Future Productivity and Growth in Dairy Farm Businesses in New Zealand: the *Status Quo* is not an option

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1. Introduction

There are several themes in this paper, all relating to the imperative for dairy businesses to grow and to improve productivity. For agricultural businesses to grow and increase productivity in a dynamic world, the *status quo* is not an option.

People running dairy businesses like to look at how their business has performed in the past year or so, and in the last month and the last week. More importantly, they need to look forward – to next week, next month and next year. Equally important, business people must look to the next 3-5 years. And, occasionally, a glance toward the next 10 years and further out, helps.

In the past fifty years, the supply of food in the world has grown at 2 per cent per annum. This is slightly faster than the rate at which the population of the world has grown. In the next forty years, world population is expected to grow at just under 2 per cent per year, from 6.5 billion people to 9 billion people. The United Nations expects the population of the world to stabilize around this level, looking out as far as 2300 (UN 2006) (see Figure 1). Ninety-nine per cent of this growth in population will be in the poorest countries in the world.

The implications of the expected extra 2.5 billion people in the next forty years, with world population stabilizing at around 9 billion people, are two fold:

- agricultural output, and food supply, will have to continue to increase at 2 per cent per year for the next forty years to exceed the growth in population, and to keep food prices down to levels at which relatively poor people can purchase it.

- the challenges agriculture faces in the next forty years to feed the extra 2.5 billion people is the greatest challenge agriculture will face in the next three hundred years.

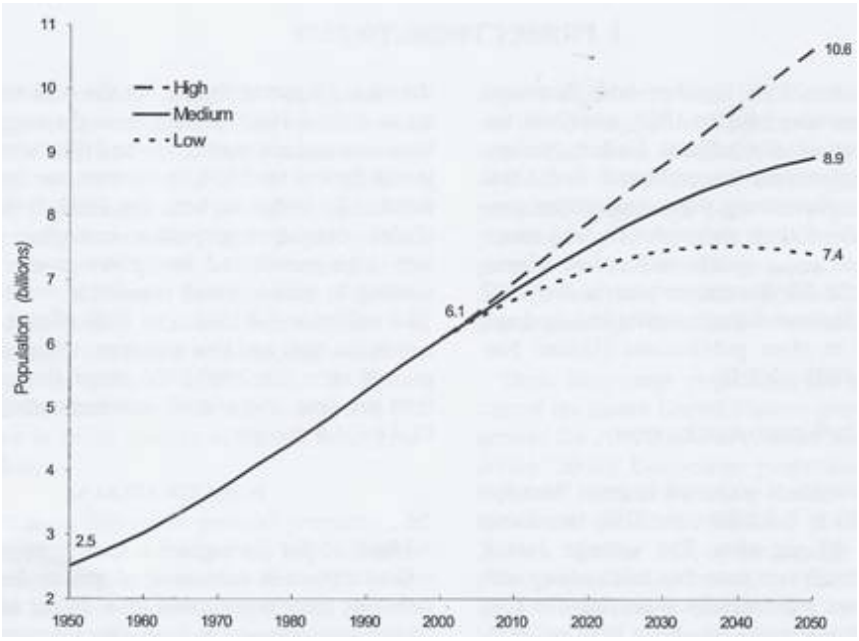

Figure 1: Projected world population next 40 years

Source: United Nations World Population Report 2006

Business analysts talk of businesses having cycles of life: starting out, minor growth, initial major growth, consolidation and continued minor growth, further major growth, consolidation, and so on. Businesses change as the opportunities and constraints created by changes in the technical, economic and human phenomena affecting these businesses change. Renewal, embracing change, or decline is the choice (see Figure 2). While the growth challenges remain as ever, there comes a time when there are complicating, dimensions to decisions about change. These include: ‘too old’, ‘done that’, ‘more at risk now’, ‘can’t/won’t let go’ and so on.

Almost always business renewal involves new size, new capital, new labour, new management, new skills, and new technology. The challenge of business renewal is for owner managers and their businesses to be sufficiently flexible to handle the inevitable; to incorporate innovation and to cope with the changes.

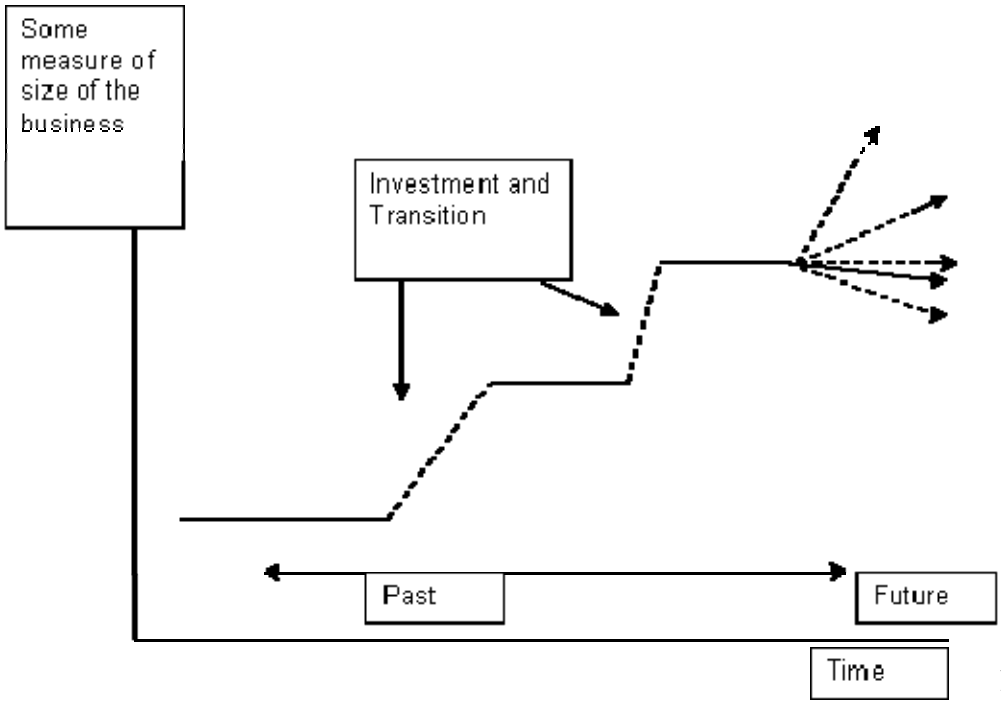

Figure 2: Growth and Transition

In the rest of this paper, the themes introduced above and encapsulated in the representation in Figure 2, are elaborated on.

