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Red Meat Targets: Grazing Management Systems for increasing Red Meat Production on King Island

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Abstract

Coastal pastures on King Island perform below their potential mainly because of the lack of nitrogen, due to the absence of legumes. This demonstration was therefore initiated to assess the potential for productivity improvement from ensuring nitrogen sufficiency. This was achieved by applying nitrogen fertiliser and measuring live weight responses by grazing cattle.

Pasture production increased in response to the addition of nitrogen fertiliser. However the cattle live weight response was less than that observed in other similar areas of Tasmania making the application of nitrogen uneconomic. A possible explanation is the absence of companion legumes with the consequence of reduced pasture quality.

Given there is about 16 000 ha of coastal legume deficient pasture on King Island, the results of this project can be directly translated to improve productivity of this part of the island. Increased stocking rate arising from adoption of these results will increase the throughput of animals through the local abattoir with associated increases in processing efficiency and benefits to the local island economy.

Executive Summary

King Island is a major beef production region of Tasmania annually processing about 23 000 animals at the local export accredited abattoir. Because the island is relatively small with only about 100 000 ha of agricultural land, production increases can largely only be achieved by increasing productivity from the available land. Pastures on the coastal sands, mainly located on the western side of the island have traditionally been less productive than those at other locations and thus have been used as winter run off areas. Preliminary investigations showed that although cocksfoot survived these conditions well, production was compromised due to nitrogen deficiency caused by a lack of companion legumes. The aim of this project was therefore to quantify the response, in terms of cattle live weight gain, of these pastures to applied nitrogen fertiliser.

The first phase of this work was initiated in the autumn of 2005 by selecting and fencing four, 5.5 ha paddocks on developed coastal country. The two treatment paddocks received additional nitrogen after the autumn break and prior to stocking. The two control paddocks received no nitrogen fertiliser. This phase compared the animal production response from initially applying 35kg N/ha as monthly applications to already established cocksfoot based pastures. Initially both treatment and control areas were stocked in autumn 2005 with 19 heifers but this was reduced to ten on the control areas after two months because of insufficient feed. At the end of winter animal production from the control and treatment areas was 20 and 40 kg live weight gain/ha respectively. Although the animals responded to the extra available feed their performance was considered marginal relative to that achieved from other Tasmanian locations. A possible explanation is the relative low quality of the forage due to the absence of legumes. From an economics view the 20 kg live weight gain /ha was not profitable equating to a production cost from added nitrogen of about $5.78/kg live weight gain.

The second phase of the project was brought forward from autumn 2006 to spring 2005. This was done to utilise the pasture productivity advantages showing in the paddocks that had received nitrogen. This phase involved the creation of a four paddock rotation on the same site, with each paddock receiving 35kg N/ha following each grazing with yearling cattle stocked at the rate of 5.5/ha. The site was stocked with 30 heifers in mid October, with a further 37 steers introduced in early November 2005. The steers were removed after six weeks and the heifers in late July 2006. A further 57 heifers grazed the area from early October until the end of November 2006, when they had to be removed due to the dry conditions being experienced on the island. The live weight gain produced for the autumn/winter period was 46 kg/ha at a cost of $1.71/kg for the added nitrogen. The combined live weight gain produced during the spring/summer period was 540 kg/ha at a cost of $0.14/kg for the added nitrogen. As there was no control, production in the absence of nitrogen is not known.

This work clearly demonstrated the animal production advantage of increased available pasture. The response was less than expected and experienced in other locations probably because of the lack of legume and thus lower overall pasture quality.

In the short term industry can benefit from this work through the strategic use of nitrogen to increase pasture quantity. In the longer term a similar response in terms of pasture quantity could be expected from the nitrogen produced by companion legumes. The ultimate solution in this environment is to increase the legume component present in these pastures.

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1 Background

The project was set up to provide an estimate of red meat production potential from developed coastal grazing areas. This information is necessary in order for decisions concerning future developments to be made on a rational and informed basis.

The coastal areas are traditionally used to provide winter grazing relief for other areas that can become waterlogged in winter. Given that producers generally set stock numbers carried by what can be carried over winter, increasing winter carrying capacity will increase overall enterprise productivity.

2 Project Objectives

1. To quantify animal production from improved pastures developed on coastal grazing country.
2. To assess the potential for productivity improvement from the inclusion of legumes in coastal pastures by measuring the response in live weight gain from the addition of nitrogen fertiliser to existing coastal pastures

3 Methodology

The following details the methodology and management chronology:

Autumn - Winter 2005

- Established four, 5.5ha plots within an existing area of developed coastal pasture.
- All plots received phosphorus and potassium fertiliser.
- Two treatment plots were selected to receive nitrogen fertiliser at the rate of 35kgN/ha with a total of 105kg/ha being applied over the autumn/winter period.
- The remaining two plots were controls, receiving no nitrogen fertiliser.
- Nineteen heifers were assigned to the treatment and control plots.
- The plots were rotationally grazed so as only one treatment plot and one control plot was being grazed at any one time.
- The animals were weighed approximately monthly.
- In July the stocking rate on the control plots was reduced to ten animals in response to available feed.
- This component of the work was completed in late August with the heifers going for slaughter.

