PROFITABLE LOW INPUT SYSTEMS – SEPARATING THE MYTH FROM THE MAGIC

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Summary

- Profitability is the key measure of financial performance for a business.
- Regardless of the resources, location, or farm system, operating profit per hectare (Gross Farm Revenue/ha – Operating Expenses/ha) is a common measure of the profitability of New Zealand dairy farms.
- Beware of incomplete marginal analyses.
- Milk price is the primary determinant of operating profit, but is outside our control.
- The factors within our control that explain the majority of the variation in operating profit per hectare are milk production and operating expenses per kg MS.
- Animal and feed costs explain a big proportion of the variation between farms in operating expenses/kg MS.
- To be profitable, supplements must be used to fill a true feed deficit, and be cost effective.
- The first limiting nutrient in pasture-based systems is energy.
- Energy is energy – energy type is not important.
- Only purchase supplements that are greater than 10.5 MJ ME / kg DM.
- Supplements should be used to manage pasture; therefore only feed supplements if pasture residuals are declining below 7 clicks, to maintain pasture cover, and/or to maintain the desired rotation length.

"A great civilization is not conquered from without, until it has destroyed itself from within"

– Will Durant, 1885-1981

Introduction

As the liberalisation of world trade continues and the international competition for markets accelerates, farmers must consider the competitiveness of their production systems. A concerted effort must be made to understand the strengths and weaknesses of various systems of production and comparisons made of the performance of the component pieces of the business to international standards or benchmarks.

New Zealand's competitive advantage has relied heavily on the use of low cost grazed pasture; however this low cost advantage is being eroded by more intensive production systems, requiring greater use of purchased supplements and significant investment in depreciating assets. This trend is exacerbated by higher milk payouts, increased value of land

and the importation of inappropriate nutrition advice from systems of farming beyond our shores. Although the medium term outlook is for higher milk prices, it is also for substantial increases in the price of purchased inputs. The key drivers of profit in New Zealand, the economics of different systems of farming, and the appropriate use of supplementary feeds from a cow nutrition perspective will be discussed, allowing you to make informed decisions on whether you should or should not change your system of farming.

Measuring profit

There are a number of measures of profit, and no one measure is all encompassing. The focus of this paper is on the cost efficient conversion of feed to milk, thereby increasing milk production and reducing costs, two crucial elements in on-farm productivity.

Operating profit: Operating Profit per milking hectare (formerly EFS) is the key measure used in the dairy industry to compare profitability between farms. Operating profit/ha is Gross Farm Revenue/ha (GFR/ha) less Operating Expenses/ha (OPEX/ha). Gross Farm revenue is cash income plus a non-cash adjustment for change in livestock numbers, while OPEX is the cash farm working expenses, plus non-cash adjustments for unpaid labour and management, owned run-off, change in feed inventory, and depreciation. These non-cash adjustments put an economic value on resources used that are not accounted for by cash. Whether you are producing shoes or milk, profit is a function of the quantity of items sold multiplied by the per unit profit of each item sold (i.e., units sold x profit per unit sold).

Operating Profit/ha = Production (kg MS/ha) * (GFR/kg MS – OPEX/kg MS)

This operating profit equation is useful for quickly diagnosing areas that may require improvements.

Marginal returns: A failing of agricultural systems worldwide has begun to fester in New Zealand; that is the use of invalid assumptions in marginal analyses to justify the implementation of a change in a system. A common but poor use of marginal analyses is in justifying feeding of supplements. For example:

- somebody works out the purchase cost of the supplement (A);
- they assume an often inflated milk production response and multiply this by the milk price promised (B).
- they subtract A from B, with no consideration for other costs, such as use of fuel, labour, extra investment in assets, depreciation, etc.

