Section 3: Physical Analysis

3.1: Introduction

Previous Economic Surveys have reported the trends in financial performance of dairy farms but not the trends in physical performance. While not printed, there are key physical indicators of milk production such as the amount of feed eaten, days in milk, cow condition, reproductive performance, soil fertility, and fertiliser use data available from DairyBase®. It is the combination of the physical performance of the farm reflected through milksolids production, the average cost of production and milk payout (refer to Figure 3.4) that drives the financial results.

3.2: 2007-08 Seasonal Conditions

New Zealand

An extensive and severe summer and autumn drought characterised the 2007-08 season. The drought seriously affected pasture growth and covers, reducing milk production across most North Island regions and northern Southland. Many herds were forced to dry off early, between February and April due to large-scale feed deficits, reduced stock condition and the tight supply of supplementary feed. National milksolids production per hectare for 2007-08 decreased 5.1% (New Zealand Dairy Statistics 2007-08) from the previous season. If it was not for the higher milk prices farmers could not afford to purchase additional feed and the impact of the drought would have been devastating.

Moderate to strong La Niña conditions from September 2007 onwards meant that more frequent anticyclones and reduced rainfall produced a relatively dry spring. Severe soil moisture deficits across most of New Zealand worsened as summer rainfall failed to develop. The drought declaration was lifted across most districts towards the end of the season (March-April) thanks to heavy rainfall. Concerns remained due to limited pasture growth and the effect that would have on animal nutrition and cow condition heading into calving.

Northland

The worst flooding events during 2007 were felt by the Northland community in July. A state of emergency was declared as buildings were washed away, homes flooded and losses of stock and agricultural production occurred in low-lying areas. The floods were the most disastrous for many decades in the Far North and Whangarei districts, especially in the Bay of Islands area.

Drought had minimal impact on Northland, only the southern most areas were moderately affected. Summer rainfall was above normal for the region providing favourable conditions for pasture growth and production. Milksolids production per hectare increased 1.7% in 2007-08.

Waikato

A combination of low rainfall, near record high temperatures, extremely dry soils and falling river levels prompted what is believed to be the first ever "official" drought declaration in the Waikato. Spring rainfall was 20% below normal in the region and as summer rain failed to materialise a drought was declared in early February 2008. Rainfall in January was the lowest in more than 100 years. Severe soil moisture deficits (more than 130mm) developed from Auckland to the King Country.

Rain eventually arrived during April and the drought declaration was lifted, however, the damage to pastures will be felt for a few seasons to come with large scale regrassing required. Pasture covers were seriously low and in order to help pastures regenerate under-sowing and direct-drilling were widely used. Northern parts of the region missed the April rain and remained drought-stricken. The greatest decline in milksolids production per hectare for the country was felt in the Waikato, 13.1% down on the previous season.

Bay of Plenty-East Coast

Bay of Plenty dairying production was substantially weakened by the 2008 drought. Spring rainfall was 45% below normal from the 10-year averages in the region. Significant soil moisture deficits developed in November. Large areas were affected by the drought and most farmers were forced to dry off early. The drought broke in April with heavy rain, more than double normal rainfall in some areas.

The high payout mitigated some of the effects of the drought, enabling farmers to buy in feed in an attempt to keep production levels up but overall the season ended with milksolids production per hectare down by 7.1%.

Taranaki

Winter saw a number of tornadoes descend upon the Taranaki region. Spring rainfall was 35% below normal, and this set the stage for the drought that followed in summer.

Drought was declared in March 2008 along coastal Taranaki, extending south from Okato, through the entire South Taranaki district including southern and eastern parts of Stratford. Heavy drought-breaking rain occurred in Taranaki on the 30th of March with 100mm recorded at Stratford. Milksolids production per hectare dropped 7.1% in the 2007-08 season.

Lower North Island

Spring rainfall was 19% below normal for the region, and by November severe soil moisture deficits in Hawkes Bay, Wanganui and Wellington were evident. As summer continued with below normal rainfall (-12%) drought conditions developed throughout much of the west of the North Island, including the Manawatu, and on the east from the Heretaunga Plains to Wairarapa. As a result farmers dried off stock.