2. Productivity and Growth

Farmers in New Zealand, including dairy farmers, will be part of meeting the challenges posed by world population growth.. To play their part they will invest, expand their businesses, manage the risks and expand the quantity and quality of agricultural and dairy product supplied, at ever lower cost, to the growing world population. New Zealand dairy farm businesses will grow and their productivity will increase, despite rising real costs and declining real prices. They will do this by increasing what they produce out of what they have to work with. They will increase productivity. Productivity is a measure of output related to the inputs used.

Farmers in New Zealand have increased productivity at various rates, depending on the time period being looked at. Cao *et al* (2007) estimated that productivity in agriculture in NZ, since deregulation in 1984 up to 2006, increased on average 3.4 per cent p.a. This is more than double the performance of the rest of the economy. Similar applies to the rate of growth in the value of agricultural product. It has grown at 3.6 per cent p.a. from 1970-2005 (MAF). Dairying in New Zealand has been part of this agricultural performance. For comparison, the average growth in productivity of dairy farms in Australia was estimated by the ABARE (2004) as follows:

1982/83-2002/03 total factor productivity grew at 1.7% p.a.

1982/83-1992/93 total factor productivity grew at 3.2% p.a.

1992/93-2002/03 total factor productivity grew at 1.2% p.a.

These productivity gains were achieved in Australian dairying after the ratio of prices received to prices paid declined as follows:

1982/83 to 2002/03 terms of trade declined at 1.1% p.a.

1982/83 to 1992/93 terms of trade declined at 0.9 % p.a.

1992/93 to 2002/03 terms of trade declined at 2.2 % p.a.

Coming down from the somewhat abstract concept of industry-wide 'productivity' to the level of individual dairy farms and dairy farmers doing things, increases in productivity come from farmers changing how they run their farm systems. In the recent past, in NZ dairying, productivity gains have come from expanding operations, minimizing costs, converting pastoral land to dairying (MAF 2007), and adopting technological changes in feeding, increasing use of nitrogen (Giera 2007), and gains in genetic potential of pastures and animals.

In considering changing farm systems, questions that arise are: which directions, which changes, what will determine these things? To Hokemea *et al.* (2000), the key elements of a business that affect changes a dairy business adopts are:

- Profitability of the business
- Capital that is available
- Physical resources
- Current utilisation of resources
- Farmers risk preference
- Skills of the farmer
- Knowledge of the farmer
- Farmers' ability to learn
- Family situation
- Objectives of the business
- Stage of business lifecycle
- Market outlook
- Skills and ability of labour

An example from Australia illustrates the above points about changing farm systems to increase productivity. The life story (nearly 40 years) of an irrigation dairy farm in northern Victoria has been written (Ho, *et al*. 2006, Melsen *et al* 2006). These researchers have documented the changes made to the farm system over time, and the changes in productivity and profitability that resulted.

The milking area of this farm was 28 ha in the early 1960s. Milking area increased with regular land purchases, as follows:

- 1965/66 44 ha
- 1972/73 50 ha
- 1978/79 50 ha
- 1983/84 86 ha
- 1985/86 104 ha
- Present 104 ha

The farm family was milking 90 Jersey cows in the early 1960s. Herd size increased to over 500 Jersey/Holstein crossbred cows in the 2000s. Production per cow increased from 120 kg milk fat and 92 kg protein per cow in the 1960s to 290 kg milk fat and 225 kg protein per cow in the 2000s. Milk production increased from 2500 litres/cow to 6000 litres/cow over the same time (Melson *et al* 2006). Total farm milk production increased more than 15 times over the 40 years, from 200,000 litres to 3,500,000 litres. Total milk fat production increased from 10,500 kg to 156,000 kg. Total protein increased from 8,200 kg to 121,000 kg.

These changes in production, and in productivity, resulted from the following changes in the farm system

- increased land
- increased cows
- the whole farm being laser graded between 1978 and 1995
- dairy up-grades in 1972, 1977, 1986 and a rotary dairy in 1988.
- a water re-use dam built in 1980
- introduction of grain feeding in 1988-89
- increases in pasture DM produced and consumed per hectare, from 7t DM/ha to 15 t DM/ha
- increases in use of conserved fodder
- labour productivity gains from improved irrigation layout and automated irrigation, and the rotary dairy

The change in performance of the farm was measured as change in annual operating profit (before interest and tax). This was expressed as return to Total Capital. The farm earned little or no annual operating profit prior to 1992 – average annual operating profit from 1966/67 to the late 1980s (in 2002 $) was $17,000.

In the 1990s some good operating profits and returns to capital were earned (Figures 3 and 4). Average operating profit from 1992-2002 (in 2002 $) was $65,000, and average annual return to capital was 3 per cent p.a. Average annual return to total capital was 3.5% higher in the last 15 years than it was in the first twenty or so years.

Total factor productivity increased by 4 per cent p.a. 1983-1992, and 2 per cent p.a. 1993-2002. This performance exceeded the industry average for the same times, which were 2 per cent and 1.2 per cent p.a. (Ho *et al* 2006).

One of the main findings from this long term case study was that the productivity improvements came several years after the changes to the system that produced them (see Figures 5 and 6). In this case, the major changes happened in the mid to late 1980s – the lifts in profit came in the early 1990s. The increase in profits came when the system was operating to its full potential, and despite the continuing cost price squeeze.

