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Lot feeding sheep in sheds

By H. E. Fels* and
B. Malcolm†

The need to gather and hold sheep for slaughter or live shipment led a West Australian company†, with the Department of Agriculture, to investigate the use of sheds for short term lot feeding of sheep. Preliminary examination suggested that feedlot sheds connected by a sheep footpath to the abattoirs, railway or saleyards could be cheaper as well as more practicable than continued use of holding paddocks. It was possible that feedlot sheds would—

- Save costs of leasing large areas of near-suburban land.
- Avoid public objections to bare paddocks and outdoor lot-feeding on such land.
- Save costs and organisational difficulties of separating groups of sheep for slaughter or shipping, and of supervising, loading into road trucks, transporting, unloading and keeping records.
- Allow more consistent and more effective feeding and watering.
- Give a better chance that most sheep would eat and drink regularly and consistently.
- Reduce the “dirty sheep” problem at abattoirs and contamination of carcases by bacteria in dust and water droplets, and so give more acceptable carcases with better keeping qualities.
- Give fewer salmonella bacteria in intestinal tracts and faeces because the sheep would eat more regularly and from uncontaminated troughs (CSIRO, 1970).
- Give less feed taints in meat (Park et al 1972).

The first week or two are commonly the most difficult in lot feeding sheep or cattle. Long-term indoor lot-feeding is a normal practice in some overseas countries but we did not know whether untrained merino sheep would adapt quickly and easily to short-term lot-feeding in sheds. Therefore the first object was to find whether short-term lot-feeding in sheds was feasible. If it was feasible, other objects were to check whether 0.47 sq m (5 sq. ft.) of pen space per sheep was adequate, to investigate trough-length requirements, to check whether walls would improve a feedlot shed and to investigate feeds for use in the first week.

Investigations

Thirty-seven groups of sheep, totalling 716 animals, were lot fed for periods of five to 42 days in seven

Contented sheep—an important factor in the success of feedlot sheds. Sheep and lambs from farms settle almost immediately in sheds like that shown here.
experiments which are outlined in Table 1. All sheep were adult merino wethers which arrived, empty, from farms or saleyards. All were weighed on arrival and at intervals of about a week. Some were slaughtered so carcass weights would show treatment effects without differences due to weights of viscera and their contents. Feed intakes and observations of sheep behaviour were recorded.

Enclosed shed

The first experiment used two groups of 40 sheep in a fully enclosed shed. On average they ate 280 g per sheep per day in the first week and twice as much in the second week. Seven sheep died (9 per cent). Four sheep post-mortem had empty rumens, and Salmonella bacteria were grown from some samples of gut contents.

The sheep reacted nervously to sounds of people, machines and dogs outside the shed. Observations suggested that some ate freely but others ate very little.

Open shed

The other six experiments were done in a more open shed. There were no deaths among the 706 sheep involved. Experiment 4 suggested there may have been real differences in voluntary feed consumption between pens.

Figure 1 shows the four pens involved and average voluntary feed intakes in each during Experiment 4. Sheep in pen 3, the most enclosed pen furthest from the open air, ate less and performed relatively poorly in most experiments (for examples, see Tables 2 and 3).

The deaths in Experiment 1, the absence of deaths in Experiments 2 to 7, the possible pen differences in voluntary feed intake in Experiment 4 and the low feed intakes in pen 3 in other experiments encouraged us to accept English advice (Fell, 1967; Williams, 1967) that sheep sheds should not have walls. Our impression was that sheep were less disturbed by the noises from people, dogs, machines and vehicles, if they could see the source of the noise.

Pen space per sheep

U.S. Experiments (Arehart et al, 1969) showed no significant differences in liveweight gains of large lambs allowed space ranging from .37 to .93 sq m (3.9 to 9.8 sq. ft.) per lamb.

U.S. practice seems to be to allow 0.38 to 0.47 sq m (4 to 5 sq. ft.) per lamb for lambs weighing up to 41 kg (90 lb) (Cox & Bell, 1957).

The local experiments gave 0.47 square metres (5 sq. ft) of pen space per sheep, or 0.42 square metres (4.5 sq. ft) in Experiment 7.