Heavy rains in April ended the drought for most regions. Milksolids production in the region declined 2.3% per hectare from the previous season.

West Coast–Tasman

West Coast and Tasman districts had a fairly typical season with some localised heavy rainfalls in north Westland and Franz Joseph in October and December respectively.

Pasture growing conditions were favourable in parts of Westland with high sunshine hours over spring. However, spring rainfall across the region was down 10% compared to the 10-year average. Milksolids production per hectare in the West Coast-Tasman region was unchanged from the previous season.

Marlborough-Canterbury

Low rainfall affected many districts throughout the Marlborough-Canterbury region in spring 2007. Severe soil moisture deficits resulted in Nelson, Canterbury and Marlborough throughout spring and into summer. Temperatures exceeding 30ºC occurred in many eastern regions in late spring.

Dry conditions worsened in the region with a heatwave in January along coastal Canterbury and throughout central Marlborough. Some relief was felt in Marlborough at the end of the season with April rainfall 200% above normal. Despite the dry weather, per hectare production lifted 3.7%, due to irrigation and increased supplementary feeding throughout the season.

Otago-Southland

Southland had a wet, snowy and frosty start to the 2007-08 dairying season. Fortunately summer sunshine hours were extremely high in lower Southland, at least 30% above normal. Typical rainfall and high sunshine hours resulted in favourable summer growing conditions in lower Southland.

Drought affected northern Southland, north and central Otago while other areas were largely unaffected. April rainfall was half that of normal and therefore did little to alleviate the drought situation in north and central Otago. Milksolids production per hectare decreased 3.4% from the previous season.

