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Feeding behaviour of live sheep during export

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Live sheep exporters in Western Australia often hold as many as 100,000 sheep in assembly feedlots while the consignment is being purchased and assembled before shipment. During this assembly phase the sheep are introduced to the pelleted rations used on board ship.

Australian Government standards require that live sheep for export are held for a minimum period of five clear days in an assembly feedlot. This is because there is a belief that sheep which eat consistently during assembly tend to perform better aboard ship. Irregular feeding can result in weight loss, digestive upsets and increased susceptibility to disease.

Feeding behaviour of sheep during assembly for live export may be influenced by many conditions associated with their immediate and past experiences on farms. It may also be influenced by their sale and trucking, the design of the feedlot and their management within the feedlot. The Merino wether is worth about $50 in markets in the Middle East. Research to minimise wastage by way of weight loss, disease and mortality during assembly and shipping has the potential to bring large economic savings to the industry, as well as improving the animal's health and welfare.

Industry reports have highlighted the wide variability in conditions, facilities and procedures used, and showed that there was little evidence from which to make recommendations to the live sheep shipping industry. This article discusses ten experiments by the Department of Agriculture from 1981 to 1985 designed to investigate what influences the feeding behaviour of Merino wethers under conditions similar to those used in assembly feedlots for live export. The understanding gained from these experiments will lead to developments to improve the survival and performance of sheep during export.
Monitoring the feeding behaviour of sheep

Feeding behaviour of each wether in the experiments was monitored by fitting paint-soaked 'marker' sponges to bars at the edge of feed troughs containing shipping pellets. To feed, animals had either to reach over the bar and in so doing marking their chins and lower necks, or to reach under the bar hence marking the top of their heads or upper necks. The six colours used, combined with the position of the bar, allowed 12 periods for measurements of when individual animals fed. There were from 360 to 750 Merino wethers in each experiment.

Effect of source of sheep

Feeding behaviour observed in the six to 12 day assembly phases was highly variable. A large part of this variation was associated with 'source' of sheep or the farm from which the animals were purchased. A single shipment, therefore, consists of many lines of sheep from various localities, mainly from the south-west sheep growing areas. The proportion of sheep classified as 'satisfactory' feeders (sheep which were marked by paint on at least three days of the third, fourth, fifth and sixth days of assembly) varied from 3 to 96 per cent (mean 59 per cent) amongst the 11 sources of sheep from four experiments (Figure 1). On average, 23 per cent of the sheep (range 1 to 78 per cent) were not marked at all during assembly.

Effect of fasting before assembly

Sheep are normally not fed and watered during mustering, sale and trucking to assembly feedlots. In experiments, fasting sheep for up to 96 hours before assembly significantly altered feeding behaviour over a six-day assembly phase with a diet of hay and pellets. Groups of sheep fasted for 12 and 24 hours had similar percentages of satisfactory feeders (62 and 79 per cent respectively). In comparison 98 per cent of the wethers fasted for 48 hours were classified as satisfactory feeders, possibly compensating for the extra day of fasting. However, wethers fasted for 96 hours had only 71 per cent of satisfactory feeders compared with those fasted for 48 hours. The results indicate that fasting for as long as four days can adversely affect feeding behaviour of sheep, in addition to causing weight loss and possible increased susceptibility to disease.
Effect of diet

Pellets made mainly of cereal grain and roughage are normally fed to sheep during shipping. Hay is often fed with the pellets during assembly to sustain sheep which are slow to adapt to pellets and to provide extra roughage to reduce the risk of acidosis (grain poisoning).

In one seven-day assembly experiment, daily proportions of sheep visiting troughs containing a mixture of hay and pellets varied from 40 to 75 per cent, while those visiting troughs containing only pellets varied from 5 to 30 per cent. Most Australian sheep are not likely to have eaten feed pellets before assembly, and may require extra time to learn to recognise and accept them.

Feeding behaviour during assembly could be influenced by a sheep's previous experience of supplements. Oats, pellets, an oats-pellet mixture or no supplements were fed to a group of wethers when they were either unweaned lambs or 18-month old hoggets. Then when they were 19 months old, their feeding performance when offered pellets in a feedlot was recorded.

Sheep which had never had supplements before ate an average of 1.020 g of pellets per head per day over five days. Sheep which had had supplements before ate 35 per cent more pellets (1.370 g/head/day) than the control sheep, but the type of supplement fed previously or age of sheep when first introduced to supplements made no significant difference. A sheep's feeding performance, therefore, can be improved if it has prior experience of supplements. However as the control sheep ate well, other factors are also associated with differences between the feeding behaviour of various sources of sheep.