Subsequent experience in commercial sheds reinforced the im-

<table>
<thead>
<tr>
<th>Experiment No.</th>
<th>No. of groups</th>
<th>Sheep per group</th>
<th>Sheep in the experiment</th>
<th>Feeding period (days)</th>
<th>Feeds</th>
<th>Other treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>40</td>
<td>80</td>
<td>14</td>
<td>Group 1: Oats, grain and hay, 47:53, milled Group 2: Commercial mixture</td>
<td>First 3 days: Groups 1 and 2 in pens 1 and 2, Group 3 in outdoor feedlot. Thereafter: Groups 1, 2 and 3 in pens 1, 2 and 3. Last 9 days: trough lengths 1-86, 2-75, 3-05 metres.</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>18</td>
<td>54</td>
<td>26</td>
<td>The basic feed was Grain and hay, hammermilled: 30:70 at first, but changed gradually to 50:50 Groups 1 and 3: basic feed. Group 2: basic feed plus a 'uramol' block.</td>
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<tr>
<td>3</td>
<td>3</td>
<td>18</td>
<td>54</td>
<td>10</td>
<td>Oats, grain and hay, hammermilled, in ratios: Group 1 Group 2 Group 3 1st 2 days 33:67 50:50 66:34 Next day 38:62 61:39 through Thereafter 66:34 66:34</td>
<td>Trough lengths 1-86, 2-75, 3-05 m.</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>18</td>
<td>288</td>
<td>5</td>
<td>Oats, grain and hay, 66:34, hammermilled</td>
<td>Pens 1, 2, 3, 4, and trough lengths 93, 1-86, 2-75, 3-05 m were compared in a 4 x 4 latin square experiment.</td>
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<tr>
<td>5</td>
<td>5</td>
<td>18</td>
<td>90</td>
<td>5</td>
<td>Groups 1 and 3: Milled hay initially; then oats grain ad lib. Groups 2 and 4: Milled barley grain and hay 1:1 Group 5: A commercial feed mix.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>18</td>
<td>90</td>
<td>5</td>
<td>Groups 1 and 3: Milled oats grain and hay, 1:1 Groups 2 and 4: Milled oats grain and hay, 3:1 Group 5: A commercial feed mix.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>20</td>
<td>60</td>
<td>42</td>
<td>Milled barley grain and hay, 3:1, plus slaked lime (2.75%) and salt (0.9%)</td>
<td>The criterion was carcass weight. A sixth group was slaughtered before the experiment to indicate pre-experimental carcass weights.</td>
</tr>
</tbody>
</table>

Table 1—Summary of experiments
pression that 0.47 sq. m per sheep give enough space for sheep to eat, drink, rest and move.

**Trough length per sheep**

Experiments 1 and 2 used feed troughs along the full length of one side of pens giving 15 cm of trough per sheep. In larger pens for practical use this layout would give less trough length per sheep.

In the last nine days in Experiment 2 trough lengths were reduced in two pens. In Experiment 3 trough lengths were reduced in two pens throughout the experiment. There were no significant differences in live-weight changes between pens.

Experiment 4 was designed for critical comparisons of four feed trough lengths. It showed no significant effect of trough length on feed intake or on liveweight change.

Further experiments used the shortest trough length, 5 cm per sheep. Observations and results encouraged the conclusion that budgets and plans for feedlot sheds could safely assume that 5 cm of trough length per sheep would be adequate for sheep fed almost as much as they would eat. If feed troughs extend the full length of the front of sheep pens, pens about 10 m deep will provide 5 cm of feed trough length for every 0.47 sq. m of pen area—that is, for each sheep. Shorter feed trough lengths were not tried.

Commercial sheds were built with 7.6 cm of feed trough length per sheep. Observations and results encouraged the conclusion that budgets and plans for feedlot sheds could safely assume that 5 cm of trough length per sheep would be adequate for sheep fed almost as much as they would eat. If feed troughs extend the full length of the front of sheep pens, pens about 10 m deep will provide 5 cm of feed trough length for every 0.47 sq. m of pen area—that is, for each sheep. Shorter feed trough lengths were not tried.