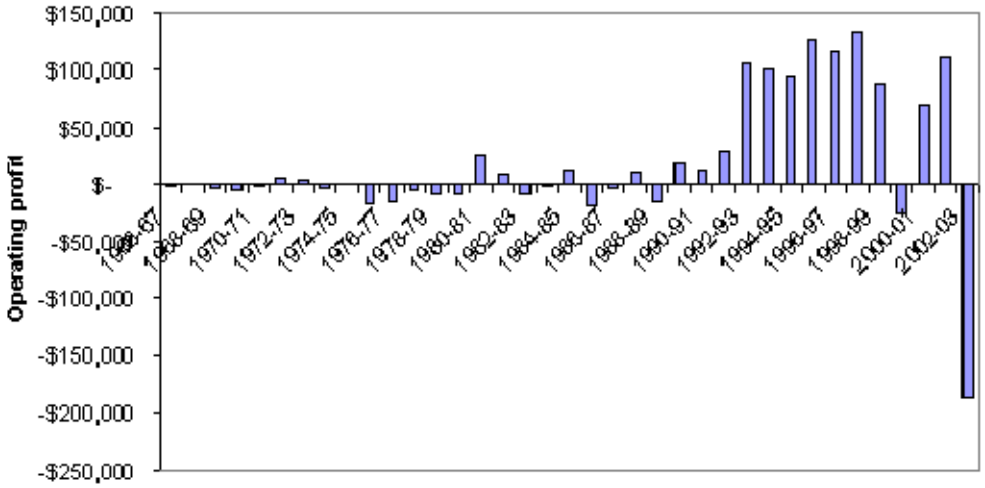

Figure 3: Forty year case study farm annual operating profit

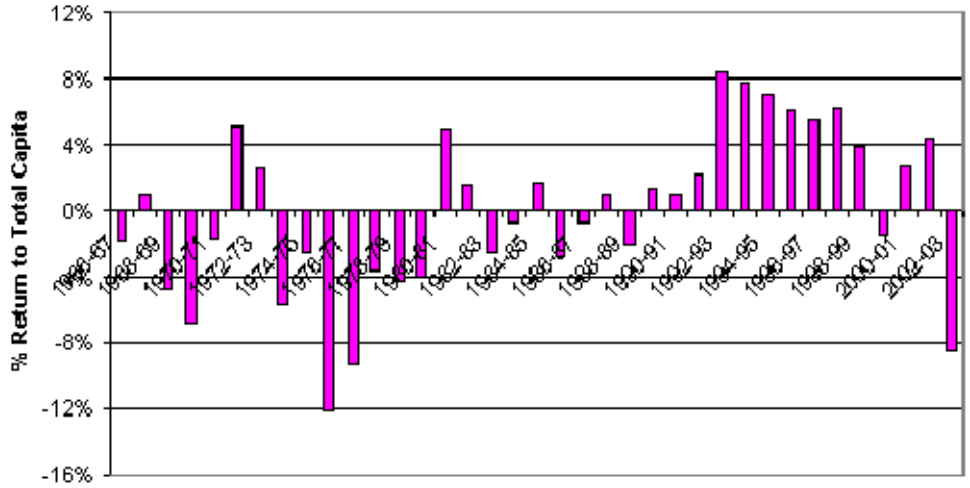

Figure 4: Implied return to total capital before tax, with labour and management fully paid, in 2002-03 adjusted dollars.

In this long term case study, average variable cost per kilogram of protein and milk fat increased from $2-$3/kg in the late 1960s to $3-$4/kg in the early 2000s. At the same time, average overhead cost (including opportunity cost of capital) per kilogram of milk protein and fat decreased from around $5/kg in 1967 to $1.70/kg in 2000. This resulted from increasing output and diluting fixed costs, such as operator labour and management and opportunity cost of capital tied up in land and improvements and cows. The increased output came from increased cows and increased output per cow.

The increased productivity took several years to achieve. A lot of learning was required to run the changed system at the higher levels. These findings about the lag between investing to improve productivity and achieving the benefits mirror those of another study involving five case study dairy businesses by Sinnett and Malcolm (2006).