This is often referred to as the Margin Over Feed (MOF), Margin Over All Feed (MOAF), or Margin Over Feed and Fertiliser (MOFF). This is an economic measure that has spelt ruin for many dairy farmers internationally. An example of this was recounted by a

Welsh farmer, Richard John, when he visited New Zealand a few years ago. He was given an award in 1996 for being in the top 2% of UK dairy farmers on a MOF basis. Despite receiving this prestigious honour recognising his economic success, his total cost of milk production was $9/kg milksolids (in 1996!) and, despite receiving a milk price of $9.60/kg milksolids, his farm profit was not sufficient to pay tax! His story is not an isolated case.

If assessed correctly, marginal analysis can help with decision making; but only if all likely cost-contributing factors are accounted for. In comparison, longer term decisions, based on incomplete analyses will, in general, decrease profit.

Milk production/cow: As dairy farmers, we have an innate belief that the production of our cows is a reflection on us as farmers. Although milk production/cow may be a reflection on how well a cow is fed and how well this feed is turned into milk, it is a poor predictor of profit, explaining only 19% of the variation in operating profit between farms. This means that more than 80% of the variation in profit is due to reasons other than milk production per cow. Milk production/cow is merely an output of a farm system, not a driver. In the words of Michael Murphy, "***Milk yield is vanity. Profit is Sanity***".

Factors affecting profitability on nz dairy farms

The analysis of actual farm economic data from DairyNZ's DairyBase database enables us to tease apart the primary factors contributing to operating profit across the different regions and types of production systems.

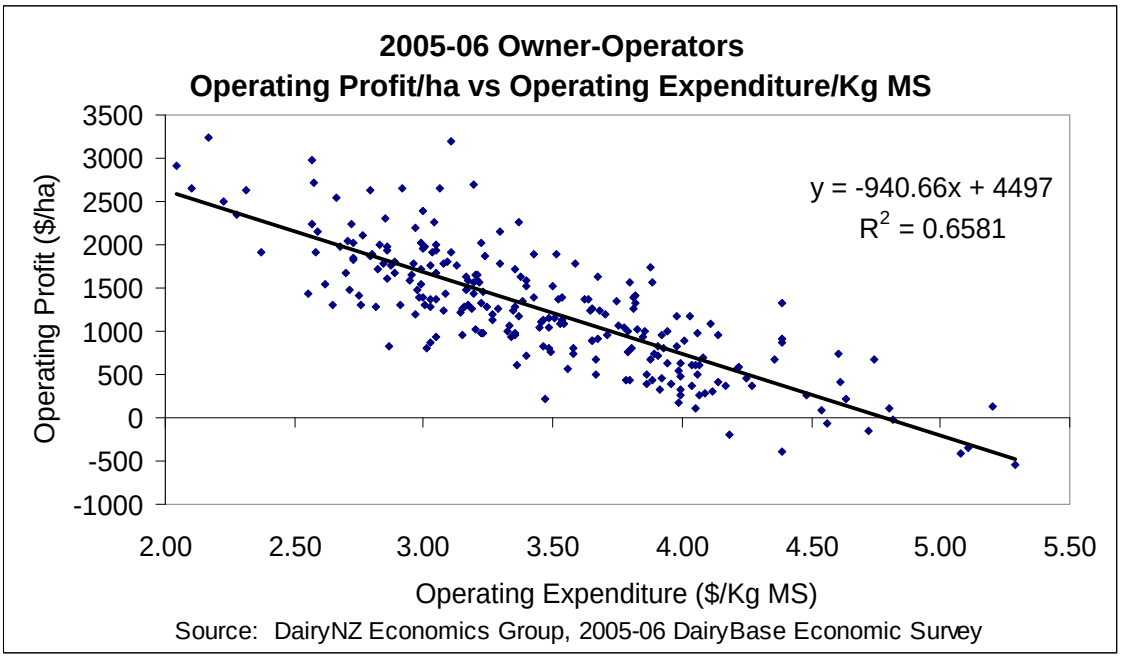


Figure 1: 2005-06 NZ Owner-Operators Operating Profit/ha vs .Operating Expenses/kg MS

New Zealand farmers and their advisors have often been criticised for too great a focus on cost of production (OPEX/kg MS), while ignoring volume of sales (kg MS/ha) in their drive to maximise profit. However, an analysis of recent years data has once again identified cost of production (OPEX $/kg MS) as the primary determinant of profitability in New Zealand (at any given MS price; Figure 1), explaining over 65% of the variation between farms in operating profit irrespective of the system of farming. In comparison, milk production/ha only explains 25 to 35% of the variation in operating profit.