Commercial sheds were built with 7.6 cm of feed trough length per sheep. After several weeks oflotfeeding, some groups of sheep have competed strongly to get to the troughs at feeding time, giving the impression that longer troughs may be desirable for longer term lotfeeding.

Water trough lengths per sheep were reduced in some pens during Experiments 2 and 3 without apparent effects on water or feed intakes or on competition between sheep at water troughs. Later experiments used as little as 1.7 cm (0.66 in.) of water trough space per sheep and this seemed adequate. Commercial sheds were later built to give 1.1 cm of water trough length per sheep with emphasis on volumes of water in troughs, water pressures and pipe sizes so that troughs would always contain water.

**Feeds and feed introduction**

The sheep all arrived empty from road or rail trucks or from saleyards. At first we avoided using feed mixtures that were mainly grain. However, experience suggested inappetence was a more serious hazard than grain poisoning.

In longer experiments the sheep always ate least in the first week and progressively more in the second and third weeks.

The deaths in Experiment 1 involved sheep with empty rumens. Presumably these individuals ate little or nothing after arrival in this shed. It seemed reasonable to suppose that failure to eat may have been a contributory cause of these deaths. If so, deaths may have been avoidable by offering more acceptable feed which more sheep would eat immediately, or by more digestible feed which would give sheep more benefit from small quantities eaten. We suspected also that walls around a feedlot shed tend to put some sheep "off their feed", by making them react more nervously to sounds of human and other activity that they could not see.

In a subsequent lot feeding investigation on a ship (Fels, 1973), feeds based on grain probably reduced death rates in comparison with mixtures containing 50 or 60 per cent. roughage, or hay with no grain.
Experiment 2 used a powdered mixture of cereal hay and grain, 30 per cent. grain at first, changing to 50 per cent. Treatments and feed intakes in the first 17 days are shown in Table 2. Feed intake was not increased by a free-access lick containing molasses, urea, salt, cobalt and other additives. Adaptation to indoor lot-feeding may have been delayed by allowing one group two days in an outdoor feed lot before bringing them into the shed and use of pen 3 for this treatment may also have contributed to the lower feed intake.

Experiment 3 compared three systems to introduce a hammer-milled mixture containing 66 per cent. grain. There were no hints of grain poisoning or other difficulties in sheep fed this mixture as soon as they arrived.

In Experiment 4 the same 66 per cent. grain mixture was fed for five days to four successive batches of 72 sheep with no hints of grain poisoning or scouring.

Experiments 5 and 6 showed no disadvantages from feeding milled mixtures containing 50 per cent. or 75 per cent. grain from the first day of lot feeding.

Experiment 7 then used three pens of 20 sheep to get experience of longer-term lot feeding using a milled mixture containing 72 per cent. barley grain, 24 per cent. hay, 2.75 per cent. slaked lime and 0.9 per cent. salt. There was no scouring and no problems. Feed intakes and weight changes are shown in Table 3. Over 28 days 60 sheep ate 1744 kg of feed and gained 336 kg liveweight. Food conversion rate averaged 5.2 kg feed per kg liveweight gain.

Conclusions
We concluded that short-term lot-feeding of merino sheep in sheds would be feasible and that budgets and plans could safely be based on—

- 0.47 sq. m (5 sq. ft.) of pen space per sheep;
- 5 cm (2 in.) feed trough length per sheep;
- 1.7 cm (0.66 in.) water trough length per sheep with pipes and pressures to give an abundant flow of water in troughs;
- sheds with no walls.

Feed troughs and water troughs should be outside the pens and at opposite ends of pens to reduce contamination of troughs and to make troughs easier to inspect and fill.

The company decided to build a prototype shed for 3,000 sheep, allowing 0.47 sq. m per sheep. The design used made it convenient to allow 7.6 cm feed trough per sheep and 1.1 cm water trough per sheep for pens of 80 sheep.

Subsequent experience satisfied the company that the benefits expected, as mentioned in the introduction, were obtained so more sheds were built. Four sheds at Midland currently accommodate 12,000 sheep, with access by footpath to and from the abattoir, railway and saleyards.

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References


