METHODS OF CONSERVING HAY FOR FEEDING SHEEP IN AUTUMN

J. W. D. CAYLEY*, A. H. BISHOP* and T. D. KENTISH†

Summary

Various methods of conserving spring pasture growth and feeding the product to sheep during the following autumn were assessed at Hamilton during 1966, 1967 and 1969 by the changes in live-weight of sheep fed these rations.

Hay in conventional bales or in fodder rolls suffered very little loss in feeding value when left in the paddock for autumn feeding compared with hay stored in a shed. Ungrazed standing pasture left until autumn was inferior to all the hay treatments.

If hay is to be fed to sheep in autumn, leaving it in the paddock in bales or in fodder rolls can result in substantial cost saving without detriment to animal performance.

I. INTRODUCTION

In the Western District of Victoria, pasture hay is made for the purpose of either feeding livestock during the following autumn and winter or as a reserve in case of drought. Most of this hay is baled from the windrow using a pick-up baler but, in recent years, a new machine, the fodder roller, has also been used.

This machine uses an endless belt to roll up a swathe or windrow on the ground producing, without the use of twine, a cylindrical roll about eight times the size of a bale of hay.

Fodder rolls are usually left in the paddock to be fed in situ, thus saving the cost of carting in the hay. During autumn, large numbers of animals can be concentrated on the rolls, enabling the grazing of other pastures to be deferred until late autumn (Bishop and Kentish 1966). This result might be achieved by other methods including the use of windrows, standing pasture left ungrazed or baled hay left in the paddock. However, weather damage to the fodder may vary between methods.

The above methods were compared by applying them in the spring and feeding the whole product, including any summer growth, to groups of wethers during the autumn and observing the changes in their liveweights.

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II. MATERIALS AND METHODS

(a) Location and Climate

The experiment was conducted during 1966, 1967 and 1969 at Hamilton in western Victoria where the mean annual rainfall is 660 mm. The rainfall recorded during the first five months of these years was for 1966 11, 20, 40, 35, 29 mm; for 1967 15, 27, 15, 9, 19 mm; and for 1969 17, 81, 48, 34, 78 mm.

(b) Fodders and Methods of Conservation

Sheep were removed in early September from a uniform area of pasture consisting predominantly of perennial ryegrass (*Lolium perenne*) and subterranean clover (*Trifolium subterraneum*) with some *Phalaris tuberosa* in 1965 and 1968 and small amounts of annual *Erodium* and *Vulpia* spp.

When the ryegrass was in flower (about mid-November), the appropriate plots were mown and the hay was conserved as bales, fodder rolls or (in 1965 and 1966 only) as windrows. After curing, the baled hay was removed from one of two plots on which it was made and stored in a weather-proof shed. The plots were not grazed until observations were commenced in March 1966, May 1967 and April 1969 respectively.

The experiment was unreplicated in 1965. In 1966 and 1968, the treatments were allocated to three randomised blocks. The area of each plot was 0.405 ha (1 ac) in 1965, 0.243 ha (0.6 ac) in 1966 and 0.101 ha (0.25 ac) in 1968.

(c) Animals and Management

Four series of observations were undertaken and these are summarised in Table 1. The experimental animals were Corriedale *wethers*, fat sheep four years old in 1966, and store sheep in 1967. The duration of feeding was determined by the yield of hay, about 1 kg of hay being allowed per sheep per day.

Two methods of feeding were used — unrestricted access to the plots, or rationed access to succeeding subdivisions and finally the whole plot. The area

<table>
<thead>
<tr>
<th>Series and year</th>
<th>Dates of access to plots</th>
<th>Days on plots</th>
<th>Nature of access to hay and pasture</th>
<th>Conserved products studied</th>
<th>Animals per plot</th>
<th>No. of Replicates</th>
<th>Area of each plot (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 1966</td>
<td>March</td>
<td>45</td>
<td>a,b</td>
<td>BS, BP, R, U</td>
<td>40</td>
<td>1</td>
<td>0.405</td>
</tr>
<tr>
<td>2a-1967</td>
<td>May</td>
<td>70</td>
<td>a,b</td>
<td>BS, BP, R, U</td>
<td>24</td>
<td>3</td>
<td>0.243</td>
</tr>
<tr>
<td>2b-1967</td>
<td>May</td>
<td>70</td>
<td>a</td>
<td>BS</td>
<td>12</td>
<td>1</td>
<td>0.122</td>
</tr>
<tr>
<td>3 - 1969</td>
<td>April</td>
<td>45</td>
<td>a,c</td>
<td>BS, BP, R, U</td>
<td>8</td>
<td>3</td>
<td>0.101</td>
</tr>
</tbody>
</table>

BS — Bales stored.
BP — Bales left in paddock.
R — Fodder rolls.
U — Uncut saved pasture.
a — Unrestricted access to whole plot. BS fed once each week.
b — Rationed access using four subdivisions.
c — Rationed access using three subdivisions.

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was subdivided into four in 1966 and 1967 and into three in 1969, each subdivision providing sufficient fodder for two to three weeks.

Bales stored in a shed were fed as a weekly ration on the plots from which they had been made. At the end of each series, sheep in all treatments were weighed and then reweighed after fasting for 36 h. After grazing abundant pasture for five days, they were weighed and then reweighed after a 24 h fast. This final weight was used for the evaluation of the various treatments.