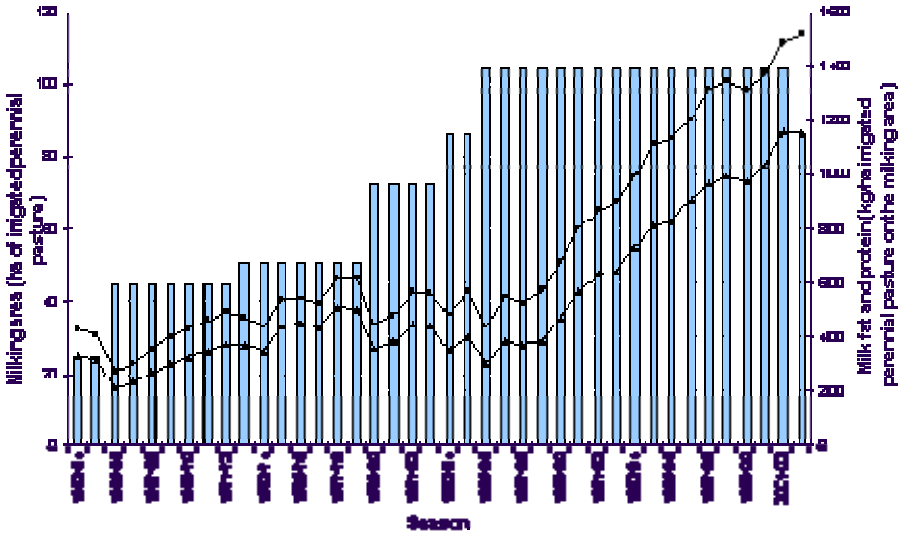

Figure 5: Change in milking area and milk solids over time

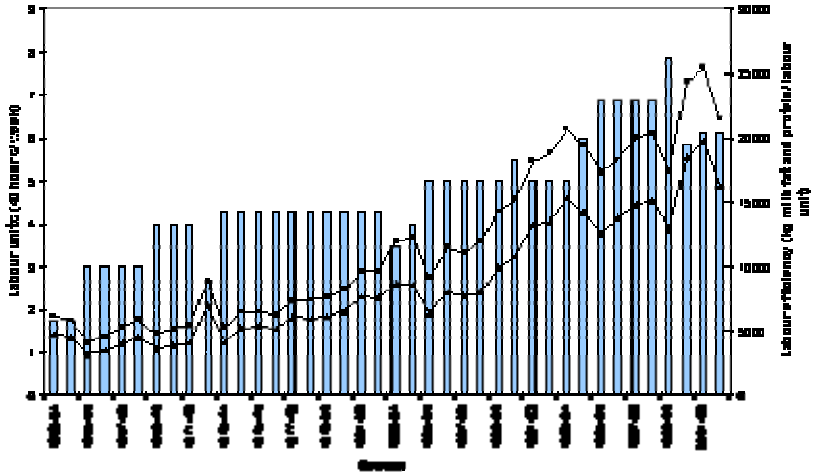

Figure 6: Change in labour and milk solids over time

Another Australian dairy story

In 2004 the Australian Bureau of Agricultural and Resource Economics (ABARE) surveyed dairy farms and ranked them according to their return on assets. A high proportion of larger herd size farms with higher milk solids production and labour efficiency were among the better performing farms. The ABARE found feed costs per litre of milk produced on average were almost 20 per cent higher for the largest herd size farms compared with the smallest herd size farms. Total costs per litre were lower on average for larger farms compared with smaller farms. Fixed costs were about 40 per cent lower for larger herd size farms that also fed more intensively compared with smaller herd size farms that fed less intensively.

The keys to increasing productivity and successfully combating the effects of the cost-price squeeze have been:

1. spreading all of the fixed costs of dairying – land, pasture, water, operator labour, capital infrastructure, machinery, and management - over more output by having more land and more cows per business (extensification); and
2. using more feed, fertilizer, water, labour per cow (intensification) to produce more output, with a margin of extra income from the extra output over extra cost of the extra input.

The ABARE data supports the obvious: if too few cows are milked and too few milk solids produced, farm fixed costs, particularly operator labour and management, are relatively high when compared to the milk income. Average fixed costs per litre reduce as output increases from a given investment. In dairying, once the main fixed costs associated are spread over the output achieved on medium-sized operations, the rate of reduction in average fixed costs slows considerably as the size of the operation increases further. Good returns on capital are achievable in medium through to large scale dairy businesses, with high management skill. Equally, if management is not good, medium and large-sized dairy farms can perform as badly as other any sized operation.

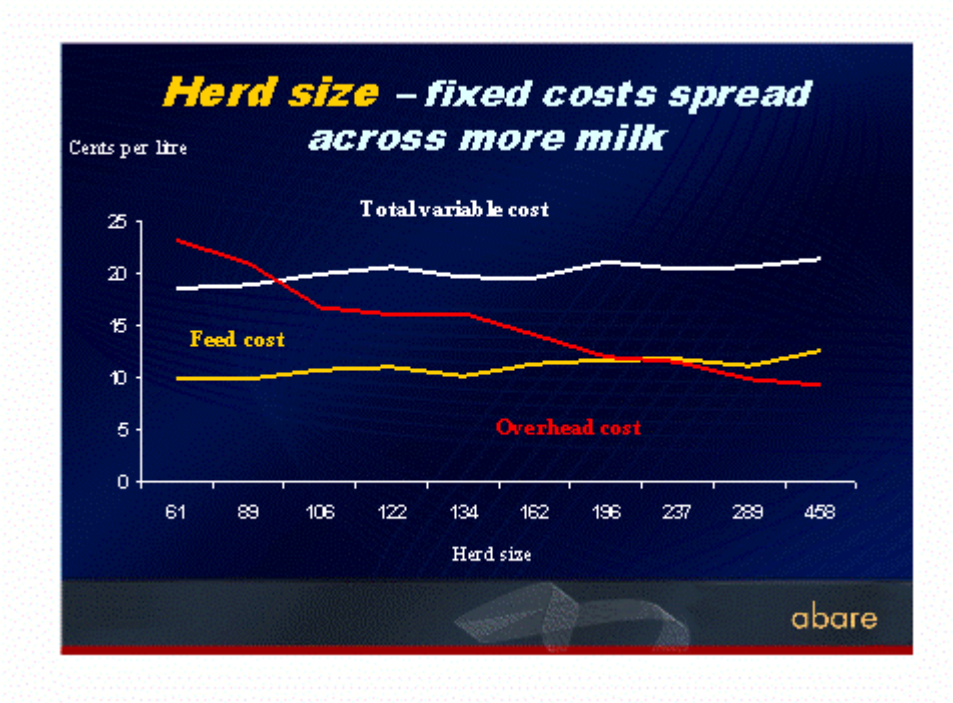

Figure 7: Cents per litre and herd size in Australian dairying

Source: ABARE (2004)

The innovations that enabled the extensification (increased herd size) and intensification (increased production per cow) that has occurred in Australian dairy farming over the past 20 years has increased production of milk solids per business and maintained profits and returns on capital for the majority of dairy businesses, despite the cost price squeeze. That is history: there is always the perennial question: 'What innovations will constitute the next round of productivity-increasing changes?' New problems and challenges, and solutions, are always emerging.

The most profitable medium and large output businesses have already adopted the 'first-round' cost-reducing, output-increasing innovations. They have increased farm area and herd size, and increased feed input and milk solids output by increased pasture utilization and use of concentrate sources of energy to complement the pasture diet.

The major future challenge in the coming decade to managers of currently profitable medium and large output operations will be to implement more complex 'second-round' innovations that will increase further the quantity and composition of milk solids produced per farm. Amongst other whole system changes, more sophisticated approaches to cow nutrition and feeding decisions to increase quantity and quality of milk solids produced per farm will be an important innovation for some of these dairy farmers.

Productivity stories in NZ dairying involve different systems and some different technologies to the case study above and in the Australian dairy industry in general, but confront many of the same 'eternal truths' of adapting agricultural systems to change. In the context of the need to continue to increase productivity each year, in dairying in New Zealand, or anywhere for that matter, two questions arise:

- how should we judge success?
- is dairying a good investment?

Success in business, as in life, is best judged as what goals you achieve from what you have to work with. The characteristics of the 'you' in your business and the nature of the resources with which you have to work, play a big role in determining success in business. There is one other big player in the dairy game. This player is called Chance. Success comes from good farmers doing a good job, and having some good fortune along the way. The size of returns and the risk of returns from the resources with which you work are both part of any criteria of success.

