BENEFITS AND COSTS OF HIGHER STOCKING RATES ON A COMMERCIAL DAIRY FARM IN THE MACALISTER IRRIGATION DISTRICT

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SUMMARY

In December 1993, the Macalister Research Farm began a whole-farm study to compare the benefits and costs of two systems of dairy farming, based on two different stocking rates. The farm, comprising 80 ha of irrigated perennial pasture, was split into two similar sub-farms. The herd of 250 cows was split into two sub-herds of similar average age and productive capacity. One herd was stocked at 2.6 cows/ha, the other at 3.9 cows/ha. Over the next 2½ years, both herds were managed to achieve similar levels of milk production per cow and high levels of pasture utilisation. Records were kept of all inputs and outputs associated with the operation of each sub-farm.

In each season, the higher stocked herd produced more milk per hectare and slightly more per cow, required higher levels of supplementary feeding and other operational inputs, and yielded higher profits than the lower stocked herd. Individual farmers have to decide whether the higher profits of the higher stocked system were sufficient to justify the extra labour and stress involved in operating the larger herd. The difference in profitability between the two systems was very sensitive to changes in the price of milk, and costs of grain and nitrogen fertiliser. The results of this study have been used to develop a ready-reckoner for use by farmers considering variations in stocking rate for their own farms.

Keywords: stocking rate, pasture utilisation, supplementary feed, dairy farming systems.

INTRODUCTION

In December 1993, in response to the demands of district farmers, the Macalister Research Farm (MRF) a community owned demonstration dairy farm near Maffra, Victoria, began a 2½ year extension project to assist farmers who were considering increases in stocking rate on their own farms. Until then, dairyfarmers in irrigation districts had sought answers to their many questions on higher stocking rates from the findings of a study of three different dry-land farming systems at the Dairy Research Institute, Ellinbank (DAV 1994). However, few farmers were confident that these results applied to their own situations.

Previous work at MRF (MRF 1992) had shown that well fertilised, irrigated, perennial pasture in the Macalister Irrigation District (MID) could be expected to supply the feed requirements of a dairy herd (plus replacements) stocked at 2.5 cows/ha, for most of the year. Herds stocked at higher rates required increasing levels of supplementation, in such forms as nitrogen fertiliser and purchased grain and fodder.

The objective of this project was to measure and demonstrate the major benefits and costs associated with two systems of dairyfarming in the MID, one based on a stocking rate of about 4 cows/ha and the other on a stocking rate of about 2.5 cow/ha.

MATERIALS AND METHODS

The milking area of the farm was split into two sub-farms of similar size (38 ha) and productive capacity. Each was stocked with a herd of similar average production index. The higher stocked herd comprised 150 cows (3.9 cows/ha) while the lower stocked herd comprised 100 cows (2.6 cows/ha).

Apart from their different feeding arrangements, the management of both herds was the same. The feed plan for each herd was determined at the start of each season and modified as the season progressed. The aim of each plan was to keep average pasture cover on each sub-farm between 4.2 and 5.5 cm (as measured by a rising plate meter) from September until March of each season, in order to maximise pasture utilisation. Milk production of each herd was targeted at 5,000 litres per cow.

Whenever anticipated or measured pasture growth rates fell behind feed requirements, supplementary feeding commenced. Because of its lower cost, nitrogen fertiliser was generally the first-used form of supplement. As feed deficits became larger, other supplements, including grain, silage, hay and sod-seeded short rotation ryegrasses were also used. Whenever pasture growth rates exceeded cow requirements, larger surpluses were conserved as silage or hay for feeding back on the same sub-farm, while smaller surpluses

were topped to maintain feed quality. All feed management decisions were based on weekly measurements of milk production (from separate milk vats), pasture cover, anticipated pasture growth rates, and other relevant observations made during weekly farm walks.

Records were kept of all major inputs and outputs associated with the project. These included use of fertilisers and feed supplements, pasture management activities, herd and shed expenses, milk production and composition, sales of fodder, cow health and fertility and pasture production and quality.

Pasture consumption was calculated from energy produced in milk less energy provided by supplements, using ARC energy standards (ARC 1980).

Two measures were used to compare profitability of the two systems:- 'Income less variable feed costs', and 'Comparative margin'. Comparative margin was calculated by deducting from milk income, all costs (feed, shed, herd and interest costs) which varied between the systems.

RESULTS

Tables 1 and 2 describe the results obtained in the 1994/5 and 1995/6 seasons.

Pasture composition and quality

Although pasture composition varied considerably from paddock to paddock and season to season, no noticeable, lasting differences developed between the two systems of farming. Attempts to measure differences in pasture quality, using a limited number of feed tests, produced inconclusive results.

