CATTLE BLOAT IN SOUTHERN NEW ENGLAND, N.S.W., 1961-66

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Summary
Information was obtained from a random sample of cattle producers in southern New England on the incidence of bloat, and the pasture and environmental conditions associated with its occurrence. During a six-year period (1961-66) deaths from bloat varied from 0.27% in 1965, a drought year, to 2.5-3.0% in years of average or above average rainfall. Bloat was associated with clover-dominance of improved pastures. Clover-dominance was encouraged by the unsuccessful establishment of perennial grasses from broadcast sowings, and a low annual rate of superphosphate application. A common and reliable method of avoiding bloat losses was to graze cattle on native pastures, but this practice wasted improved pastures and retarded property development.

I. INTRODUCTION
Bloat is a serious problem limiting the production of beef cattle in New England (Walker 1960), but little quantitative information is available to characterise the pasture and environmental conditions that are associated with its occurrence.

As a prelude to an investigation of agronomic aspects of bloat control, a survey of the incidence of bloat was made on a sample of southern New England properties. For each property, information was sought on the incidence of bloat in the period 1961-66, its effect on stock and property management, methods of control, pasture improvement, and the botanical changes in pastures following improvement.

II. METHOD
A list of property owners within the Armidale Pastures Protection Board district was first adjusted to exclude those owners who had less than 50 head of cattle on their property at the 31st December, 1963. Graziers who did not supply to the Board the actual number of stock carried on their property at this date were also excluded. From the remaining 727 graziers, 150 were randomly selected.

A further adjustment was made to exclude from the sample 13 graziers who had sold or vacated their property between 31st December, 1963 and 31st December, 1965.

A questionnaire mailed to each of the remaining 137 graziers yielded 107 replies that were sufficiently detailed for use.

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III. RESULTS AND DISCUSSION

(a) Incidence of bloat

Table 1 shows the annual incidence of deaths from bloat in the survey period (1961-66) for the 107 properties. Thirty-one properties did not suffer bloat losses at any time during the survey period, although deaths had occurred on three of them before 1961. Annual losses on the 76 properties on which deaths did occur averaged 3.61% in 1961-64, and 0.63% in 1965-66 when rainfall was well below average for the region.

For the six-year period, annual bloat deaths averaged 2.0% over all properties. In New Zealand, where bloat is regarded as an important problem, bloat deaths exceeded 2% in only one of a total of 18 farming regions in the most severe bloat year (1963-64) yet recorded (Anon. 1964).

(b) Effect of bloat on property and stock management

Forty-nine graziers indicated that the occurrence of bloat, or fear of it occurring, affected in some way the management of their property and stock. Were it not that many properties were in an early stage of pasture improvement or relatively lightly stocked with cattle compared with sheep, this figure may have been higher.

Thirty-nine graziers indicated that the risk of bloat restricted the use of improved pastures, particularly in spring, and it was a common practice to pasture cattle on native rather than improved pastures during the periods of greatest bloat risk. On 23 properties, a certain acreage of pasture was retained in an unimproved condition for use when the danger of bloat was high.

Twenty-five graziers were discouraged by the risk of bloat from buying and fattening stock on excess feed in springtime. The inconvenience and financial loss associated with bloat caused at least seven graziers to reduce the size of their cattle herd, and run more sheep.

