THE USE OF OBSERVATIONS ON FARM PADDOCKS TO EVALUATE PASTURE IMPROVEMENT ON DAIRY FARMS

I.K. BUCHANAN* and R.T. COWAN*

SUMMARY

An experiment was done to evaluate the use of observations on farm paddocks as a means of extrapolating results from a research station to surrounding farms. On the farm, milk production was maintained relatively constant and cow grazing days obtained from nitrogen fertilized Rhodes grass (Chloris gayana cv. Callide) were measured. On the research station stocking rate was fixed. Pasture response was consistent between the two sites but cow grazing days on the farm was a less sensitive measure of the effects of fertilizer level than milk yield in the fixed stocking rate experiment. Cow grazing days were influenced by alternative feed sources on the farm, particularly during summer.

(Keywords: pasture, dairy, fertilizer)

INTRODUCTION

Many of the recent increases in productivity and efficiency on Queensland dairy farms have resulted from improvements in pasture technology (Cowan et al. 1985). However, much of this technology is developed on research stations and takes some time to become established on farms. There is a need to develop techniques which can assess pasture technology on farms and allow direct comparison with assessments being conducted on research stations. These techniques must also be simple and practical and give a measurement which is related to the end product, for example, milk.

This study forms part of an investigation into the effects of nitrogen applied to summer growing grasses on milk production during summer and autumn. Normally during this time in south-east Queensland milk production falls rapidly as pastures mature and cool weather slows regrowth of pasture. The study was set up in two parts, the first a conventional grazing experiment on a research station, and the second an investigation on a farm 20 kilometres from the station. The aim was to assess the farm study as a method of extrapolating results from the research station to other areas of south Queensland.

MATERIALS AND METHODS

Both experiments were done in the Fassifern Valley in south-east Queensland. The area receives 800 mm rainfall annually and approximately 60% of this falls in the period November to March inclusive. Rainfall during summer and autumn of 1984 and 1985 averaged 94% and 81% of mean values respectively.

On a farm in the Kalbar region a seedbed was prepared on a sloping hillsite of 7.5 ha and Callide Rhodes grass (Chloris gayana cv. Callide) was planted at 3 kg seed/ha in December 1982. Establishment was slow and only light grazing was attempted during the first year. Experimental grazing was begun in November 1983 but during the first year of experimental grazing there was further strengthening of Rhodes grass establishment and reduced weed growth in fertilized paddocks. At establishment 250 kg superphosphate, 125 kg potassium chloride and 125 kg urea were applied. In subsequent years superphosphate at 125 kg/ha was used.

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In October 1983 the area was fenced into five paddocks of approximately equal area. These were allocated at random to the three levels of nitrogen fertilizer, nil (one paddock), 200 and 400 kg N/ha/year (two paddocks each). Nitrogen was applied as urea in three equal sized dressings in October, December and February each year.

The pastures were grazed each month. Cow numbers varied from 70 to 75. The amount of grazing was determined by the farmer based on milk sales and pasture yield. The farmer’s payment was on the basis of a milk quota and his object was to maintain a reasonably constant daily output of milk. Records were made of milk sales, herd numbers and dates of grazing for individual paddocks, Pasture on offer before grazing was measured monthly.

On Mutdapilly Research Station an experiment to study the effects of five levels of urea application (0, 150, 300, 450, and 600 kg N/ha/year) to Callide Rhodes grass on milk production was established concurrently with the on farm experiment. This experiment used fixed stocking rates of 2 and 3 Holstein-Friesian cows/ha and results were measured in terms of increased milk output. Cows calved from September to November and grazed Callide Rhodes grass throughout the year. They were supplemented with 800 kg grain/cow during lactation, and 0.4 ha of grazing oats/cow during winter.

RESULTS

Milk production by the herd and the periods cows spent grazing pastures are shown in Fig. 1. This figure shows the fluctuations in milk production on the farm. The fluctuations were generally small and the farmer was successful in maintaining a certain level of production. The figure shows the Rhodes grass pastures were part of the feeding system used to maintain this production.