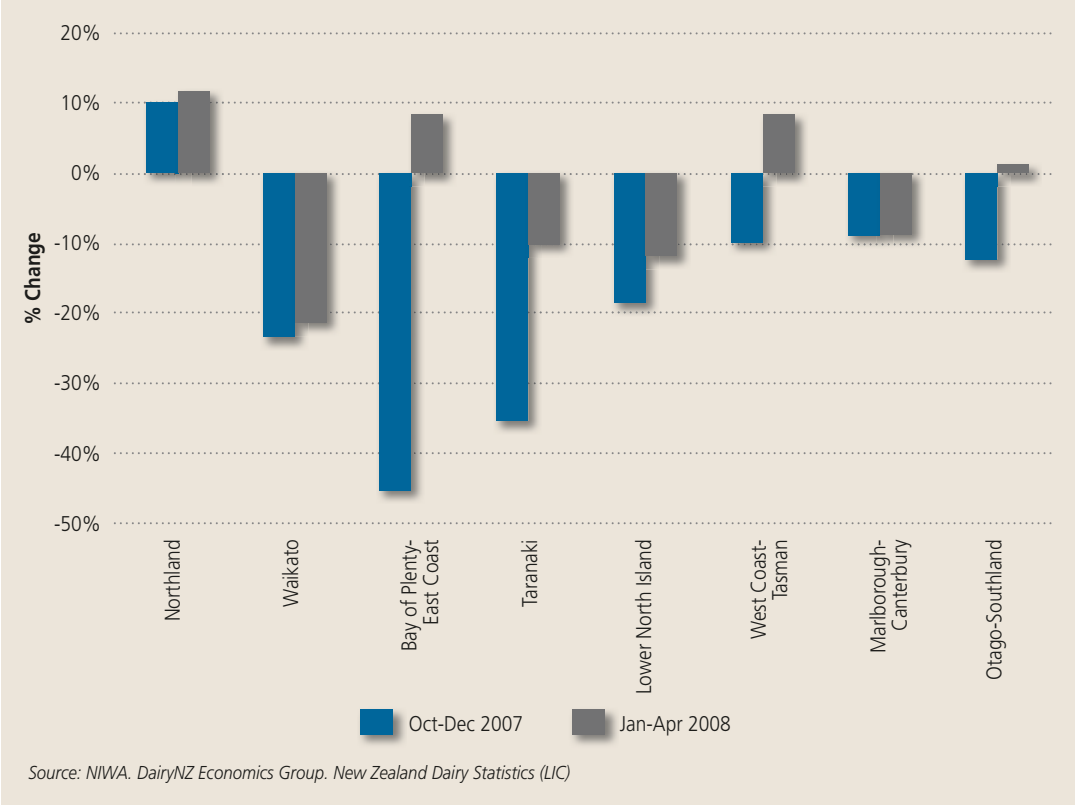
Rainfall summary

NIWA supplied up to 10 years of mean monthly rainfall data from 77 sites in dairying districts. Within each region, mean rainfall for the October to December (spring) and January to April (summer) periods were weighted by the number of cows in the district in which the rainfall was recorded (New Zealand Dairy Statistics 2007-08, LIC). The variation in mean regional rainfall from 10-year weighted averages is shown in figure 3.1.

Throughout the country, with the exception of Northland, spring was significantly drier than normal. In the South Island spring rainfall was down around 10% from average, whilst the Bay of Plenty and East Coast experienced a reduction in mean rainfall of 45%. Taranaki and the Waikato were also afflicted by reduced rainfall, 35% and 20% respectively. The dry spring across many regions resulted in soil moisture deficits leading into summer and the subsequent drought.