Although true that the top quartile (top 25%) of profitable farms produce 15 to 20% more milk/ha than the average (Table 1), their OPEX (per kg MS) is also 16.5% lower. Therefore, high profits are produced from a level of milksolids production that is cost efficiently produced and not from high milksolids per se.

Table 1. Summary of key performance indicators relating to profitable farming across NZ owner operator farms

Component	Top Quartile	Average	Bottom Quartile	Bottom Quartile As % of Top Quartile
Number of farms	61	244	61	-
Operating Profit/ha	2,130	1,246	380	18
Production, MS/ha	1,257	1,071	894	71
Production, MS/cow	388	360	326	84
GFR/kg MS	**4.62**	**4.6**	**4.6**	**-**
OPEX/kg MS,	2.89	3.46	4.13	143
Operating Profit /kg MS	**1.73**	**1.14**	**0.47**	**27**
Costs				
Animals/kg MS	0.23	0.25	0.27	117
Feed/kg MS	1.02	1.15	1.33	130
Labour/kg MS	0.75	0.93	1.11	148
Other/kg MS	0.89	1.13	1.42	159
Cows/FTE	151	134	118	78

Source: DairyNZ DairyBase - 2005-06 Owner-Operator farms

Operating expenditure

As operating expenditure ($/kg MS) is the primary driver of operating profit on NZ dairy farms, financial data were divided into key categories of expense, to provide insight into

where profit could be increased. Individual farm operating expenses were classified into four groups. These were:

1. Animal – animal health, breeding and herd improvement
2. Feed – net feed made/purchased/cropped, stock grazing, run-off lease, fertiliser (including nitrogen), irrigation, regrassing, weed and pest, feed inventory adjustment and owned run-off adjustment.
3. Labour – wages, ACC and labour/management adjustment
4. Other – farm dairy, electricity, vehicles, fuel, repairs and maintenance, freight, general, administration, insurance, rates, and depreciation

The analysis of 2005-06 DairyBase Owner-operator farms (Table 1) shows that farms ranked on operating profit and grouped into top and bottom quartiles differ in important areas:

- Milksolids production/ha in the bottom quartile is 29% less that the top quartile
- OPEX/kg MS is 43% higher in the bottom quartile compared with the top quartile.
- All cost categories per kg MS are considerably higher for low profit farms, with the exception of animal costs.
- Labour efficiency (Cows/FTE) in the bottom quartile is 22% less that the top quartile; this is linked to the lower labour costs on highly profitable (top quartile) farms.

Having established that OPEX ($/kg MS) is the key driver of operating profit on New Zealand dairy farms, we need to establish the key drivers of OPEX/kg MS. Simple regressions of OPEX/kg MS and the categories outlined above show that feed and animal costs/kg MS explain 46% of the variation in OPEX/kg MS between farms. Labour accounted for 31% of the variation, and steps taken to increase labour productivity, without reducing production will likely improve profit. These are the major contributors to OPEX.

Milk production

Although milk production on its own is not a strong driver of profit compared with OPEX/kg MS, it is important to optimise production through the cost efficient use of feed. Figure 2 illustrates that increasing milk production is a result of increasing feed eaten. **NOTE:** this is not the same as increasing the amount of feed offered. Profitable use of additional feed (purchased or otherwise) results from the supplementation of cows in a true feed deficit (i.e., results in low substitution) with the least expensive, high quality (>10.5 MJ ME/kg DM) supplement. The remainder of this paper will explore the need for supplementary feed, and the factors affecting responses to supplements fed.