During 1969 only, sheep were weighed directly from their plots throughout the series. In order to provide a common scale by which to compare the treatments, additional observations were undertaken in 1967 (Table 1, Series 2b). On six plots which were conserved as baled hay, matched groups of 12 sheep were grazed during the feeding period, and fed 100 per cent, 90 per cent, 80 per cent, 70 per cent, 60 per cent and 50 per cent respectively of the hay made.

III. RESULTS

The relative effectiveness of the fodders as assessed by the final weight was consistent in each year. There were minor differences between the sheep fed on bales stored, bales left out and fodder rolls, but all were very much better than those fed on standing pasture (Table 2).

The sheep fed on windrows in 1966 and 1967 were lighter than those on the other hay treatments but were heavier than those fed standing pasture by a small

TABLE 2

<table>
<thead>
<tr>
<th>Initial Wt.</th>
<th>1966</th>
<th>1967</th>
<th>1969</th>
<th>1967</th>
<th>% hay fed back†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fodders</td>
<td>Final Wt.</td>
<td>Final Wt.</td>
<td>Final Wt.</td>
<td>1967 only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R+</td>
<td>R−</td>
<td>R+</td>
<td>R−</td>
<td>R+</td>
</tr>
<tr>
<td>Bales stored</td>
<td>56.2</td>
<td>44.0</td>
<td>43.0</td>
<td>43.8</td>
<td>43.5</td>
</tr>
<tr>
<td>Bales left out</td>
<td>55.3</td>
<td>55.0</td>
<td>44.4</td>
<td>44.0</td>
<td>42.6</td>
</tr>
<tr>
<td>Fodder rolls</td>
<td>55.7</td>
<td>53.0</td>
<td>44.4</td>
<td>42.2</td>
<td>42.2</td>
</tr>
<tr>
<td>Windrow</td>
<td>53.9</td>
<td>51.2</td>
<td>42.6</td>
<td>37.2</td>
<td>80</td>
</tr>
<tr>
<td>Standing feed</td>
<td>53.0</td>
<td>50.7</td>
<td>38.5</td>
<td>36.2</td>
<td>40.8</td>
</tr>
<tr>
<td>L.S.D. P = 0.05 (No test)</td>
<td>1.41</td>
<td>1.20</td>
<td>1.95</td>
<td>1.66</td>
<td></td>
</tr>
</tbody>
</table>

Significant of main treatment effects

| Fodders   | **  | *** |
| Rationing | *   | **  |
| Interaction| N.S. | N.S. |

N.S. denotes P>0.05

* " P<0.05

** " P<0.01

*** " P<0.001

† Calculated percentage of stored hay which would need to be fed back to give equivalent final liveweights.
margin in 1966 and by a substantial margin in 1967 when the fodders were fed late. In maintaining the liveweight of the sheep, stored bales were significantly better than paddock bales in one comparison in 1967 and, in 1969, paddock bales were better than fodder rolls when rationed whilst stored bales were better than fodder rolls when unrestricted. These differences suggest a trend in the order — stored bales, paddock bales and fodder rolls, and this order is also apparent in the intermediate liveweights during 1969 (Figure 1).

In 1967, the difference between rationed feeding and unrestricted feeding was more important than the difference between the various hay treatments but, in 1969, the effect- of rationing was not as marked. The sheep with unrestricted access to their plot initially gained more weight than those with rationed access, but relative performance of the various fodders was similar for both methods of feeding. When the sheep were allowed unrestricted access, fodder rolls produced the greatest gains initially, but also the most rapid loss in weight later (Figure 1).

The effect of rationing the aftermath on the performance of the sheep, gauged by the difference in the groups fed hay from a shed, was very small.

In 1967, the final weights of the six groups of sheep fed different percentages of the baled hay made on their plots (Table 1, Series 2b) were in proportion to these percentages. Those receiving 50 per cent of the hay were 4.75 kg lighter than those receiving all the hay made, and the remainder were in linear relation. From this relation, the corresponding percentages of hay required to match the liveweight losses of the sheep fed the other fodders were calculated (Table 2, columns 7 and 8).

IV. DISCUSSION

The feeding value of a roughage is dependent on the form of animal production to which it is applied rather than its e.g. energy content (Blaxter and Wilson 1963). In this comparison, the form of production is the maintenance of adult sheep during the autumn when pastures are regenerating.

![Graph](image)

Fig. 1.—Liveweight of sheep during feeding in 1969 (* denotes fasted weight).
In all years, the performance of sheep fed on hay conserved in conventional bales and fodder rolls which had remained in situ was very similar to the performance of those fed baled hay as a ration from a shed, and it is inferred that the hay had suffered little loss in feeding-value due to exposure to weather. Sheep fed on saved standing pasture were always inferior to those in all the hay treatments.

The difference between rationed feeding and unrestricted feeding was important in most comparisons but not in all, and the liveweight changes during feeding suggest that this variability may depend on the duration of feeding relative to the total fodder available.

An alternative to rationing may be to feed the fodder to different classes of animals in succession, in order of the quality of fodder they require. However, the results show that standing pasture would not be as suitable as hay for animals requiring a high quality ration.

The cost of carting and stacking baled hay can be one third of the cost of making it (White and Cousins 1966), and further costs are involved in feeding it. The results show that when hay is used for early autumn feeding, leaving it in the paddock can result in substantial savings in cost without detriment to animal performance.

Whilst baled hay left out tended to maintain its feeding value better than fodder rolls, both were satisfactory. The choice of method is likely to depend upon the availability of the respective machines and their capital and operating costs in relation to the expected volume of output.

V. ACKNOWLEDGMENTS

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VI. REFERENCES