Drought conditions prevailed through the Waikato, Taranaki, central North Island, Manawatu, Tararua, Wairarapa and northern Southland in early 2008. The dry spring and ensuing drought led to reduced pasture growth and production throughout these dairying districts. Half the surveyed regions received slightly more than average rainfall for summer in 2008, Northland ahead of the rest at 12%. Summer rainfall was 20% less than usual in the Waikato, and around 10% less than usual for the Lower North Island, Taranaki and Marlborough-Canterbury regions.

Figure 3.1: 2007-08 Variation in Rainfall from 10-Year Region Averages



Source: NIWA. DairyNZ Economics Group. New Zealand Dairy Statistics (LIC)

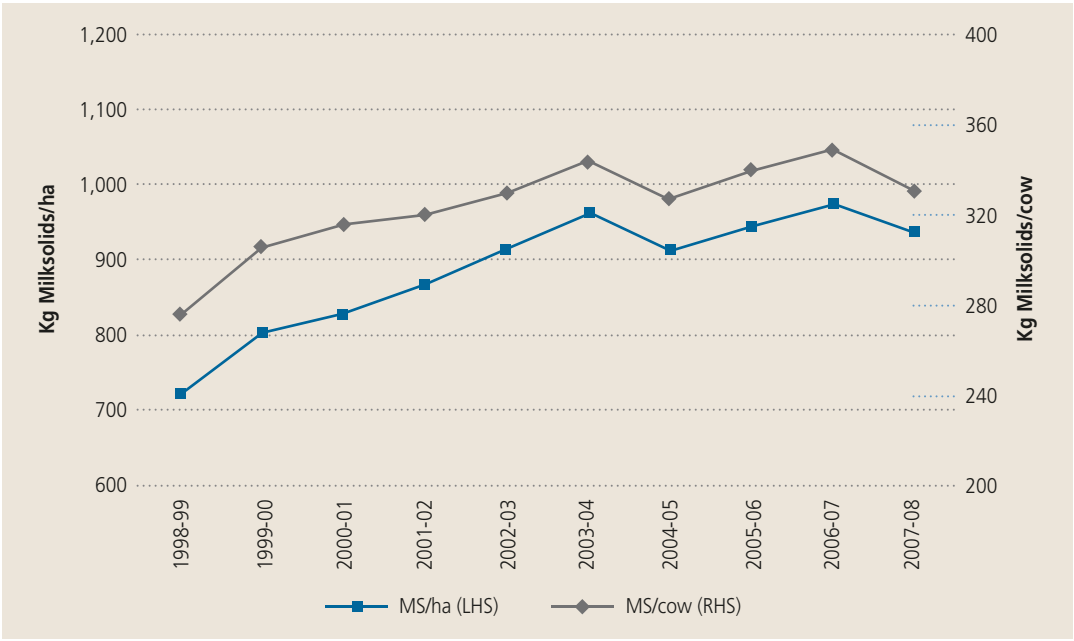
3.3: Milk Production

Milk production on the average New Zealand owner-operator dairy farm measured in the DairyNZ Economic Survey decreased 1.9% in 2007-08 to 115,083 kilograms milksolids. Despite an increase in the average number of peak cows milked from 336 to 348 (+3.6%), the widespread drought conditions resulted in decreased milksolids produced per cow from 349kg to 331kg (-5.2%). Milksolids per milking hectare at 939 kilograms decreased at a slightly lower rate (-3.7%) than per cow production.