(c) Factors associated with bloat occurrence

Bloat losses occurred in all except the winter months, but were most serious in October-November and in March. Bloat occurred when clover-usually white clover (Trifolium repens L.)-was growing actively, particularly when it was young and short. Outbreaks were often associated with moist, damp, or dewy conditions, and four graziers noted that losses often occurred immediately after a sudden, out-of-season, cold change in the weather.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Annual incidence of bloat on 107 properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of cattle</td>
<td>15,879</td>
</tr>
<tr>
<td>No. of properties recording bloat deaths</td>
<td>43</td>
</tr>
<tr>
<td>Total number of deaths from bloat</td>
<td>376</td>
</tr>
<tr>
<td>Bloat incidence (deaths/100 cattle)</td>
<td>2.37</td>
</tr>
</tbody>
</table>
A general feature of the results was that as more fertilizer (usually superphosphate) was applied to the pastures, the incidence of bloat increased (Table 2). The association between bloat and fertilizer usage was found to be highly significant ($P < 0.001$). This association apparently reflected the increased growth of clover that followed the application of fertilizer and seed to previously unimproved pasture. Of the 76 graziers who reported bloat losses, 60 said that all occurred on clover-dominant pasture. A further 12 had occasionally recorded bloat on other types of pasture, such as oats (4 graziers), rape (1), ryegrass (1), and sown grass/clover pastures that were grass-dominant (6). However, the 6 graziers who reported bloat on grass-dominant grass/clover pastures added that such losses were only 10-20% of those experienced on vigorous clover-dominant pastures. This is consistent with Sears’ (1960) observations on the occurrence of bloat in New Zealand.

It was evident from the survey that a progressive change occurred in the grass/clover ratio of pastures regularly fertilized with superphosphate. The pattern of change depended, to some extent, on the methods of improvement adopted by individual land-holders, in particular the method of sowing. To the end of 1966, 55.4% (159,775 acres*) of the total acreage of the 107 properties (288,651 acres) had been sown with grasses and/or clovers. Of the sown acreage, 104,253 acres (65.2%) were sown by broadcasting seed, usually from aircraft, on to undisturbed native pasture, and 5,137 acres (32.0%) by ground methods (drilling into a prepared seed-bed, or sod-seeding). A further 4,485 acres (2.8%) were sown by both methods.

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**TABLE 2**

**Incidence of bloat (average 1961-66) in relation to superphosphate usage**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>No. of properties in each group</th>
<th>Total acreage (acres)</th>
<th>Percentage of total acreage in each group that received a total $^*$ superphosphate application of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bloat</td>
<td>31</td>
<td>96,233</td>
<td>$&lt; 1$ cwt/ac</td>
</tr>
<tr>
<td>II</td>
<td>40</td>
<td>105,831</td>
<td>34.4</td>
</tr>
<tr>
<td>III</td>
<td>19</td>
<td>44,261</td>
<td>7.7</td>
</tr>
<tr>
<td>IV</td>
<td>6</td>
<td>17,483</td>
<td>3.5</td>
</tr>
<tr>
<td>V</td>
<td>11</td>
<td>24,843</td>
<td>5.6</td>
</tr>
<tr>
<td>TOTALS</td>
<td>107</td>
<td>288,651$^+$</td>
<td>37.3</td>
</tr>
</tbody>
</table>

$^*$Cumulative total of all superphosphate applications, including those applied before 1961, up to the end of 1966.

$^+$116,817 hectares.

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*1 acre = 0.4047 hectare.
The establishment of white clover (T. repens), phalaris (P. tuberosa), cocksfoot (D. glomerata), and perennial ryegrass (L. perenne), according to method of sowing

<table>
<thead>
<tr>
<th>ESTABLISHMENT</th>
<th>BROADCAST</th>
<th>GROUND — SOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Phalaris</td>
</tr>
<tr>
<td>No success, or poor establishment</td>
<td>6 17 23 25</td>
<td>2 6 11 6</td>
</tr>
<tr>
<td>Satisfactory establishment</td>
<td>34 3 13 19</td>
<td>16 22 16 22</td>
</tr>
<tr>
<td>Good to excellent establishment</td>
<td>36 0 4 8</td>
<td>55 24 39 46</td>
</tr>
</tbody>
</table>

Graziers were asked to indicate how successful establishment was, according to species and method of sowing. The figures above represent grazer observations, and are not percentages.

