The relationship between milkfat production per hectare and economic farm surplus on New Zealand dairy farms

T.H. DEANE

Consulting Officer Service, Livestock Improvement, Private Bag 3016, Hamilton, New Zealand.

ABSTRACT

Consulting Officer survey data from 198 owner/operator dairy farms for the 1991/92 season was analyzed. Trends in income, farm costs and profitability at changing levels of milkfat production/ha were examined. Increases in milkfat production/ha were associated with increases in stocking rate (R^2=0.79) and small increases in milkfat production per cow (R^2=0.47). Increases in stocking rate were weakly associated with milkfat production/cow (R^2=0.092). Increases in milkfat production/ha were strongly associated with increases in total income (R^2=0.93). Cash expenses (R^2=0.31) and overhead costs (R^2=0.29) also tended to increase but at a slower rate. An increase in milkfat production/ha was generally associated with an increase in EFS/ha (R^2=0.58). On individual farms at similar levels of EFS/ha there was considerable variation in milkfat production/ha. Implications for future research are discussed.

Keywords: dairy farm profitability, farm survey data, milkfat production, stocking rate, economic farm surplus.

INTRODUCTION

For many years milkfat production per hectare has been a common measure of dairy farm performance. The goal of dairying production research has been to develop technologies or farm management practices which maximise milkfat production per hectare. Some scientists have frequently assumed that increases in production are synonymous with increases in profitability.

Farmers have challenged scientists and extension workers as to whether increases in production per hectare on their farm will actually increase profitability. Some claim that the marginal cost of inputs on farms at high levels of production are greater than the marginal income generated from the extra production.

Survey information from sheep and beef properties (Taylor and McRae, 1977; Fitzharris and Wright, 1984) and dairy farms (McRae et al., 1980; Holmes, 1990) has been used to rank farms according to their level of production/ha. Analysis of this data shows in general that farms at high levels of production/ha are more profitable than farms at lower production levels.

The limitations of analysis of farm survey data has been discussed by Townsley and Parker (1987). Observational studies such as farm survey data analysis identify factors **associated with** each other. These factors may or may not be linked in a **cause and effect** relationship. For example variables including climate, stage of land development and the genetic quality of the stock may differ between each of the farms surveyed. These variables may be partly responsible for the trends seen in the data but are not considered in a survey type analysis. Provided this limitation is considered when interpreting the results, analysis of survey data can provide valuable information for extension and research.

Much of a Consulting Officer's time is spent looking at the economic implications of strategies which increase production with farmers. Up to date data to assist Consulting Officers answer the farmer question "will increased production on my farm result in greater profitability?" is needed. This paper presents an analysis of Consulting Officer survey data relating trends in income, farm costs and profitability to changing levels of milkfat production/ha.

MATERIALS AND METHODS

Consulting Officers collected physical and financial information from 198 owner/operator dairy farms relating to the 1991/92 season. The farms were selected at random from all New Zealand dairy farms. Financial information was collected from the farm accounts. Information relating to non dairy activities was excluded from this analysis.

Total income in this study was taken as all income from the dairying operation.

Cash expenses were taken as wages (excluding wages of management/personal drawings of the owner/operator),animal health, herd improvement, electricity, shed expenses, supplements, grazing, pasture renovation, fertiliser and lime, freight, weed and pest control and contractor costs.

Overhead costs were taken as the cost of repairs and maintenance, farm vehicle expenses, standing charges and administration. The personal portion of these costs was excluded as was the cost of debt servicing.

Total farm working expenses (FWE) were defined as the sum of cash expenses and overhead costs.

Economic farm surplus (EFS) was defined as the difference between total income and total farm working expenses. Economic farm surplus was the amount available for debt servicing, development and capital expenditure, life insurance, personal drawings, tax, and investment.

RESULTS AND DISCUSSION

Physical and production characteristics

The physical and production characteristics of the farms surveyed (table 1) were similar to those of the average New Zealand factory supply dairy farm (Dairy Statistics 1991/92).

TABLE 1: The physical and production characteristics of the surveyed dairy farms compared with the average New Zealand dairy farm.

	Milkfat /farm (kg)	Herd size (cows)	Eff. area (ha)	Stocking rate (cows/ha)	Milkfat /cow (kg)	Milkfat /ha (kg)
Mean	28505	176	74	2.4	162	385
Min.	4700	30	20	-	-	-
Max.	108598	770	410	-	-	-
SD	15250.9	93.9	47.5	-	-	-
NZ Av.	26567	170	74	2.3	157	359

Increases in milkfat production/ha were associated with increases in stocking rate and small increases in milkfat production per cow (figures 1 and 2).

Stocking rate was weakly associated with milkfat production/cow (figure 3). Other production survey data shows a similar trend (Bryant and Morgan, 1992; Deane, 1992a; Simmonds, 1991).

FIGURE 1: The relationship between milkfat production/ha and stocking rate (R^2= 0.79, m = 0.0042, c = 0.79).

