PHYSICAL AND FINANCIAL CHARACTERISTICS OF HIGH INPUT AND LOW INPUT DAIRY FARMS IN NEW ZEALAND

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This thesis is dedicated to my parents

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ABSTRACT

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In recent years the use of supplements in New Zealand dairy farms has increased, but there is little information about the way in which this extra feed has influenced the dairy system. This research work aimed at analysing the effect of extra feed input on the physical and financial performance of dairy farms. ProfitWatch data corresponding to 915 owner -operated dairy farms were analysed. The data was classified according to dairy season (1998/99, 1999/00, 2000/01, 2001/02), extra feed offered per cow (low input systems: <50kg DM extra feed/cow; Intermediate input system: between 50-500 kg DM extra feed/cow; High input systems: >500kg DM extra feed/cow) and quartiles according to EFS/ha. The definition of extra feed comprised supplements imported, winter grazing and maize grown in the farm. The statistical analysis comprised analysis of variance (ANOVA) and regression analysis done in SAS. In all 4 dairy seasons, high input systems had higher stocking rates (2.7-2.8 vs 2.4-2.5 cows/ha), lower comparative stocking rate (83-86 vs 92-83 kg LWT/t DM), higher milksolids production per cow (293-341 vs 249-295 kg MS/cow) and per hectare (826-921 vs 616-744 kg MS/ha), and higher use of nitrogen fertiliser per hectare (85-116 vs 53-67 kg N/ha/year) than low input systems. During the period of study, milksolids payout increased from $3.58/kg MS in 1998/99 to $5.30/kg MS in 2001/02. High input systems had higher Gross Farm Income per hectare ($3287/ha vs $2374/ha in 1998/99; and $5377/ha vs $4362/ha in 2001/02) and higher Farm Working Expenses per hectare ($2519/ha vs $1760/ha in 1998/99, and $3259/ha vs $2187/ha in 2001/02) than low input systems. There were not significant differences in EFS/ha, Return on Assets (%) and Return on Equity (%) between farms in the 3 feed input systems. Within each feed input system, farms in the top quartile for EFS/ha had higher stocking rates and higher estimated pasture consumed per hectare than their corresponding farm system in the bottom quartile. Regression analysis of all the farms (915 farms) showed that across all farms, the marginal (average of 4 years) response to the extra feed used was 50g MS/cow/kg DM extra feed per cow. But the marginal response per hectare to extra feed was higher (96g MS/ha/kg DM extra feed per hectare) due to associated increases in stocking rate and other inputs. The operating cash surplus per hectare increased by approximately $0.07 to $0.12/kg DM of extra feed used per hectare, but EFS/ha was not significantly affected by these differences in cash operating surplus.

Keywords: low, intermediate and high input systems; extra feed.

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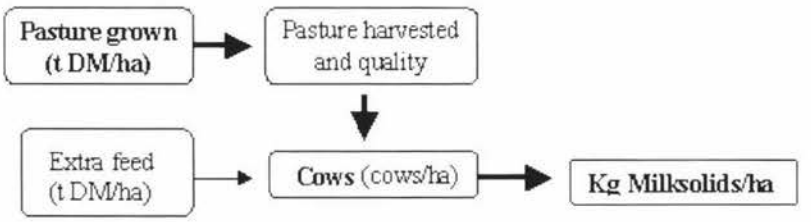
CHAPTER 1

INTRODUCTION

Approximately 10% of the milk produced in the world occurs in pastoral systems (World Animal Review, 1995; In: Holmes, 2000). This is because the optimum weather conditions (rain, temperature) and soil fertility necessary for pasture growth during the whole year occur only in a few countries.

The pastoral dairy system, simple in structure (See figure 1), is a dynamic system in which all parameters are related and influence each other. In this system, pasture growth is greatly influenced by weather conditions, pasture cultivars, the use of fertilisers and grazing management (Holmes et al., 2002). The performance of the dairy cow is influenced by her genetic merit and the environment, especially the feeding environment (Kolver, 2000). Healthy cows, with high feed conversion efficiency and longevity are essential for high milksolids production per cow.

Figure 1.1: The Pastoral Dairy System



Stocking rate influences the level of pasture utilisation, the feed intake of the cow and milksolids production per cow (McGrath, 1997). When pasture production is not enough, supplementary feeds can be used to meet the feed requirements of the herd (See Figure 1.1).

The New Zealand pastoral dairy system is characterised by its low cost of production and the lack of subsidies from the government. Between 90% and 95% of the milk produced in this country is exported (Burton, 2001; NZOY, 2000), at a price

that varies from year to year. Maintaining low costs of production is necessary to remain competitive in the global market (Parker, 1998; Holmes, 2000). But keeping low costs of production can also limit farm profitability during periods of high milksolids payouts (McCall et al., 1999).

In New Zealand, the strategic management of grazing, stocking rate, calving and dry-off dates, fertilisers and supplementary feed have resulted in a system with a high degree of synchrony between feed demand and feed supply. However, this system also constrains milksolids production per cow (Penno et al., 1996). This is due to the variability in pasture growth and pasture quality during the year, and to the limits that grazed pasture imposed on dry matter intake (Holmes et al., 2002; Kolver, 2000). While in the USA and Europe the average milk production per cow is 8000 - 9000 kg per lactation (USDA, 2003; Zwald et al., 2001; Perkins, 2002), in New Zealand milk production per cow is on average 3500 – 4000 kg per lactation (Zwald et al., 2001; Perkins, 2002).