![Fig. 1. Fluctuations of milk production by the herd and periods of grazing](image)

Pasture yield on offer increased with level of nitrogen fertilizer, particularly in the second year (Table 1). Leaf proportion and crude protein content of leaf also increased and weeds and clover content decreased.
Table 1 The mean weight of pasture dry matter on offer at each grazing, composition of pasture and crude protein and phosphorus percentage in the leaf

<table>
<thead>
<tr>
<th>Level of nitrogen kg/ha/year</th>
<th>kg DM/ha on offer at each grazing (mean)</th>
<th>Percentage composition of pasture (mean of 2 years)</th>
<th>Composition of leaf dry matter (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983-84 1984-85 Leaf Stem Dead Weed Clover Other Grassers Protein</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 1973</td>
<td>1653</td>
<td>19 23 15 18</td>
<td>18</td>
</tr>
<tr>
<td>200</td>
<td>2527</td>
<td>2118</td>
<td>24 32 19 13</td>
</tr>
<tr>
<td>400</td>
<td>2541</td>
<td>2737</td>
<td>35 31 14 6</td>
</tr>
</tbody>
</table>

The amount of grazing obtained increased with level of nitrogen fertilizer (Table 2). Most of this effect was evident in the autumn period.

Table 2 Cow grazing days per hectare obtained at each level of nitrogen fertilizer during summer and autumn

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<tr>
<td>0 1973</td>
<td>77</td>
<td>47</td>
<td>169</td>
<td>169</td>
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<tr>
<td>200</td>
<td>134</td>
<td>56</td>
<td>156</td>
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</tr>
<tr>
<td>400</td>
<td>89</td>
<td>43</td>
<td>176</td>
<td>254</td>
</tr>
</tbody>
</table>

The effects of level of nitrogen fertilizer on cow grazing days during autumn on the farm and milk production during autumn at Mutdapilly are shown in Fig. 2.

Fig. 2. The effects of level of nitrogen fertilizer on cow grazing days during autumn on the farm (-----) and milk production during autumn at Mutdapilly Research Station (--------).
The forms of the response measured are similar. For an increase in nitrogen fertilizer level from 0 to 200 kg N/ha/year there was an increase of 43 cow grazing days/ha or 264 l milk/ha during autumn.

**DISCUSSION**

On the farm the object was to maintain milk production within narrow limits and to vary the stocking rate on pasture in order to attain this objective. By contrast, at Mutdapilly the stocking rate was fixed and milk production was allowed to vary to reflect fertilizer treatment. In addition, at Mutdapilly there was very little opportunity for other feed sources to modify the response to fertilizer whereas on the farm other paddock feed was routinely used in association with the Rhodes grass.

This study shows some similarities in response between the two methods, notably the response curve obtained during autumn and the pasture yield response (Cowan et al. 1985). In both studies there was also a marked increase in response from the first to the second year. However, there is a major difference in response during summer. On the farm no additional grazing was obtained from fertilized paddocks during summer, whereas at Mutdapilly the milk response as indicated in Fig. 2, was consistent throughout summer and autumn. Total milk response at Mutdapilly was approximately 1600 l/ha/year when fertilizer level was increased from 0 to 200 kg N/ha/year.

The most likely explanation for this difference during summer is the influence of other paddock feed on the farm during summer. During this time other pastures such as lucerne, forage sorghums and native pasture grow rapidly and the importance of this relatively small area of fertilized pasture to farm productivity would be lessened. The data in Fig. 1, support this suggestion as cows grazed 0 N paddocks for a similar time in both summer and autumn but in autumn were left for a longer period in the fertilized paddocks than during summer. Since pasture yields were higher in summer than in autumn this would indicate an increase in relative importance of fertilized Rhodes grass to farm feed supply during autumn.

We conclude that the increases in pasture yield and cow grazing days on farm paddocks enabled us to obtain a relative measure of productivity. In this on farm assessment there is a strong interaction with other feed sources. Further development of farm models, such as that of Mayer (1982), may allow more precise assessment of the contribution of individual feed sources on a farm.

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**REFERENCES**