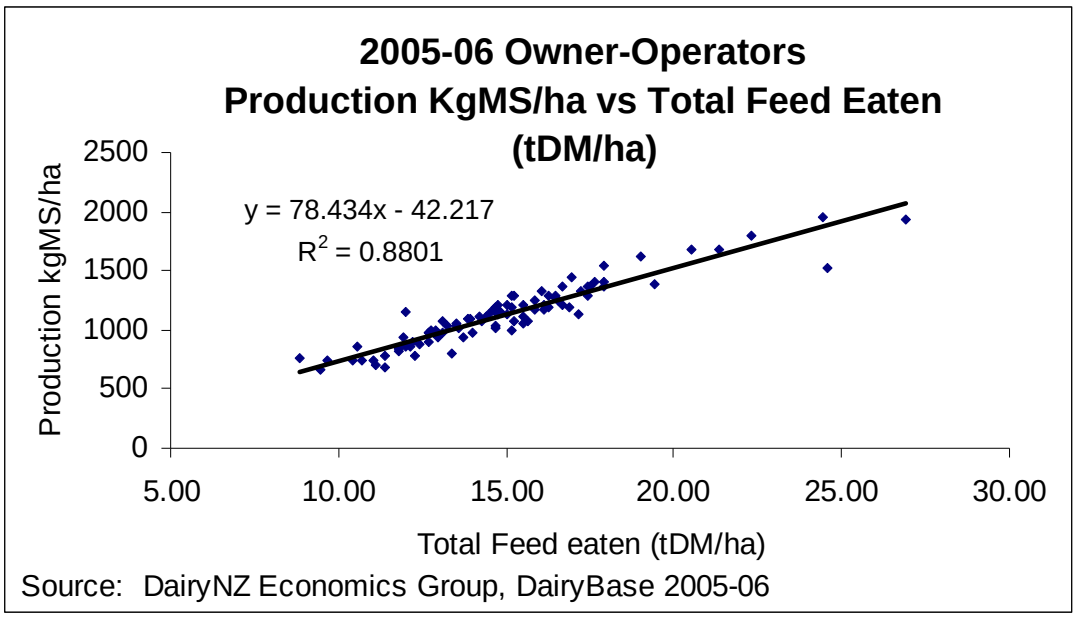


Figure 2: 2005-06 NZ Owner-Operators Milk production (kg MS/ha) vs Total Feed Eaten (tonnes DM/ha)

Getting value from supplements?

"About almost any subject, there are the facts 'everyone knows' and then there are the real ones" – Ernest G. Ross

Cows are ruminants, mammals that have adapted with an ability to digest fibre. The majority of the cow's diet is digested through a fermentation process in the rumen, and it is controlling and optimising this process that enables us to increase dairy cow production. To understand the nutritional requirements of the pasture-based dairy cow, and consequently where responses to supplements will increase profitability, you require an understanding of cow requirements, and when and where appropriate supplements will improve milk production.

When will my cows benefit from feeding supplements?

Pasture is an excellent quality feed and is very well balanced for the nutritional requirements of dairy cows. Therefore, supplements should **ONLY** be used to maintain post-grazing residuals of 7 to 8 clicks (3.5 to 4cm), to achieve the desired grazing rotation, and/or to maintain required pasture cover at a particular time of the season. <u>In effect, supplements should be used to manage pasture, not to feed the animal</u>.

Ignore anybody that tells you that you need to supplement cows when you have sufficient pasture (i.e. the rotation length is correct for the time of year and the post-grazing residual is 7 to 8 clicks). New Zealand research has shown no increase in production when

pasture energy is replaced by supplement energy. Supplementary feeding is only beneficial when you do not have sufficient pasture.

What supplements should i feed?

Just like all animals, cows require energy, protein, fibre, vitamins, and minerals. However, this does not mean that we need to supplement cows with all of these.

Energy: In the majority of circumstances in New Zealand, when pasture supply is not sufficient to meet demands, cows require an energy supplement. Energy comes in different forms – sugars, starch, fats, fibre, and even protein. It does not matter what this supplement is as long as it is of high quality (i.e., palatable and digestible). Independent experiments undertaken in New Zealand over the last 15 years have shown that replacing digestible fibre with sugars or starch does not increase milk production or the efficiency of digestion.