Spring 2005 – Spring 2006

- Nitrogen was applied at the rate of 35kgN/ha in September, May and July to the four plots established in autumn 2005.
- Thirty heifers were rotationally grazed around the four paddocks until they met market specifications in July 2006.
- Surplus feed was available in the spring/summer period, which allowed 37 additional steers to also be grazed for six weeks during this period.
- The heifers were removed from the site in July for slaughter.
- There was still pasture available so a further 35kgN/ha was applied in August 2006.
- The owner had no young stock available to stock the site so 160 cows and calves crash grazed the area for about two weeks during late August but no animal production was recorded.
- 57 heifers were rotationally grazed around the four plots during October and November 2006.
- These heifers were removed at the end of November due to the dry conditions experienced on the island.
- This completed the final phase of this demonstration.

Pasture production was not estimated because of the difficulties of undertaking such measures at an isolated and infrequently visited site. Rotational grazing was however used in an effort to achieve high levels of pasture utilisation.

4 Results and Discussion

Autumn / Winter production

Table 1 below shows the live weight response to applying nitrogen during the autumn/winter period. As described above there was two measurement periods with the second period being without a control of nil applied nitrogen.

Table 1. Response to nitrogen applied during autumn and winter

Period	Live weight gain (kg/ha)		
Phase 1	Control	+ Nitrogen	N applied (kg/ha)
25/5/05 – 20/6/05	16	17	35
20/6/05 – 20/7/05	12	26	35
20/7/05 – 22/8/05	-8	-3	35
	20	**40**	**105**
Phase 2			
14/2/06 – 29/5/06		18	35
29/5/06 – 21/7/06		28	35
		46	**70**

Spring / Summer production

Table 2 shows the cattle live weight response to nitrogen applied during spring and summer over two consecutive years. As described above there was no control treatment with nil nitrogen applied.

Table 2. Response to nitrogen applied during spring and summer

Period	Live weight gain (kg/ha)	N applied (kg/ha)
Heifers 10/10/05 – 15/12/05	258	35
15/12/05 – 14/2/06	14	
Steers 1/11/05 – 15/12/05	117	
Heifers 6/10/06 – 30/11/06	151	35
	540	**70**

5 Success in Achieving Objectives

During autumn and winter the live weight gain from the application of nitrogen fertiliser was minimal. This was confirmed on two occasions the first of which required 105kg nitrogen to be applied to yield a production advantage of 20kg. This represents a production cost of about $5.78/kg live weight gain that is clearly uneconomic. Observations over the second period show the application of 70kgN resulted in a live weight gain of 46kg at a cost of about $1.71/kg which is also uneconomic.

Experience in other Tasmanian locations suggests these responses to be atypical but there is no apparent obvious explanation.

The spring and summer response of 540kg live weight gain from the addition of 70kg nitrogen suggests a production cost of $0.14/kg live weight gain. Whilst this is economic some of this response would have happened without the addition of nitrogen. The design of this work does not allow this to be calculated because all plots had nitrogen applied.

Both these responses are below those observed at other Tasmanian sites. The relatively low spring production may be a product of poorer pasture quality due to the absence of companion legumes. This work does however suggest an animal production response from a cocksfoot monoculture with growth unlimited by nitrogen supply.

6 Impact on Meat and Livestock Industry – now & in five years time

The coastal sands of King Island are capable of supporting pasture grasses and thus animal production. The animal production observed is however disappointing and thus may render conversion of this country from its native state to improved pasture sub economic.
Further work is required to detail the reasons for the observed animal production. This should include assessment of the system that includes a legume companion species.

This area of King Island is characterised by soils that do not pug over the high rainfall winter period. They are therefore a valuable component of a business that also has higher productivity sites limited by winter pugging.
Unfortunately this work suggests winter is the period of lowest production for the coastal sand country so conserved fodder would need to be used to sustain high winter stocking rates. This could be harvested from surplus spring growth that can be achieved from the coastal sands.

7 Conclusions and Recommendations

Nitrogen applied after each grazing to cocksfoot based pastures on King Island coastal sands does not result in an economic response during autumn and winter.

Cocksfoot based pastures on the coastal sands are capable of producing at least 540kg live weight gain per hectare during spring and summer under conditions of nitrogen sufficiency.

These animal responses are low relative to some other areas of Tasmania with a similar climate. The reason for this may be lower pasture quality due to the lack of companion legumes but this hypothesis requires further testing.

It is recommended that a future research project be designed to investigate and explain the variable animal production response to grazing cocksfoot dominant pastures.