(i) Broadcasting of seed

Less than one-third of all graziers who had established pastures by this method had sown grass and clover seed together. The remaining two-thirds had broadcast either clover seed only, or clover seed followed in a subsequent year or years by grass seed. In general, the establishment of broadcast white clover seed was satisfactory, but grass establishment was poor (Table 3). Under these conditions, the pattern of botanical change observed on most properties was very similar to that observed for broadcast subterranean clover (Trifolium subterraneum L.) + superphosphate pastures in southern Australia (Moore and Biddiscombe 1964). After three or four annual applications of 1 cwt/ac (126 kg/ha) of superphosphate, the contribution of native grasses to the sward had declined and clover predominated. With further applications, these pastures were invaded by nitrophilous species such as barley grass (Hordeum leporinum Link) and spear thistle (Cirsium vulgare (Savi) Ten.), but clover remained dominant. Bloat was not a danger in the early stages of development but was prevalent once the native grasses had declined and clover had achieved dominance.

(ii) Sowing by ground methods

With the exception of a few cases where grass seed only was sod-seeded into clover-dominant pastures, all graziers, when sowing by ground methods, usually sowed grass and clover seed together, and most recorded successful establishment of grasses and white clover (Table 3). At the time of the survey most ground-sown pastures were clover-dominant and bloat was a problem, but many graziers had noticed a gradual increase in the sown-grass component after some years of applying superphosphate. Pastures that had received a cumulative total of more
than 10 cwt/ac of superphosphate to the end of 1966 were commonly grass-dominated, after first going through a period of clover-dominance which lasted for about 5-10 years.

Experiments on grass/legume pastures in southern Australia have indicated that the length of the clover-dominant phase is reduced by increasing the annual rate of super-phosphate application (Anderson and McLachlan 1951; Willoughby 1954). Anderson and McLachlan (1951) found that in the first four years of a *Phalaris tuberosa-subterranea* clover pasture, high fertility and grass dominance were achieved by annual dressings of 2 cwt/ac of superphosphate, but where 1 cwt/ac was applied annually, the pasture was lower yielding and clover-dominant. In the present survey, only seven graziers applied superphosphate to improved pastures at an annual rate exceeding 1 cwt/ac, and then only in the first year or two after sowing. In general, the clover-dominant phase in New England improved pastures appears to be prolonged by the relatively low annual rate of superphosphate applied to these pastures.

(d) Bloat control

Forty-one graziers (including four who had not lost any cattle from bloat during 1961-66) regularly attempted to control bloat, 21 occasionally did so, and 45 never. Of those who regularly attempted control, 37 removed cattle from pastures thought to be dangerous (usually white clover-dominant) to unimproved pastures, fodder crops, and pastures dominated by sown grasses, and 4 dairy farmers - the only dairy farmers in the survey — all successfully controlled bloat by daily drenching of cattle with an anti-foaming agent.

Either drenching or puncturing the rumen with a trocar and cannula was useful in treating bloated cattle if applied in the early stages of an attack. Other methods of treatment and prevention (licks, antibiotics, Stockholm tar, etc.) were either unreliable or impractical for use on a large scale. Four graziers commented favourably on the practice of grazing clover-dominant pastures with sheep before admitting cattle.

Although the question was not specifically asked, five graziers thought that their losses were reduced after they began vaccinating their cattle against entero-toxaemia (*Clostridium welchii* infection). Only 19 vaccinated against entero-toxaemia, 18 against black disease (*C. oedematiens*), and 37 against black leg (*C. chauvoei*), and it is possible that some of the losses reported by the 107 graziers were due to these diseases. However, heavy losses were not confined to properties that did not vaccinate.

IV. CONCLUSIONS

This survey emphasizes the seriousness of the bloat problem in New England, and underlines the lack of suitable methods for the control of bloat in a situation where cattle are grazed extensively. Although the practice of grazing cattle on native pastures undoubtedly minimizes bloat, this is only achieved at the expense of productivity.
As bloat occurs most commonly during the clover-dominant phase of pasture development the best approach to the bloat problem in New England may lie in techniques for overcoming clover-dominance. The recommendation of suitable management practices that encourage grass-dominance will depend on an understanding of the factors determining the botanical composition of the developing swards. An investigation of these factors has begun.

There is also a need to investigate factors that determine successful establishment of grasses into clover-dominant pastures for New England conditions.

V. ACKNOWLEDGMENTS

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VI. REFERENCES