Many people believe that it is necessary to supplement cows with an energy supplement in spring because of low sugar content in grass. You should never judge your supplementation strategy on either pasture or dietary sugar content, because the majority of energy in a grazing cow's diet comes from fibre digestion. Even so, pasture sugar content is greatest in winter and spring and lowest in summer, contrary to what many people believe. Pasture sugar content is largely a function of rotation length and not day length/sunshine hours.

Protein: In general, pasture has surplus protein for dairy cows, and pasture protein is of very high quality. Although there may be some instances when dietary protein is insufficient for maximum milk production, these situations are rare in our systems. In a recent study in Australia where cows were fed up to 8 kg DM/day of wheat in mid to late lactation, there was no advantage to supplementing cows with a high quality protein supplement (canola/lupins mix).

Furthermore, there is no benefit to feeding an energy supplement to utilise the excess protein. The focus in this case is to make greater use of nitrogen compounds in the rumen. Although it makes excellent sense in theory, it has not held true in practice. Furthermore, the energy cost of excreting surplus protein is small.

Fibre: This is one of the most poorly understood dietary components for grazing dairy cows. On the one hand people claim we have insufficient fibre when pasture is lush (i.e. in spring), and this is causing poor digestion, rumen acidosis, lameness, and scouring. In summer, the story switches and we have too much fibre, which reduces intake and limits milk production. It is quite staggering that despite all of the research on the fibre requirements of dairy cows that have been undertaken in New Zealand and Australia over the

last 10 years, we still have this level of misinformation being perpetrated on New Zealand dairy farmers.

- Fact 1. Cows require fibre to maintain rumen pH and a healthy rumen environment.
- Fact 2. Supplementing grazing dairy cows with fibre does very little to rumen pH. Rumen pH varies throughout the day. Supplementing cows with 2 kg of straw, while feeding high quality pasture (NDF 28%) and 5 kg concentrates, did not affect rumen pH in a recent experiment in Australia. These results are consistent with the most recent research undertaken in the South Island.
- Fact 3. Dairy cows grazing high quality pasture do **NOT** have a "rumen mat"; nor is there a need to supplement with fibre supplements to maintain a rumen mat!
- Fact 3. Grazing dairy cows have low rumen pH; they do **NOT** appear to have a problem with that. In fact a recent review of all pasture-based research from around the world showed increasing milk production with declining rumen pH. This means that the last thing we want to do is supplement cows with fibre.
- Fact 4. The consistency of the dung of a grazing dairy cow is **NOT** important. It is a reflection of the amount of water in the pasture. If you want proof of this, feed her some grain. Her dung will dry up even though you haven't provided any effective fibre. You have, however, removed about 3.2 kg water for every kg DM grain fed (assuming 15% DM pasture; 90% DM grain; and 50% substitution rate).
- Fact 6. You can **NOT** determine the fibre requirements of a cow by examining how many of them are ruminating in the paddock. Some people recommend that between 30 and 50% of cows should be ruminating in the paddock at any time. This may be true for cows in confinement in Europe and North America; however, in our observations of grazing cows in New Zealand, the only time that this occurs is approximately 2am. Observe at your leisure!

Minerals: Grazing dairy cows should be supplemented with calcium during the colostrum period and with magnesium from 2 to 3 weeks pre-calving until approximately early-December. In addition, deficiencies of copper, cobalt, selenium, iodine and zinc are also a risk during winter and spring, and these should be supplemented as cheaply as possible from 2 weeks pre-calving to 4 months post-calving (see: www.dairynz.co.nz; Farmfact 3-4 for more details). Supplementing cows with calcium, magnesium and sodium should also be considered when more than 1/3 of the diet is grain-based concentrate, maize, or cereal silage.

Vitamins: Grazing dairy cows rarely need vitamin supplementation. There are rare situations where some vitamins will be deficient. These should be identified in consultation with your vet.