Business risk is volatility in the production and market environment. The role of risk in agriculture, and the limits it imposes on productivity gains and growth of a business, is often insufficiently grasped – by people not involved in agriculture. Risk and uncertainty affect productivity gains and expansion of businesses because of the extra managerial services required. No risk, no management. Low risk, low returns. High risk, high returns. Risk creates returns.

Because investing in dairying in New Zealand is risky, it can bring returns as good as any investment in the economy. Research by Mark Neal (2004) showed that capital invested in dairying in NZ 1993-2002 earned annual rates of return that were comparable, on average, considering return and risk, with the returns and risks of shares listed on the Australian stock exchange (Table 1). Further, Neal (2004) showed that the returns to capital invested in dairying in NZ over the period 2000-2004 fluctuated in a way that meant adding dairying to an investment portfolio, would have maintained total returns and reduced overall risk of that portfolio.

Year	Inflation %	Sharemarket return %	Dairy return %	Dairy operating return %	Dairy capital return %
1993	1.26	9.9	21.1	3.2	17.9
1994	1.1	18.5	21.7	1.6	20.1
1995	4.6	5.7	5.4	1.1	4.3
1996	2	15.8	5	2	3
1997	1.1	26.6	-0.8	1.4	-2.2
1998	1.7	1.6	-3.4	1.6	-5
1999	-0.4	15.3	9.4	1.8	7.6
2000	2	15.5	9.3	3.3	6
2001	3.2	9.1	25.7	7.6	18.1
2002	2.8	-4.7	23.5	7.5	16
Average	1.9	11.3	11.7	3.1	8.6
Risk (S.D.)	1.4	9	10.5	2.4	9

Table 1: Returns to capital in NZ dairying and Australian stock exchange

Source: Neal (2004)

2. Principles

There a few important principles relating to biology, economics, finance and people in farm systems. The manipulation of the resources of the business – land, labour and capital – according to the operation of these principles is instrumental in determining success of a business.

These principles are:

- The principle of reducing the average fixed cost component of the average total cost per unit of output by increasing output in a production period from a set of fixed resources with associated fixed costs.
- The principle of diminishing extra returns to spending on extra variable inputs. Variable inputs are not fixed over a production period. They directly affect output. The farmer has discretion over their use in the production period.
- The principle of increasing financial risk. This principle is about how best to finance the business to achieve growth in equity over time. It refers to the gearing ratio of the business. Financial risk is independent of the business risk that comes from volatile prices and costs, market access, exchange rates, seasonal conditions, disease outbreaks.
- The principle of continual improvement to maintain profitability and enable wealth to grow. The application of this principle involves re-organization of resources in the business and time to learn.

Together the operation of these principles help determine the success of changing the mix of resources used in the farm system, within a season and over the medium term.

3. Understanding spreading fixed costs and the operation of the principle of diminishing marginal returns

The principle of diluting the big fixed costs by increased output is demonstrated in Figure 8. The more milk solids produced for a given set of total fixed costs reduces the average fixed cost per kilogram of milk solids.

To understand how these principles work, it is first necessary to have a time period in mind. This might be a production year, next month, or tomorrow. Or, the next 5 years. The length of the time involved determines what costs are unavoidable (fixed) and what costs we have some decision-making power over. Determining the relevant time period determines the costs that the manager can manage. The trick is, for whatever level of fixed costs that exists, get the most out of these costs that are unavoidable in the time by maximizing the output and income that can be produced from the costs that can be changed.

