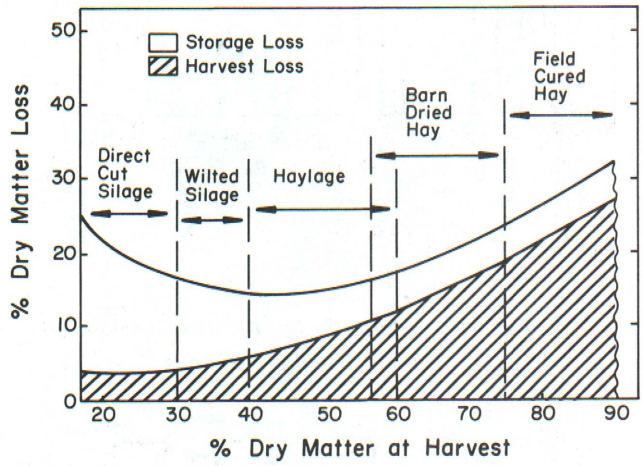
b) haylage—forage chopped and stored in a silo at 40-60% dry matter

c) silage—forage chopped and stored in a silo at 30-40% dry matter

By definition, the primary difference between systems is forage dry matter (DM) content at storage.

The harvesting system you use affects the amount of DM lost during harvesting and this is a reflection of the dry matter content at harvest. Dry matter losses during harvest and storage are depicted in Fig. 1. Dry matter losses increase as forage DM at harvest increases. Harvesting losses account for 5-8% of the forage crop when harvested as silage, 8-10% as haylage and 15-28% as dry hay. Storage losses are discussed in Extension Bulletin E-803.

FIGURE 1. Dry Matter Losses Occurring in Forages by Haying System



The effect of harvest system on dry matter and protein losses is shown in Fig. 2. Dry matter losses during harvest ranged from 7 to 12% for silage and from 14 to 25% for field-cured hay. Dry matter losses were 14% for haylage but 31% for rain-damaged hay. Protein losses during harvest were 4.6% for both silage and haylage and 24.7% for field-cured hay. Rain caused protein losses of almost 42%. The magnitude of these losses reflects again the impact of forage DM percent at harvest. These data indicate that harvest losses are substantial, especially as forage dry matter increases. They also illustrate that improved harvesting techniques should reduce harvesting losses.

Most harvesting loss results from leaves and small stems shattered during harvesting operations. Data in Fig. 3 show the fate of leaves by harvesting system. Hay retained 60% of the leaves present in the standing crop; silage retained 80%. Rain-damaged hay retained only 40% of its leaves, but this figure depends on the severity of rain damage and subsequent handling. Data are not available for haylage but leaf loss would be expected to be intermediate to that of hay and silage. Leaf loss occurs by shattering during mechanical handling, especially windrowing of partially dried forage. Windrowing losses are reduced substantially by windrowing when hay contains 35-40% moisture. Dry matter loss during baling was 23% for legumes but only 10% for a grass-legume mixture.