Most regions recorded per cow decreases in milksolids production due to the drought, with the exception of Northland (+2.1%), West Coast-Tasman (+1.9%) and Marlborough-Canterbury (+4.2%).

Despite the 2007-08 drought and a combination of a cold spring and dry autumn in 2004-05 there has been a steady increase in per cow and per hectare production on the typical owner-operator farm in the last decade (Figure 3.2).

Figure 3.2: Owner-Operator Milksolids Production (per cow and per ha)



The average annual increase in milksolids production per herd since the 1997-98 season has been 6,150 kg MS or a least squares annual growth rate of 6.9%. Contributing to this have been:

- **More hectares** – annual growth in milking area of 4.5 ha (4.5% per year);
- **More cows** – annual growth of 14.8 cows per herd (5.5% per year);
- **Higher stocking rate** – annual growth of 0.02 cows per ha (1.0% per year).
- **More milksolids per cow** – annual growth of 5.3 kg MS (1.7% per year);
- **More milksolids per hectare** – annual growth of 22.6 kg MS (2.6% per year);

In summary, the annual growth in cows per farm (5.5%) has been slightly faster than the growth in milking hectares per farm (4.5%) and therefore stocking rate has increased slightly (1.0%) over the last 10 years. This increase in stocking rate coupled with the growth in milksolids per cow (1.7%) resulted in an annual increase in milksolids per milking hectare of 2.6%.

3.4: Stocking rate

The average number of peak cows milked per hectare has increased slowly from 2.6 in 1997-98 to 2.8 cows in 2007-08. This can be explained by farms purchasing more feed (including nitrogen), genetic gain in herds and possibly improved utilisation of pasture. In 2007-08 80% of farms had a stocking rate between 2.4 and 3.4 cows per milking hectare.

3.5: Productivity

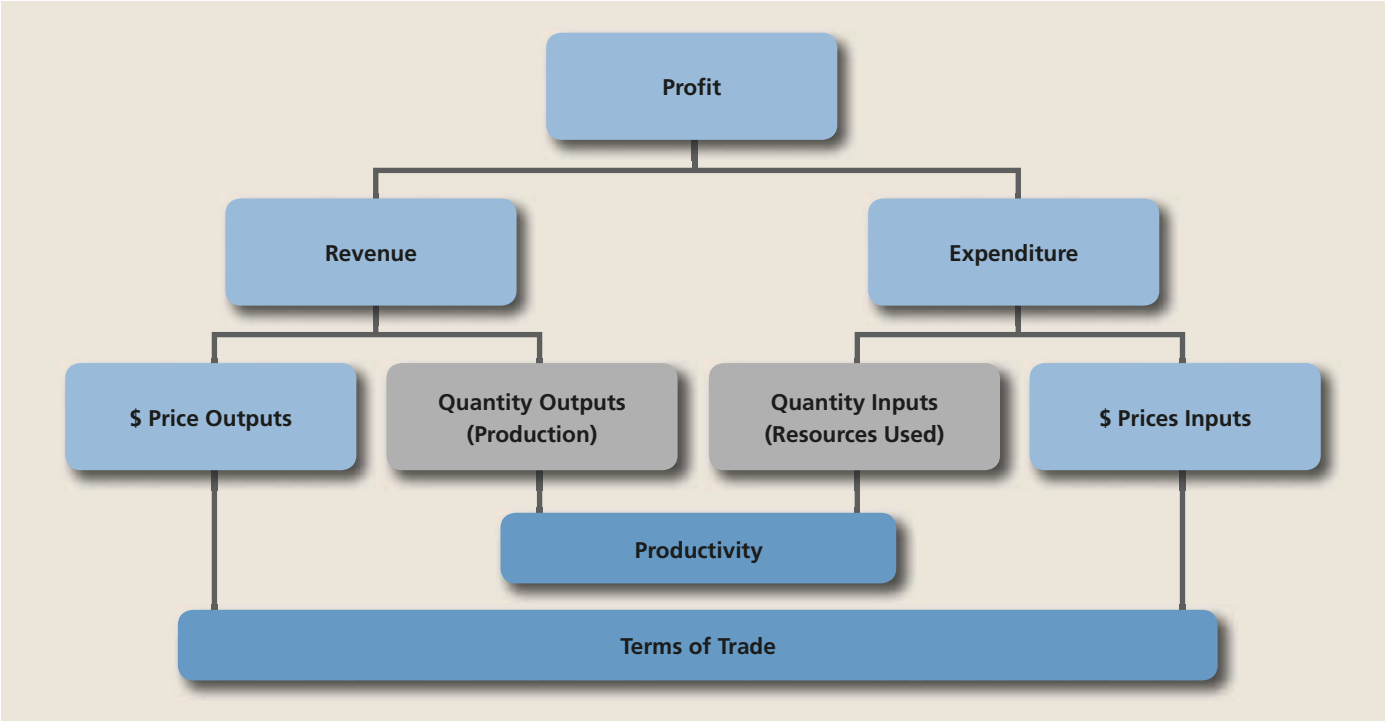
Productivity is a measure of physical farm efficiency or how well a business converts input resources into production. For a dairy farm to become more efficient it must increase production of milksolids and/or reduce inputs such as labour, farm working inputs, repairs and maintenance, overheads and assets such as land, livestock, infrastructure and vehicles. Essentially this is "more from less", although it is possible to be more efficient by producing less providing inputs decrease by more than outputs.