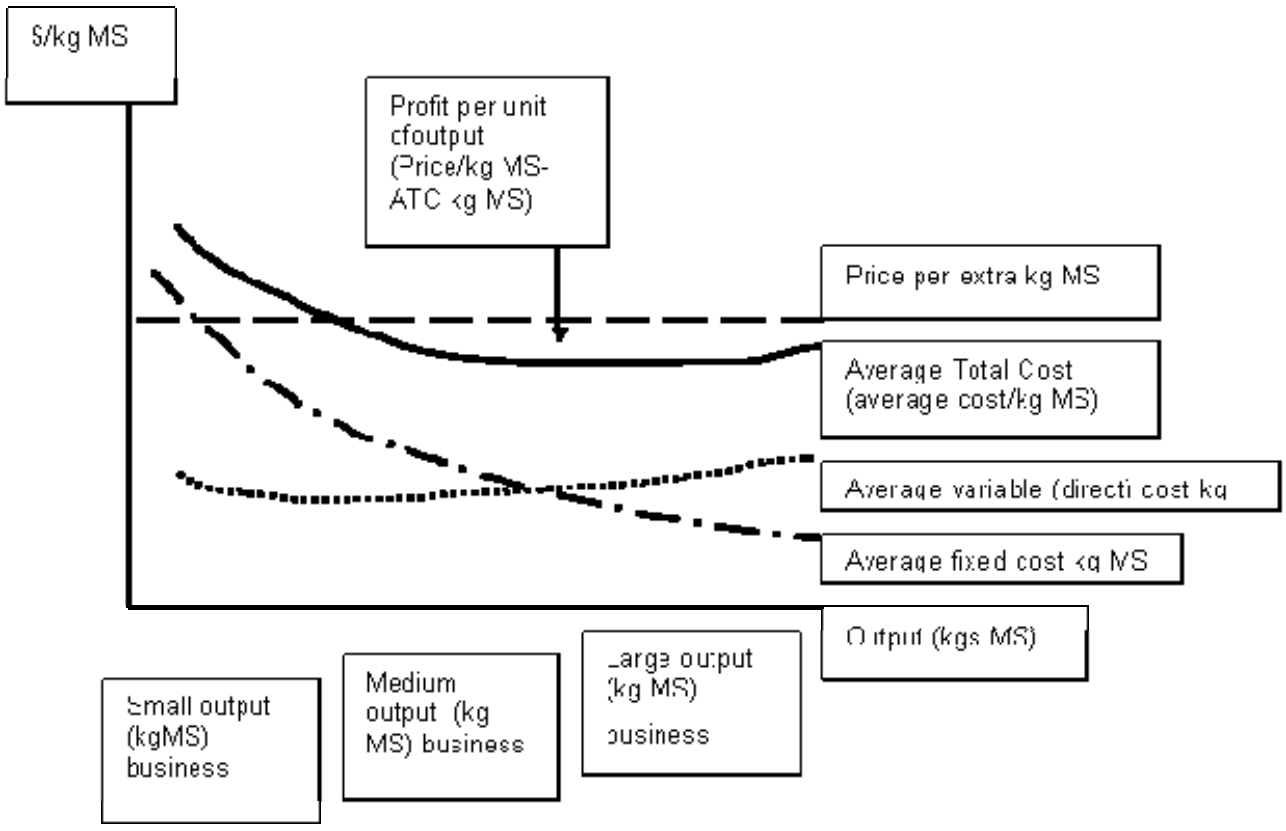

Figure 8: Changing average fixed, variable and total costs as output increases; no new investment

Note: average total cost includes opportunity cost of capital.

The obvious example is to feed to get as much milk solids from the resources that are fixed. This reduces the fixed cost component of each kilogram of milk solids produced. In the jargon, average fixed cost per unit of output is reduced. On any one day, feed might be the only cost that is able to be varied. Over a production year, variable costs are feed, herd and shed costs. These variable costs

are manipulated to maximize the income from milk solids over the year. The margin – milk income minus variable costs - is available to cover the costs that cannot be avoided, and leave a profit.

The other part of the cost story is about the inputs that are able to be varied. As we add more of these variable inputs – feed, herd, shed costs – the return from an extra unit of variable input decreases. See Figure 9. At first, extra return increases at an increasing rate with extra input. Then, even more input still causes the total return to increase, but at a decreasing rate. The amount of extra return from the extra input diminishes. Eventually more input causes no addition to total return and even has negative effects on total return. This is the result of the operation of the biological principle of diminishing extra returns to extra variable input added to a set of fixed resources.

The critical question is: 'How much of a variable input should I use, in a particular production system, for a given planning period?' The answer: before considering dollars of costs and returns, we know there are amounts of variable input that do not make sense. This is where too little or too much input is used. If an extra unit of variable input adds more output to total output than the previous unit added, the average production of each of all the previous variable inputs rises. At this level, regardless of the cost and returns (i.e. as long as the product is worth producing at all), more of the variable input has to be better than less. Anything less than this is too little variable input. The rule is variable inputs should be used at least up to where the average output from these inputs is at a maximum.

As well, it makes no sense to use variable inputs beyond the level where total output is at a maximum and further inputs would reduce total production, even if the input was free. Beyond this amount is too much variable input. So we know how much is too little and how much is too much.

The key question is how much is just right? The answer is: 'if you can finance it, you should use more variable inputs up to where the extra return it produces just exceeds the extra cost of putting the input into the production system'. See Figure 10. Each unit of output produced up to this level is adding to total profit. These concepts are somewhat abstract because we rarely know with precision and never with certainty how much extra output will be produced by an extra unit of variable input in a farm system. However, farmers make judgements about this on a daily basis. The important point about this principle of diminishing marginal returns to extra inputs is it is *the* logical way of thinking about increasing profit from a farm system. Note that the level of output that achieves the minimum average total cost per unit of product is not the output that maximizes profit.