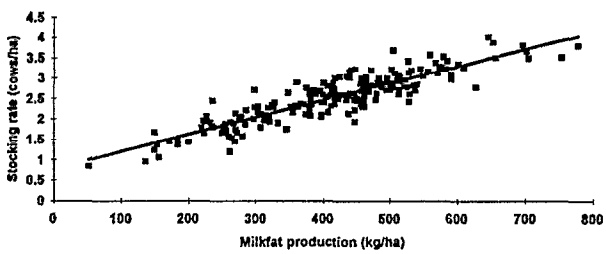
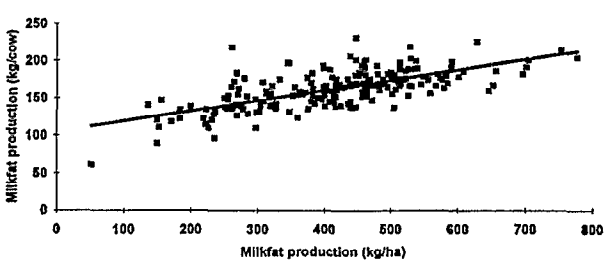


FIGURE 2: The relationship between milkfat production/ha and milkfat production/cow (R^2= 0.47, m = 0.14, c = 105).

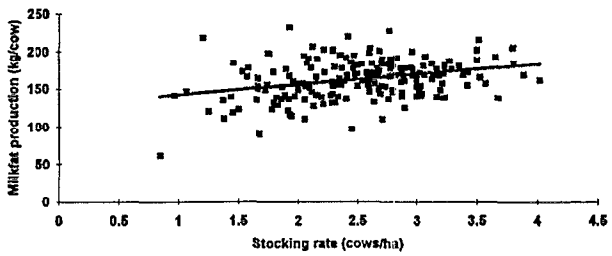


This data is in apparent disagreement with the results of controlled stocking rate experiments which show decreasing per cow production as stocking rate increases. (Holmes and MacMillan 1982).

Possible reasons for the disagreement between the research results and survey data are:

(1) The top producing farms are on better land which grows more grass and can be stocked at higher levels without sacrificing per cow production. (Holmes and MacMillan, 1982).

FIGURE 3: The relationship between stocking rate and milkfat production/cow (R^2= 0.092, m = 13.2, c = 129.2).



(2) At the stocking rates common on many New Zealand dairy farms increasing stocking rate increases pasture utilisation and pasture quality without affecting feed intake/cow. For this reason increases in stocking rate may increase milkfat production/cow (Holmes and Wilson (1987). In contrast stocking rate research was conducted at relatively high stocking rates where feed utilisation was close to optimum, even for low stocked treatments. Increases in stocking rate simply reduced feed intake/cow reducing milkfat production/cow.

(3) There are management or other factors more important than stocking rate affecting per cow production on many New Zealand dairy farms (eg. the genetic merit of the herd, calving date and spread, soil fertility levels).

(1) explains part of the reason for the disagreement between the research results and the survey data however survey data from farms within small geographical areas on similar land capability also shows a poor relationship between stocking rate and per cow production (Deane 1992a).

Data from 21 Northland focal farms supports (2) and (3). Over a 3 year period milkfat production/ha on these farms increased on average by 7%. This was a result of a 6.6% increase in milkfat production/cow and a 0.5% increase in stocking rate (Deane 1992b). Factors other than stocking rate influenced per cow production. These factors must be explained when encouraging farmers to increase per cow production. Consulting Officers report that many farmers have simply dropped their stocking rate in response to scientists recent emphasis on increasing per cow production. Profitability on many of these farms has declined as a result.

Financial characteristics

Figure 4 shows that increases in milkfat production/ha were strongly associated with increases in total income. Cash expenses and overhead costs also tended to increase slightly but at a much slower rate. Consequently an increase in milkfat production/ha was generally associated with an increase in EFS/ha (figure 5).

Table 2 shows the production and financial information for the surveyed farms classified into quartiles based on EFS/ha. The farms in Quartile (Q) 1 had the highest, and in Q4 the lowest EFS/ha.

FIGURE 4: The relationship between milkfat production/ha and income, cash expenses and overheads/ha (for income R^2= 0.93, m = 6.02, c = 75, for cash exp. R^2= 0.31, m = 1.55, c = 222, for o/heads R^2= 0.29, m = 0.83, c = 83).

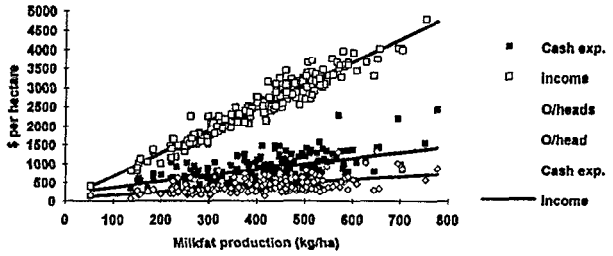


FIGURE 5: The relationship between milkfat/ha and EFS/ha (R^2= 0.58, m = 3.65, c = - 230).