Additional things to consider

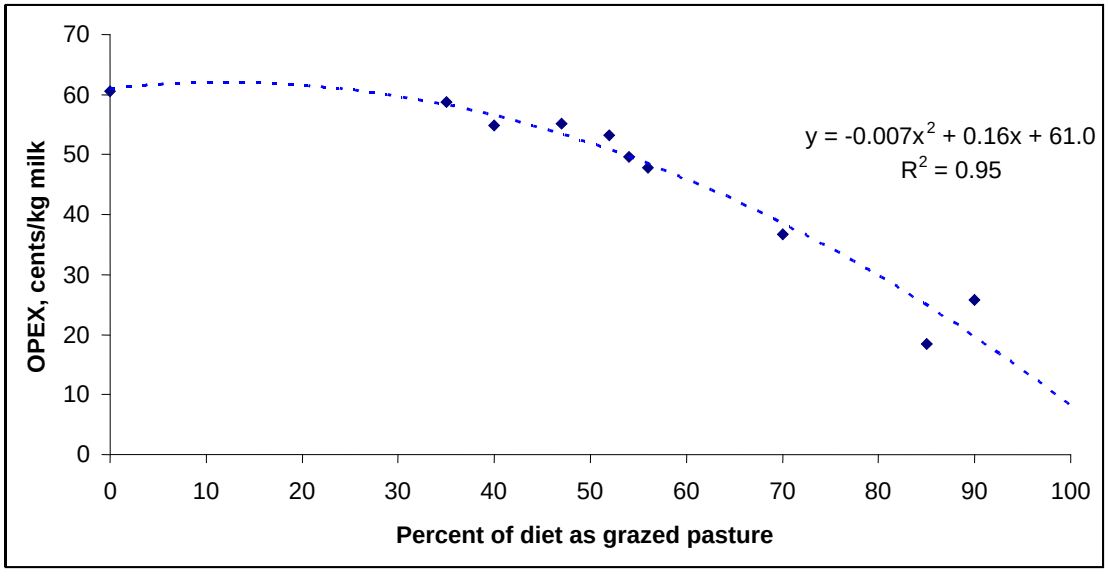
"He who doesn't learn from history, is doomed to repeat it"

– Chinese Proverb

Other systems: It would be humorous if it weren't tragic, that we have so many foreign visitors grace our shores to learn about our dairying system, while we adopt the system that has destroyed their profitability. We need to learn from mistakes made in these systems and not emulate them.

Figure 3 depicts the relationship between supplementary feeding and OPEX in many systems around the world. As the system becomes more intensive and the proportion of pasture in the diet declines, OPEX increases. In the biological zone of interest to NZ farmers (>50% of diet as pasture), OPEX increases $1/kg MS for every 10% reduction in the proportion of grazed grass in the diet, even though feed costs would only be expected to increase by 30 to 40c/kg MS. This highlights the dangers of marginal analyses, with non-feed costs associated with feeding supplements at least equal to the actual cost of the supplement, and quite possibly more.

Figure 3: Relationship between the proportion of grazed grass in the diet and OPEX.



Future price of commodities: The same economic growth fuelling record high milk prices is affecting demand for all other food items, in particular soybean, wheat, rice, and corn. As a result, prices for these commodities have more than doubled in the last 24 months,

and stocks are lower than they have been seen since the early 1970s; and they are still declining. This means that the price of these grains and legumes will continue to escalate (demand greater than supply). In the future we can expect high dairy commodity prices. However we can expect an even greater price hike in all of the other commodities, putting greater pressure on operating profit in higher input systems.

Conclusions

*"**Many receive advice. Only the wise profit from it.**"*

-Publilius Syrus, 50 BC

Operating profit is a function of volume of sales and profit per unit sold. We have no control over milk price, leaving the only profit-determining factors we control to be milksolids yield (per ha and per cow) and cost of production. An analysis of actual farm financial data indicates that cost of production is 2 to 3 times more important than milk yield in explaining differences between farms in operating profit. Inefficient use of supplements and/or the intensification of pasture-based systems will reduce operating profit, as it has done internationally.