Since in New Zealand farm income is related to milksolids production per hectare, strategies oriented to increase milksolids production per hectare can potentially increase farm profitability. The inclusion of extra feed into the pastoral system can increase farm profitability by increasing milksolids production per cow and per hectare. Changes in stocking rate and in calving and dry-off dates are necessary when extra feed is used in order to maximise feed utilisation and the conversion of feed into milksolids (Holmes et al., 2002). However, the effect of feeding supplements on farm profitability can vary depending on the milksolids response to the extra feed, the costs associated with feeding the supplements, and the milk price (Penno, 2003).

In New Zealand, strategies aimed at increasing milksolids production must not be separated from profit. Recently there has been an increase in mi lksolids production per cow and per hectare, due in part to higher inputs of fertilisers and extra feed into the pastoral system (MAF, 2001). However, increases in milksolids production per hectare have not always resulted in higher farm profits per hectare due to the increase in production costs (Van der Poel, 1996).

1.1 AIMS AND GENERAL DESCRIPTION OF THE RESEARCH

In recent years there have been major debates about the profitability of the inclusion of extra feed into the dairy system. However, there is little information about the effect that the inclusion of extra feed has had on commercial dairy farms. The general objective of this work was to analyse the influence that extra feed has had on commercial dairy farms in recent years.

This research work starts with the revision of literature related to the physical and financial characteristics of low input and high input dairy farms in New Zealand (Chapter 2). This chapter shows that the dairy system should be adapted to the amount of extra feed input and that milksolids production, per cow and per hectare, is influenced by the use of extra feed. This chapter also shows that the reports about the profitability of low input or high input dairy farms in previous research works are contradictory.

This thesis comprises the analysis of ProfitWatch data corresponding to 4 dairy seasons (between 1998/99 and 2001/02). To analyse the effect of extra feed on the dairy system, dairy farms in ProfitWatch were classified according to the amount of extra feed offered per cow. The definition of extra feed, for the classification of dairy farms, comprised supplements imported, pasture imported as winter grazing and maize grown in the farm. Three feed input systems (low input: <50 kg DM extra feed/cow; Intermediate input: 50-500 kg DM extra feed/cow; High input: >500 kg DM extra feed/cow) were formed and analysed.

The first part of the results describes the physical characteristics of low, intermediate and high input systems between 1998/99 and 2001/02 (Chapter 3). In this chapter the objective was to describe how the inclusion of extra feed influenced the farm system (farm size, stocking rate, comparative stocking rate), milksolids production, per cow and per hectare; pasture production and the use of nitrogen fertiliser. This information helps to understand the influence that the inclusion of extra feed has had on farm size, stocking rate, milksolids production (per cow and per

hectare), some reproductive characteristics of the herds and pasture production per hectare.

The second part of the results describes the financial characteristics of low, intermediate and high input systems between 1998/99 and 2001/02 (Chapter 4). In this chapter the objective was to describe how the use of extra feed influenced Gross Farm Income ($/ha), Farm Working Expenses ($/ha), Economic Farm Surplus ($/ha), Return on Assets (%), Return on Equity (%), and the cost of milksolids production ($/kg MS). This chapter helps to understand how the inclusion of extra feed into the system, and the adaptation of the dairy system to this extra feed, have affected the profitability of dairy farms (EFS/ha, RoA, RoE). The financial analysis of low, intermediate and high input dairy systems also helps to understand the effect of extra feed on Gross Farm Income per hectare and Farm Working Expenses per hectare.

The third part of the results (Chapter 5) analyses the physical and financial characteristics of low, intermediate and high input dairy farms in the top and bottom quartiles for EFS/ha. In this chapter the objective was to determine the physical (stocking rate, comparative stocking rate, milksolids production, pasture production) and financial (Gross Farm Income, Farm Working Expenses, Return on Assets and Return on Equity, cost of milksolids production) characteristics of farms in the top and bottom quartiles for EFS/ha. The classification of the 3 feed input systems into quartiles for EFS/ha helps to identify the characteristics that make low, intermediate and high input farms profitable. The inclusion of extra feed requires the adaptation of the system. For this reason, the characteristics of low, intermediate and high input farms in the top quartile for EFS/ha help to clarify the adaptations that are necessary in the dairy system in order to maximise profitability.

The last part of the results (Chapter 6) comprises simple and multiple regression analysis of the whole data. In this chapter, instead of classifying the dairy farms in 3 feed input systems, all dairy farms were used for the regression analysis. The objective of this chapter was to determine the relationships between milksolids production (per cow and per hectare), Gross Farm Income ($/ha), Farm Working Expenses ($/ha), Economic Farm Surplus ($/ha), Return on Assets (%) and Return on Equity (%) with the amount of extra feed used per cow or per hectare. This chapter

helps to clarify the relationships between different farm parameters and the inclusion of extra feed.

This study provides a better understanding of the effect of extra feed input on New Zealand dairy farms in recent years. By knowing the effects of extra feed on the system, it will be possible to advise dairy farmers on the profitable inclusion of extra feed into their farms.