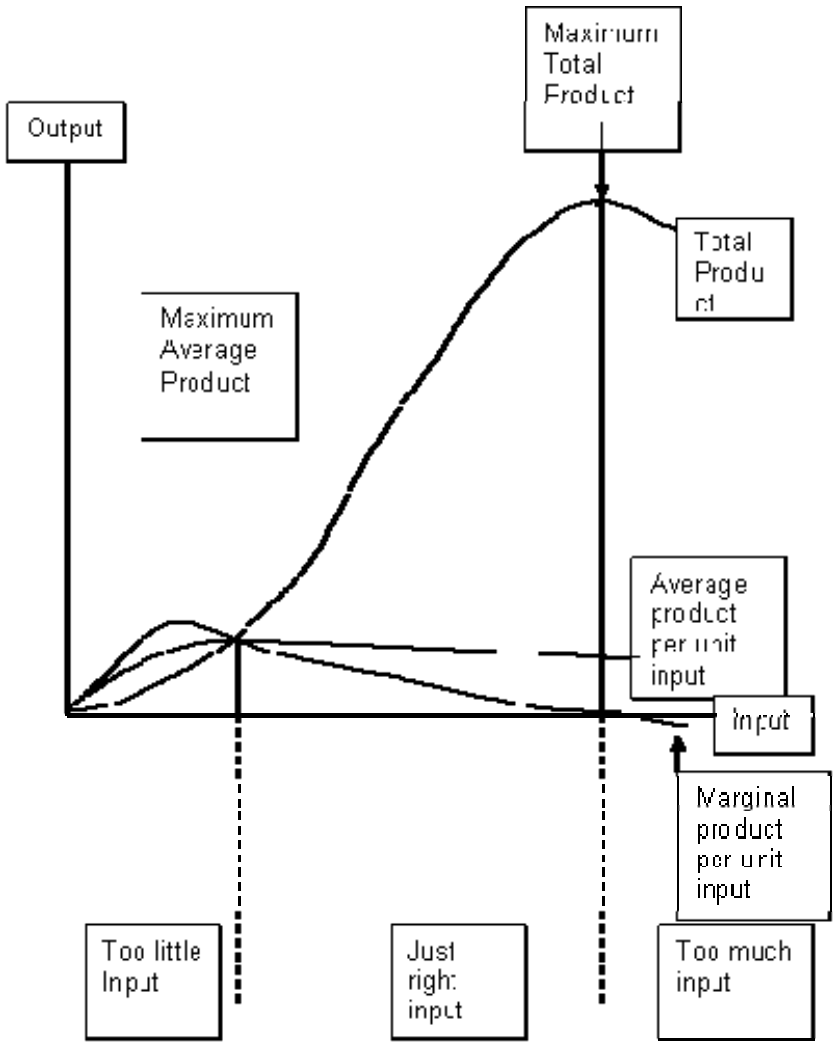

Figure 9: The principle of diminishing marginal returns to extra variable input

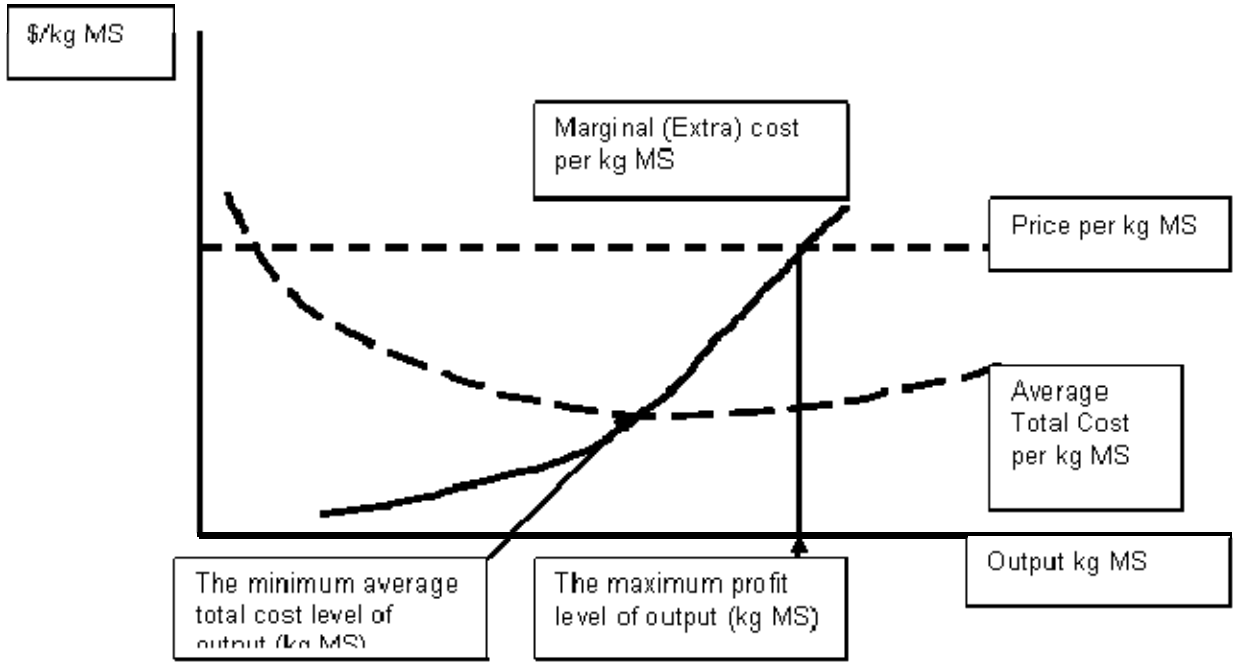

Figure10: Maximum Profit where Marginal (Extra) Cost equals Marginal (Extra) Revenue (short and medium term)

4. Understanding the principle of increasing financial risk

If you can run an efficient business – defined as earning a good return on total capital - understanding the principle of increasing financial risk, is the key to surviving in business and growing your net worth over time. Again, too little or too much and it all goes wrong. This time it is too little or too much debt. There are two big threats to survival of a business:

- having too little debt and not growing as fast as your competitors
- having too much debt and eroding net worth too much when things go bad.

The operation of the principle of increasing risk means that the rate at which your equity will grow when things go well is not symmetrical with the rate at which your equity will erode when things go bad. The example below demonstrates the operation of the principle of increasing risk.

Equity grows faster with more debt when the rate of return to total capital exceeds interest rate. When an operating loss happens, you lose the operating loss plus the interest on the debt that still has to be paid. The rate at which your equity grows is less than the rate at which your equity erodes. And, there is more. When the circumstances that caused the operating loss to occur play themselves out in full, asset values fall, gearing automatically increases, credit dries up at the pre-existing interest rates and the business is forced onto high risk higher interest markets. An unnerving and often devastating spiral of risk exposure and equity decline is in place. Often, only a run of good fortune will halt the trajectory of decline of equity in the business.

		Case A	Case B
Assets		$10m	$10m
Equity		$10m	$5m
Debt		0	$5m
Operating profit	10%	$1m	$1m
Return on capital		10%	10%
Interest on debt	8%	0	400000
Net profit		1000000	600000
Return on Equity		10%	12%
Tax		0	0
Consumption		0	0
Growth		1000000	600000
Growth Rate		10%	12%
Operating Loss	-10%	$1m loss	$1m loss
Return on capital		-10%	-10%
Interest		0	400000
Net Loss		$1m	$1.4m
% Decline in Equity		10%	28%

Table 2: Operation of the principle of financial increasing risk.

As a firm expands through using borrowed capital the chance of losing the firm owner's capital increases. Heady (1952) argued that in agriculture financial risk constrained growth. The principle of increasing risk is an ever-present risk because the capital individual farmers can obtain access to is limited, and expansion in farm size is mainly brought about through borrowed funds. Heady (1952) suggested that risk and uncertainty is the final determinant of farm size.

Borrowing ability is critically important to growth. Non-price factors such as the experience of the lender, the relationship of the farmer and the lender, the farmer's banking history, what the farmer is borrowing for, and whether the farm is perceived to be run as a business are important determinants of a farmers ability to borrow capital.

5. Understanding principles of reorganization for continual improvement and growth

Over time the real costs of production rise and real prices received for output decline. This means farmers have to change what they do. They have to re-organize their business. The following eight propositions (from Ferris 2004) summarise the main findings from past research on growth of businesses:

- Business expansion will lead to larger returns on capital (Vlastuin *et al.* 1982 and Teese 1998)
- Unused productive capacity and indivisibility of resources is an inducement to firm growth (Penrose 1995)
- There will be a transition period after growth that will inhibit further firm growth for some time (Kakabadse 1982, Penrose 1995)
- The entrepreneurial ability of a farmer is a major factor in determining the extent of growth undertaken by the business (Upton and Hawthorn 1987 and Penrose 1995)
- The goals and values of the farmer and the farm family change as growth proceeds (Patrick and Eisburger 1968)
- Farmers do not usually borrow to the point where the external financial constraint inhibits growth (Ockwell 1979)
- Internal financial constraints, caused by financial risk, will stop some farmers from expanding (Heady 1952)
- Assets will be fixed in agriculture for a range of prices. When the price of milk reaches some critical level, technology will be replaced (Salter 1966)

Usually reorganization involves three things:

(i) incorporating new technology in an expanded system, often including investment and a new set of fixed resources and higher total fixed costs

(ii) increased output from the fixed resources resulting in a lower average total cost per unit of output. Profit and return to total capital is maintained, even though price per unit of output is lower than previously.

