ECONOMIC CONSEQUENCES OF FORAGE HARVEST AND STORAGE LOSSES

Foremost among the improvements needed in forage crops production and management is increased forage quality. A high-quality forage is one that is consumed in large amounts per unit of time and contains a large amount of digestible energy. These qualities permit intake of digestible energy in amounts in excess of maintenance requirements. The greater this difference, the higher the animal output will be.

Forage quality is closely associated with maturity of the herbage. Very young herbage may reach 70 percent digestibility. Alfalfa-grass mixtures in Ohio (Hibbs and Conrad, 1975) at prebud stage had 66.8 percent digestibility, declining at a rate of 0.28 percent/day to 55.8 percent at maturity. Much of our hay and hay crop silage is harvested at growth stages that average 55 to 60 percent digestibility -- seven to nine digestibility units below the practical maximum. This results from limited harvesting capacity per day, weather delays and damage, and a lack of appreciation by farmers and many farm advisors of the importance of forage quality for animal production. Furthermore, physical and biological losses experienced with current harvest and storage methods commonly reach 20 to 25 percent of dry matter and an even greater decrease in digestibility.

Losses during harvest and storage can have disastrous economic consequences for the farmer. Data presented by Hodgson (1980) illustrates the impact of three hypothetical, yet not unrealistic, loss levels on dry matter digestibility (DMD), digestible energy (DE) consumption, and milk production (Table 1). Loss level (a) is routinely experienced with our best hay-making procedures and favorable weather during harvest. Loss level (b) could be expected if the cut forage is rained on once and loss level (c) occurs after more than one wetting by rain. The data are for alfalfa cut at first bloom. Delayed harvest plus harvest losses compound the economic loss.

Hodgson's data indicate that, even with good weather during harvest and very good hay-making procedures (loss level a), we are realizing only about 56 percent of the potential milk production that would be possible if we could get all the digestible energy in the standing crop into the cow. With poor weather, Hodgson indicates that we may realize only 40 percent, or less, of potential. The inability of dairymen to exploit the potential milk production per acre in alfalfa is very costly. The value of the potential milk yield of bud stage alfalfa having 68% DMD is about
$1340 per acre (milk valued at $13.60/cwt). The value of milk production with best current harvest technology, as illustrated by loss level (a) in Table 1, is about $755 per acre; with loss level (c) the value declines to about $105 per acre. This clearly shows why farmers feed large quantities of grain to dairy cattle. It also shows that there is great opportunity to exploit forages more fully. Hodgson points out that, in ration balancing, animal nutritionists usually value alfalfa hay at about 55% DMD, about equivalent to loss level (b) of Table 1.

Table 1. Effects of post harvest losses on alfalfa quality and animal production.1 Loss Levels: (a) 10% of dry matter and reduce DMD to 60%; (b) 15% of dry matter and reduce DMD to 57% and; (c) 25% of dry matter and reduce DMD to 50%

<table>
<thead>
<tr>
<th>Loss Level</th>
<th>DMD %</th>
<th>DE/Acre Mcal</th>
<th>DE/Day Consumed Mcal</th>
<th>Milk Produced lb/day</th>
<th>Milk Produced lb/acre</th>
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<tbody>
<tr>
<td>a</td>
<td>60</td>
<td>7992</td>
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</tr>
<tr>
<td>b</td>
<td>57</td>
<td>7171</td>
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<td>17.2</td>
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</tr>
<tr>
<td>c</td>
<td>50</td>
<td>5550</td>
<td>22.0</td>
<td>3.1</td>
<td>782</td>
</tr>
</tbody>
</table>

1Alfalfa crop as harvested at first bloom yielded 3.7 tons/acre
2Mcal = megacalorie or 1 million calories. It is used for expressing the chemical energy in feeds and metabolic processes.
3Calculated for a 1430-pound Holstein cow.

The potential milk production from a modest 3.7 tons per acre alfalfa crop is about 9800 lbs per acre (Hodgson). Dairymen generally obtain less than half of that amount. Furthermore, 3.7 tons per acre is not a very high yield by today's standards. Thus, if dairymen were to obtain potential yields and achieve potential utilization efficiency, milk production per unit of land area could be increased several fold. While Hodgson's data are for milk production, liveweight gains by beef cattle follow similar trends in relation to forage quality.

According to Hodgson, "Special emphasis should be given to reducing the excessive losses between harvest and feeding. These losses are perhaps the most extreme losses in agriculture. Very large quantities of photosynthetically fixed energy are either lost or rendered less available to animals by current harvest and storage systems." He further states, "Progress in increasing yield, pest resistance, or DMD in the standing crop by genetic means will have little payoff unless we are able to improve harvest and storage technology and reduce digestible energy losses. With that improvement, increased forage yield and higher quality in the standing crop will have a very large payoff.

References


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