Table 1. Performance of dairy cows grazing at high and low stocking densities

	1994/95		1995/96	
Herd (stocking rate)	High	Low	High	Low
Stocking rate (cows/ha)	3.9	2.6	3.9	2.6
Fertiliser applied N (kg/ha)	611	376	407	160
P (kg/ha)	51	44	68	47
K (kg/ha)	76	65	101	73
Pasture renovation (hectares oversown)	30	0	0	0
Pasture topping (hours)	8	10	14.5	48
Pasture consumed and conserved (kg DM/ha)	13,700	12,700	12,900	10,000
Fodder conserved (tonnes silage DM)	18	34.5	11.5	36.5
Fodder sold (tonnes silage DM)	0	26.5	0	1.5
Fodder purchased				
(tonnes silage DM)	26.5	0	1.5	0
(tonnes hay DM)	36.5	12	42.5	9
Concentrates purchased (tonnes grain DM)	157	55	147	49
Pasture consumed by cows (estimated)				
(kg DM/ha)	13,300	11,000	12,600	9,400
(kg DM/cow)	3,369	4,180	3,192	3,572
Conserved fodder consumed by cows				
(kg DM/cow)	120	80	77	350
Purchased fodder consumed by cows				
(kg DM/cow)	420	0	293	90
Concentrates consumed by cows				
(kg DM/cow)	1,050	546	979	493
Total feed consumption (kg DM/cow)	4,959	4,806	4,541	4,505
Production				
(litres milk)	777,720	504,920	712,210	470,390
(kg fat)	33,413	21,536	29,458	19,932
(kg protein)	25,688	16,719	23,501	15,307
Productivity				
(litres/cow)	5,185	5,049	4,784	4,704
(litres/ha)	20,466	13,287	18,742	12,379

Table 2. Financial performance of dairy cows grazing at high and low stocking densities

	1994/95		1995/96	
Herd (stocking rate)	High	Low	High	Low
Milk income ($)	182,078	118,159	212,075	139,847
Milk price ($/kg fat + protein)	3.08	3.09	4.00	3.97
Other income (sale of silage) ($)	0	3,402	0	200
Total income ($)	182,078	121,561	212,075	140,047
Variable feed costs (excluding water)				
NPK fertilisers ($)	23,567	15,511	20,299	9,744
grain ($)	32,528	10,737	40,208	13,417
fodder conservation ($)	1,768	3,340	675	2,190
fodder purchased ($)	8,922	1,800	6,400	1,440
pasture renovation ($)	3,839	0	0	0
pasture topping ($)	200	250	363	1,200
Total variable feed costs ($)	70,824	31,638	67,945	27,991
($/ha)	1,864	833	1,788	737
Shed costs ($)	4,950	3,300	6,450	4,300
($/cow)	33	33	43	43
Herd costs ($)	15,150	10,100	17,100	11,400
($/cow)	101	101	114	114
Interest on investment in cows ($)	15,000	10,000	15,000	10,000
Total costs of key inputs	105,924	55,038	106,495	53,691
Income less variable feed costs				
($)	111,254	89,923	144,130	112,056
($/cow)	742	899	961	1,121
($/ha)	2,928	2,366	3,793	2,949
Comparative margin (income less costs of key inputs)				
($)	76,154	66,523	105,580	86,356
($/cow)	508	665	704	864
($/ha)	2,004	1,751	2,778	2,273

Cow health and fertility

The average condition scores of the high and low stocked herds, as they approached drying off, were 4.9 and 4.9 (in 1994), 4.7 and 4.6 (in 1995) and 4.7 and 4.7 (in 1996) respectively. Levels of fertility, as measured by average calving date and proportion of cows requiring induction, were similar for both herds in the 1995 and 1996 calving seasons. Average calving dates of high and low stocked herds were respectively September 1 and August 30 in 1995, and August 30 for both herds in 1996. The proportion of cows requiring induction in each herd in each season was 16%. Both herds experienced similar levels of milk fever (7% of uninduced cows) and mastitis (average BMC for high and low stocked herds were 288,000 and 256,000 respectively).

DISCUSSION

Differences in production

The higher stocked herd out-produced the lower stocked herd in both seasons. The extensive use of feed supplements to maintain similar levels of production per cow in both herds, resulted in the large difference in production per hectare in favour of the higher stocked herd.

Differences in pasture consumption

Pasture consumption on the higher stocked sub-farm exceeded that on the lower stocked sub-farm by 2,300 kg DM/ha and 3,200 kg DM/ha in Seasons 1 and 2, respectively. While larger quantities of pasture were consumed by the higher stocked herd in almost every month of the year, the pattern of daily pasture consumption of cows in both herds during both seasons showed that the biggest differences in consumption took place in spring and early summer.

Much of this difference in pasture consumption was due to the higher growth rates associated with higher levels of fertiliser, particularly nitrogen fertiliser, applied to the higher stocked pastures. The higher growth rates then combined with more intense grazing to increase pasture consumption.

Differences in levels of supplementary feeding

To provide satisfactory feeding levels for both herds, the higher stocked herd required greater inputs of grain and purchased fodder, as well as additional fertiliser at most times of the year. This resulted in higher quality feed being offered to the higher stocked herd and slightly higher levels of per cow consumption and per cow production by higher stocked cows.

Differences in profitability

In each season, the higher stocked system involved higher variable feed costs than the lower stocked system, but it was also the more profitable of the two systems. Much of the extra profit was generated in the spring, when differences in variable feed costs were at their lowest. On a cumulative basis, the higher stocked system operated at lower profit at the start of the season, because of its higher winter feeding costs, but quickly reversed the situation in the spring and continued to gain in profitability, as the season progressed.

Sensitivity of outcome

The difference in profitability between the two systems was particularly sensitive to changes in the price of milk and costs of grain and nitrogen fertiliser.

Ready reckoner

Based on the results of this study, a ready reckoner has been developed to assist farmers with decisions about levels of stocking rate for their own farms, using various prices of milk and grain.

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