FIGURE 2
Dry Matter and Protein Losses by Harvesting System

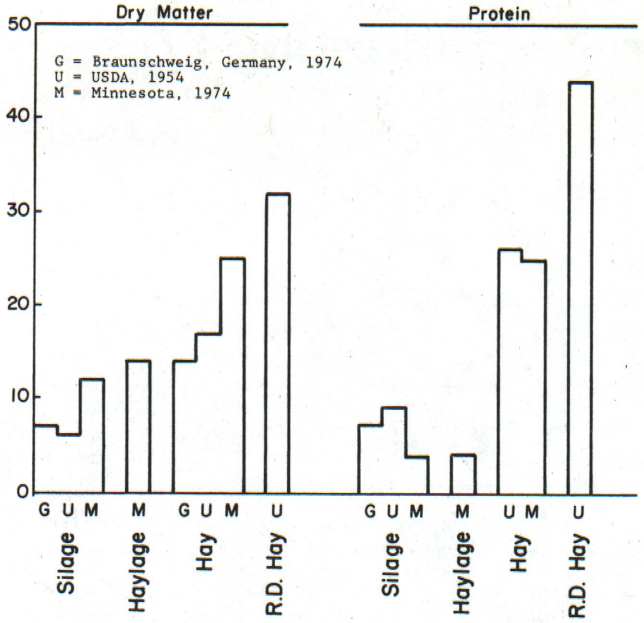
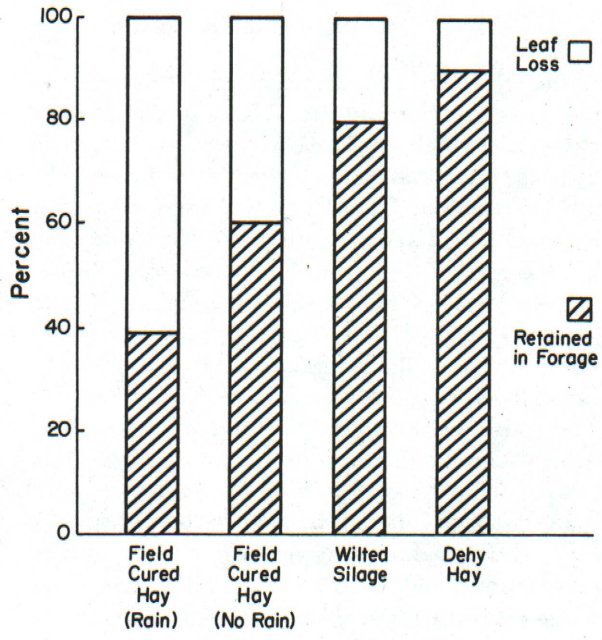


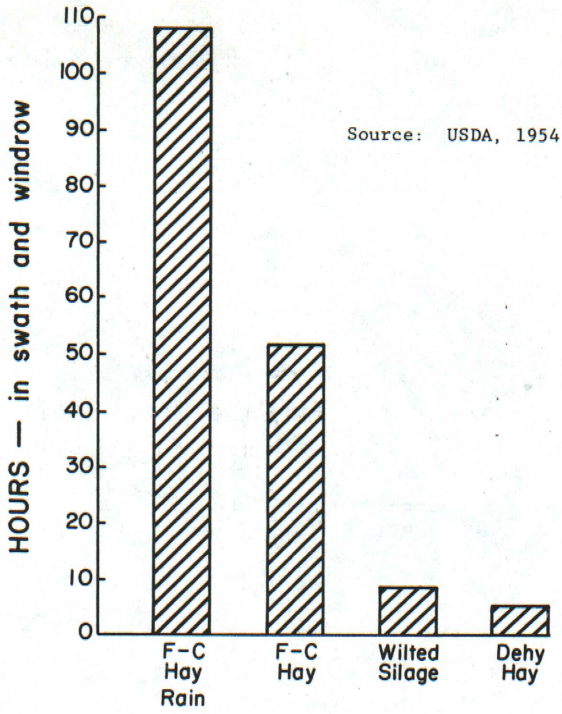
FIGURE 3. **Fate of Leaves from Alfalfa Harvested by Different Methods**



Source: USDA, 1954

Forage cut at the proper stage of spring growth may contain only 18-22% DM. The forage is then left in the swath or windrow to dry before harvesting. The time required between cutting and harvesting reported in one experiment is shown in Fig. 4. Wilted silage required about 10 hours to dry to a suitable DM level whereas hay required 50 hours to dry. This 40-hour difference

FIGURE 4. **Comparative length of time forage lies in swath and windrow when harvested by different methods**



greatly increases the chance of rain damage to the down forage. When rain occurred, an average of about 4.5 days was required to reach a suitable DM for harvesting.