$$\textbf{Productivity} = \frac{\textbf{Physical Outputs (Production)}}{\textbf{Physical Inputs (Resources Used)}}$$

DairyNZ measures dairy farm productivity using the Total Factor Productivity (TFP) approach. TFP assesses the efficiency of producing all outputs against the usage of all inputs (including assets) in the production process. The model uses Tornqvist indices based on changes to outputs and inputs on the average New Zealand dairy farm.

Productivity is one component impacting on profit; the other is prices as demonstrated in Figure 3.3. If the price of outputs e.g. milksolids and the price of all inputs remain constant, the only way to increase profit is to improve productivity. Productivity is what can be controlled or influenced as prices are set by market forces outside the farm gate. However, the reverse also applies, if productivity shows no movement, the only way to increase profit is through a change in the terms of trade, either an increase in output prices and/or a decrease in input prices, neither of which can be controlled by farmers.

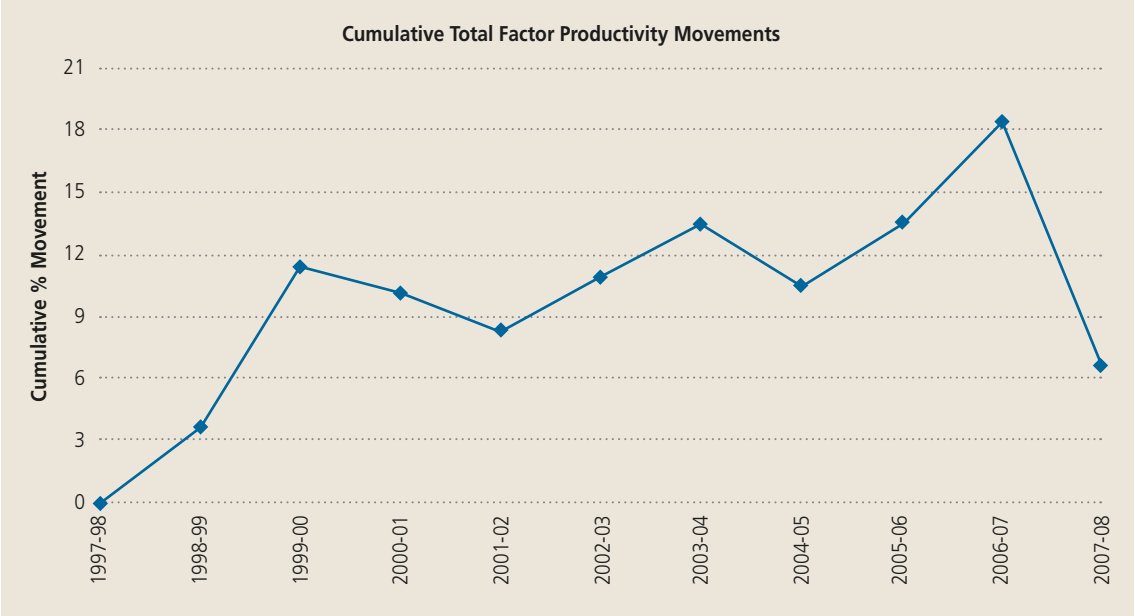
Figure 3.3: Components of Profit



Cumulative TFP movements for owner-operators over the past ten years is shown in Figure 3.4. It is interesting to note that in years of extremely high payouts such as 2000-01, 2001-02 and 2007-08 productivity declined. This is a response by farmers sacrificing efficiency to maximise short term profit through increasing inputs at a faster rate than outputs. Productivity declined 11.8% in 2007-08 erasing many of the gains made over the last decade.

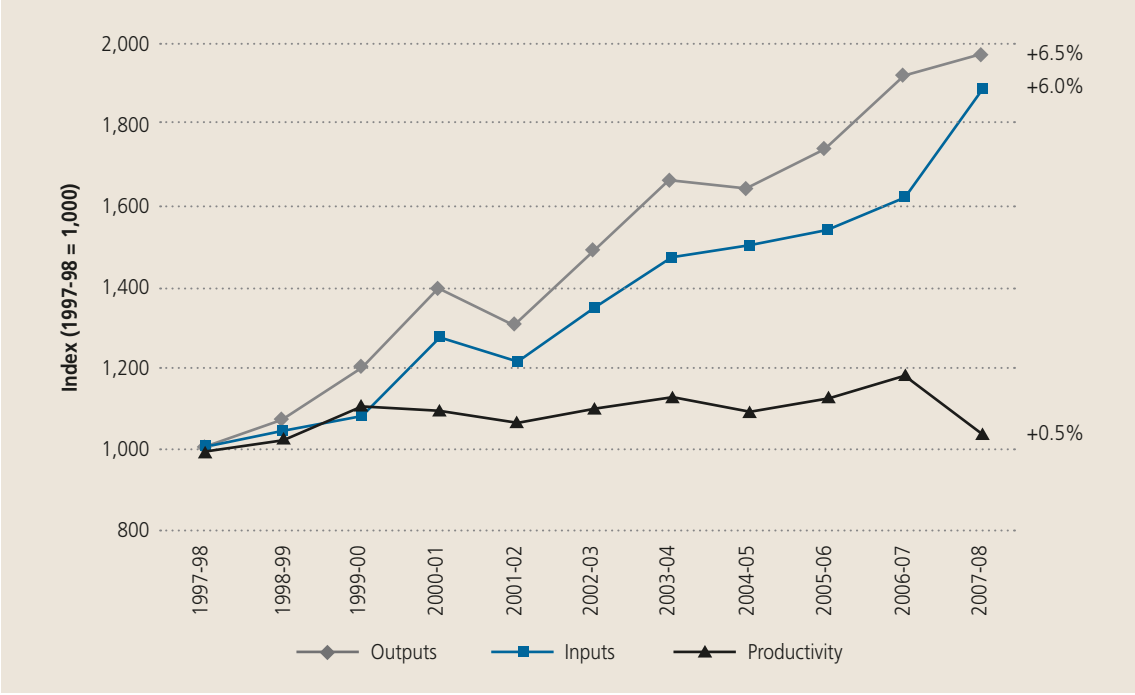
The annual least squares percentage movement in productivity over the last ten years was 0.5%. Following the high payouts and drought in 2007-08 this 10-year trend was down on the 10-year period ending 2006-07 (+1.8% per annum).

Figure 3.4: Cumulative Total Factor Productivity Movements (%)



In the decade ending June 2008, milk production on the average New Zealand dairy farm has nearly doubled. However, the majority of the extra production has come from an annual increase in inputs such as land, cows, and farm working inputs (feed, fertiliser, overheads etc.) and a smaller proportion from more efficient utilisation of the resources (Figure 3.5).