The effect of feed additives to encourage sheep to eat pellets was then tested. Daily intakes of oaten or lucerne hay mixed with pellets and pellets treated with molasses, butyric acid or anised were compared with a control diet of untreated pellets without hay. Sheep fed the control ration had a mean intake for the 10 days of 840 g/head. Addition of oaten or lucerne hay to pellets or treatment with butyric acid did not significantly alter mean daily intake compared with the control. However, it was surprising that treatment with anised or molasses caused a reduction in mean daily feed intake to 624 and 724 g/head respectively.

Effect of stocking rate, trough length and trough placement

The design of assembly feedlots involves balancing construction costs against sheep performance and ease of management. High stocking rates and short lengths of feed trough result in lower overhead costs per sheep. Location of troughs within laneway fences makes distribution of feed easier, but sheep have access to only one side compared to when troughs are located centrally in the yard. Troughs within laneway fences, therefore, need to be twice as long. Limiting yard space and trough length per animal, and not locating troughs centrally, appears to adversely affect the performance of sheep.

Sheep stocked in yards at 0.27, 0.62, 1.42, 3.38 and 7.56 square metres per head were classified as "satisfactory" feeders if they were marked on every day of a 12-day assembly. At each of these stocking rates, 38, 59, 73, 75 and 75 per cent of sheep were classified as "satisfactory" feeders (Figure 2).

In the same experiment, where pellets were freely available, the longer the trough available to sheep the more regular the sheep fed. Available trough lengths of 0.5, 1.0, 2.0, 4.0 and 8.0 cm/head resulted in 37, 47, 74, 79 and 81 per cent satisfactory feeders respectively. In a second experiment, with feed rationed to 1,000 g/head/day, available trough lengths of 2, 4, 8, 16 and 32 cm/head resulted in 58, 77, 91, 81 and 95 per cent regular feeders.

Incorporating troughs into boundary fences resulted in 67 per cent of sheep being classified as satisfactory feeders over a seven-day assembly compared with 79 per cent when troughs were located in the centre of yards.

Carry-over effects from assembly to shipping

In these experiments, the effects of source of sheep (farm of origin) carried over from assembly to simulated live export. The higher the percentage satisfactory feeders for particular sources during assembly, the higher the frequency of feeding under simulated shipping conditions and the greater the gain in liveweight and condition score.

Fasting before assembly, type of diet during assembly and trough location appeared to have small and unimportant carry-over effects to shipping.
The relative importance of source of sheep and assembly management on the effects of carry over to sheep performance during shipping were evaluated further. Sheep from 15 farms were divided equally to a “good” or “harsh” assembly as determined by the number of satisfactory feeders from the experiments already discussed. The results are shown in Table 1.

Although the results indicate that sheep from “harsh” assembly can adapt their feeding behaviour and liveweight performance during simulated shipping equally as well (and possibly better) as sheep from “good” assembly, they suggest that death rates may be higher after a “harsh” assembly. The wide range in performance of sheep from various farms is noticeable, and “harsh” assembly appears to increase the differences between the sources.

Our work has shown that most of the variation in sheep feeding behaviour and liveweight change during simulated live export can be accounted for by unidentified differences between sources of sheep. However, we now know how to provide good assembly management. Our work shows that this is important to reduce the range in feeding performance amongst sources of sheep and possibly to reduce deaths.

### Table 1. Performance of Merino wethers from 15 farms during simulated shipping after “good” and “harsh” assembly

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Percentage satisfactory feeders in assembly</th>
<th>Percentage satisfactory feeders during shipping</th>
<th>Liveweight change during shipping (kg)</th>
<th>Numbers of deaths (% in brackets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good assembly</td>
<td>100</td>
<td>80</td>
<td>-0.3</td>
<td>3 (0.8)</td>
</tr>
<tr>
<td>Harsh assembly</td>
<td>72</td>
<td>83</td>
<td>0.3</td>
<td>12 (3.2)</td>
</tr>
</tbody>
</table>

Other research

The main emphasis of future research will be to identify what influences the variation in performance of different sources of sheep and developing management strategies to correct “poor” sources.

A major study using skills in pathology and epidemiology has started by the Department of Agriculture’s Animal Health Division to identify immediate causes of sheep deaths and pre-disposing risk factors during export. The study involves identifying large numbers of sheep (5 000 to 10 000) on arrival at commercial feedlots, measuring feeding behaviour and collecting information on previous management. The sheep are accompanied by a veterinarian during the sea voyage to the Middle East and those dying are examined to determine cause of death. Six voyages have been undertaken so far and the results will be presented after completion of the study in June 1987.