Several factors influence drying rate. Weather is undoubtedly the most critical factor. Forages dry rapidly when exposed to sunshine, low humidity, and a light breeze. These climatic conditions are a haymaker's dream. Under similar weather conditions, a high yield requires longer to dry than a low yield. Research has shown that drying time can be cut in half if forage is cut and *conditioned* (not simply cut) regardless of storage system. Dry matter losses are also reduced by 50% by cutting and conditioning. The major physical characteristic of the forage affecting drying rate is leaf-stem ratio. Leaves dry 10 times faster than stems. Much of the moisture lost from stems is lost through the leaves. Forages with a high leaf-stem ratio (early cut forages) will dry faster than those with a low ratio, if other factors are equal.

A comparison of the milk production potential of rain-damaged hay, field-cured hay and wilted silage is shown in Table 1. Little differences in DM preserved per acre and milk production potential were observed between hay and silage. Both hay and silage were far superior to rain-damaged hay in both yield and milk production potential.

TABLE 1. Potential milk production per acre of alfalfa harvested as field cured hay, rain damaged hay or silage

Forages	Dry matter preserve/ acre	Relative milk production from other forages compared with Field cured hay	Rain damaged hay
	%	%	%
Rain damaged hay	63.0	80.3	100.0
Field cured hay	79.0	100.0	124.6
Wilted silage	83.2	105.3	131.2

Source: Shepherd, J. B. et al., USDA Tech. Bull. No. 1079, 1954.

Thus, the average hay produced 11,250 pounds of milk per acre of harvested forage. Rain damage limited milk production to only 7,200 pounds of milk per acre whereas improved harvesting nearly doubled milk per acre above that of rain-damaged hay. The 10% decrease in harvesting losses from the average losses resulted in a 137 dollar increase in return per acre. Returns from rain-damaged hay were exceedingly low.

Rain damage severely limits both forage yield and milk production, but reduced harvesting losses increase forage yield and milk production. The forage harvested with 15% loss would be of much higher quality requiring less concentrate feeds.

ECONOMIC IMPACT OF REDUCED HARVESTING LOSSES

A reduction of harvesting losses has considerable impact on dollars returned per acre of harvested forage. Calculations in Table 2 illustrate this impact. Three dry matter recoveries of available forage for harvesting are given. An average of 25% of dry matter is lost during baling; the minimum expected loss with one inch of rain falling at each cutting is about 40%; and a 15% loss can be expected under conditions of excellent management. Five tons of forage is available per acre per year. Under the imposed conditions, 4000, 2500 and 1500 pounds of forage are left in the field for systems with 40, 25 and 15% losses. Since leaves are the major plant part lost, milk production potential (MPP) is inversely related to losses.

TABLE 2. Dollar value for reduced harvest losses

Item	Percent dry matter lost 40	25	15
Forage available (lb/acre)	10,000	10,000	10,000
Forage harvested (lb/acre)	6,000	7,500	8,500
Milk production potential (%)	80	100	109
Milk production (lb)	36	45	49
Forage intake (lb)	30	30	30
Milk/acre	7,200	11,250	13,883
Dollars/acre ($)[a]	648	1,013	1,250

[a]Milk at $9.00/cwt.

STEPS TO REDUCE HARVESTING LOSSES

1. Keep equipment in good condition: Faulty equipment (unsharpened mower blades, broken sections and missing rake teeth) leaves forage in the field. Check each piece of equipment, both to insure top-notch performance and to reduce losses and likelihood of equipment breakdown during operation.

2. Check weather forecast daily: Weather conditions during harvesting are critical. Rain damage not only lowers quantity and quality but increases the total harvesting time. It is better to delay cutting than to suffer rain damage.

3. Mowing, windrowing and baling: Mowing followed by conditioning reduces drying time and field losses each by about 50%. If windrowing is necessary, moisture content should be greater than 30%. Below this level, the plant shatters. Begin baling at about 20% moisture. Hay can be stored safely at this level and further field drying occurs. For all operations, use the proper ground speed.

4. Store bales immediately: Bales which are rained on in the field often have to be broken to dry and rebaled to allow safe storage. Never bale more than you can handle safely if rainfall is imminent.

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