Figure 3.5: Dairy Farm Output, Input and Productivity Movements



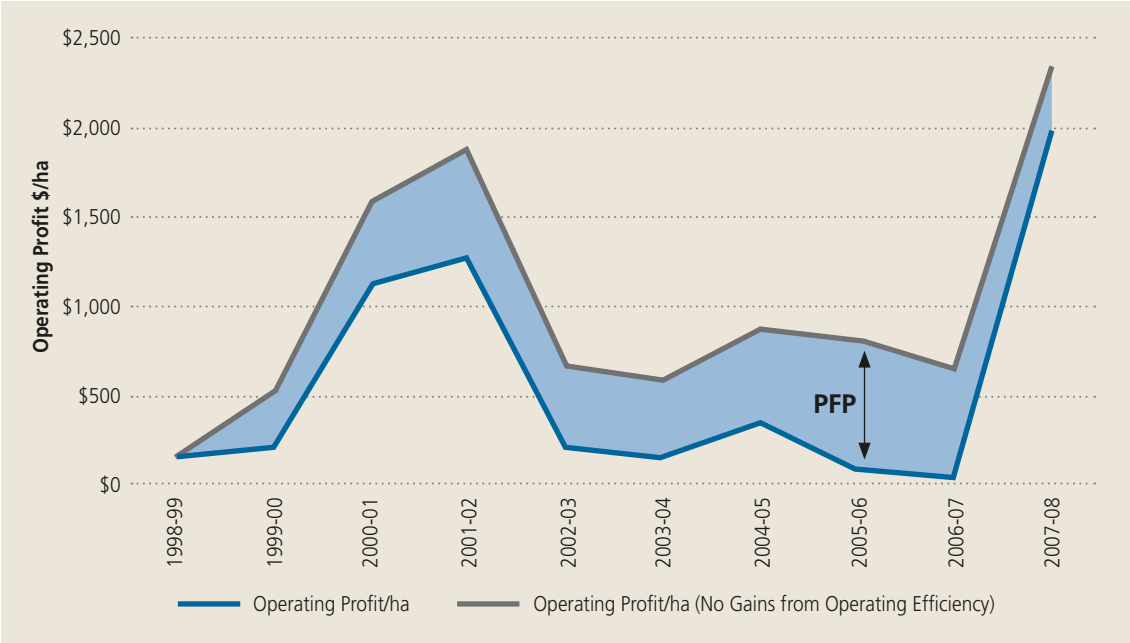
3.6: Profit from Productivity (PFP)

Productivity improvements over time are essential to sustain or grow business profits and therefore to compete successfully with alternative uses for resources. DairyNZ has developed a measure for productivity based on operating profits.

Operating profit from productivity (PFP) is defined as the difference between actual operating profit and the operating profit that would have occurred with no productivity changes since a base year (i.e., in the absence of milksolids production increases and with operating expenses per kilogram milksolids increasing annually at the rate of Dairy Farm Input Price inflation). In essence, PFP is a measure of cost-efficient milksolids production increases since the base year, valued at the year end operating profit margin per kilogram milksolids.

The three main contributory components of PFP are milksolids production increases since the base year; operating expenses savings on inflation since the base year and end year operating profit/kilogram milksolids (largely influenced by payout). DairyNZ and dairy farmers must increasingly focus on achieving cost-efficient milksolids production and PFP provides a means for monitoring the value of productivity gains over time.

*Figure 3.6: Profit from Productivity**



* Operating profit per hectare in Figure 3.6 differs from that presented elsewhere in this publication due to differences in hectare definitions between the *Economic Survey* and the *New Zealand Dairy Statistics*. However, the relativities between operating profit per hectare actual and operating profit per hectare with no productivity gains, i.e. PFP, would be the same under either methodology.

Compared with 2006-07, a reduction in milksolids production per hectare coupled with a significant increase in operating expenses over and above inflation in 2007-08 resulted in a reduction in PFP to $336 per hectare (1998-99 base year PFP = $0/ha).