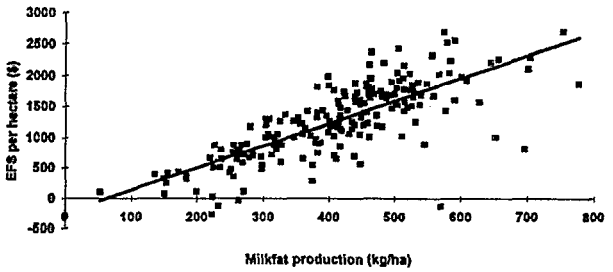


TABLE 2: The production and financial characteristics of the surveyed dairy farms classified into quartiles based on EFS/ha.

	Q4	Q3	Q2	Q1			
	mean	mean	mean	mean	min.	max.	SD
MF kg/ha	279	384	460	525	382	777	92
MF kg/cow	142	157	172	177	145	214	16
Cows/ha	1.9	2.5	2.7	3.0	2.1	4.0	0.44
Income$ /ha	1720	2339	2852	3322	2510	5202	550
FWE $/ha	1245	1259	1330	1289	522	3334	468
EFS $/ha	475	1080	1522	2032	1733	2697	258

Despite the general relationship between milkfat production and profitability, individual dairy farmers are achieving the same EFS/ha at vastly different levels of production. In other words some farmers are producing the same amount of milkfat/ha for a much lower cost than other farmers. This is illustrated by the range in production characteristics of the farms in the top quartile (table 2).

One of the major goals of dairying production research is to improve dairy farm profitability. In the past this goal was successfully achieved by developing strategies to increase production/ha.

Improvements in production/ha have slowed over the last decade. It is believed this is due to the "feed barrier" - production is simply limited by the amount of feed grown/ha. Because of the "feed barrier" the scope for increasing profitability by increasing production/ha on many of the highest producing dairy farms is now very limited.

This survey data indicates there is scope to improve profitability by developing management strategies which reduce costs. What management strategies are being used by those farmers with high production and low costs? Surely the dairy industry would benefit if those and other strategies were identified by research and adopted by farmers.

Dairying production research aimed at breaking through the feed barrier is important. Perhaps however it is now time to place more emphasis on research which develops strategies to maintain production/ha while reducing costs.

The development of "deferred grazing" is one example of the type of research suggested. Feed conservation was identified as a major farm cost. Research then developed strategies to reduce this cost. Largely through savings in farm working expenses the practice of deferred grazing can result in an increase in EFS of $360/ha (McCallum et al., 1991). In terms of farm profitability this is equivalent to a production increase of **100 kg milkfat/ha** for the 1991/92 season.

When research priorities are set, farm profitability as well as farm production must be considered.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance of Kaye Harding (Livestock Improvement) for initial data manipulation, and Rob Jackson, Bevin Harris (Livestock Improvement) and Peter Morgan (Dairying Research Corporation, Hamilton) for statistical assistance and advice.

REFERENCES

Bryant, A.M; Morgan, P.F. 1992. The production performance of large herds supplying New Zealand Dairy Group. *Proceedings of the Large Herds Conference 23:* 29-31.

Dairy Statistics 1991/92. *Livestock Improvement Corporation Limited.*

Deane, T.H. 1992a. The evidence for improvements in milksolids production by manipulating feed demand in "Feed Planning for Dairy Farmers". *Animal Industries Workshop, Lincoln University, 1992:* 11-18.

Deane, T.H. 1992b. Dairy farm monitoring - A New Zealand perspective. *Proceedings of the Dairy Research and Development Corporation conference "Dairy Horizons",Victoria, Australia:* 137-142

Fitzharris, M.J.; Wright, D.F. 1984. Critical inputs into Gisborne hill country. *Proceedings of the New Zealand Grassland Association 45:* 27-37.

Holmes, C.W. 1990. Principles and practices of profitable dairy farming. *Proceedings of the Ruakura Farmers Conference 42: 60-67.*

Holmes, C.W.;MacMillan, K.L. 1982. Nutritional management of the dairy herd grazing on pasture. pp244-274. *In: Dairy Production from Pasture, New Zealand Society of Animal Production Occ. Publication No. 8.*

Holmes, C.W.; Wilson, G.F. 1987. Feeding the herd: Management of feeding. pp33-46. *In: Milk Production from Pasture, Butterworths, New Zealand.*

McCallum, D.A.; Thompson, N.A.; Judd, T.G. 1991. Experiences with deferred grazing at the Taranaki Agricultural Research Station. *Proceedings of the New Zealand Grassland Association 53:* 79-83

McRae, A.F.; Townsley, R.J.; Murray, J.B.; Hopkins, J.; Hutton, J.B.; Stonyer, E. 1980. High verses low input farming. *Massey University Dairy Farming Annual 32:* 104-125.

Simmonds, J.G. 1991. Does reducing stocking rate pay? *Proceedings of the Ruakura Farmers Conference 43: 51-54.*

Taylor, N.W.; McRae, A.F. 1977. The effect of increased farm production on profitability and workload. *Proceedings of the Ruakura Farmers Conference 29: 75-79.*

Townsley, R.J.; Parker, W.J. 1987. Regression analysis of farm management survey data. *New Zealand Journal of Experimental Agriculture 15:* 155-162.