(iii) a time for learning before the reorganized system is operating efficiently

The effect the reorganized state of affairs has on costs and profits can be shown in Figure 11 below:

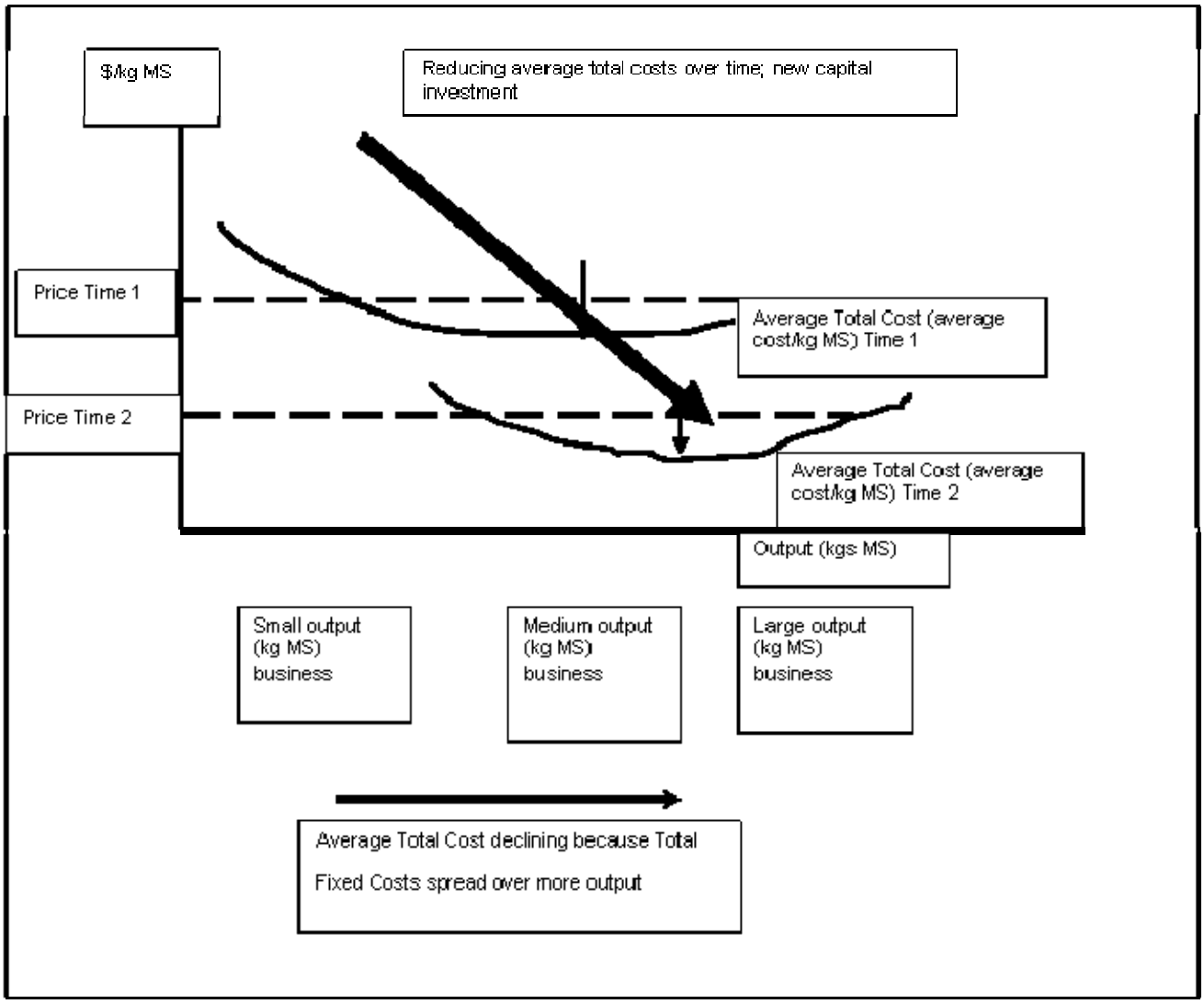

Figure 11: Changing costs with changing size of business over time

5.1 Business stages and their implications

Kriegl (1998), Peck (2001) and Heald and Holden (2001) have explained that as a result of business expansion the management style of the farmer changes from doing all the physical work to doing little physical work and more labour and office management. Peck (2001) suggested various sizes of business and the management style required. The first management change occurs when the manager can no longer milk the cows all the time. He claimed this was around 300 cows. This is a time when the manager has to rely on other people and has to manage other people. Peck (2001) suggested that the second management change occurs when the owners or managers realise that they are not able to make all of the major operational decisions, they now need to delegate some of these decisions to others. Peck believed this management style changed at between 500 and 800 cows. At such time the management role changes to full time manager, managing other managers.

Peck (2001) and Heald and Holden (2001) explain that larger farms require farmers to have considerable skills in managing people. This involves creating the right jobs, providing the right incentives, fostering development, ensuring clear responsibilities and accountability, and so on. In addition, Peck (2001) and Heald and Holden (2001) suggest that with growth skills in office

management become increasingly important. In particular, planning for both short-term and long-term goals, monitoring performance of the key parts of the business, and focusing on important factors of the business, become imperative. Butcher and Whittlesey (1966) specified tasks that become more important as a business expands. These include sales and procurement, labour management and credit management.

The effect of changes to a business can be explained by looking at different stages of the business over the career of the owner – called 'stage models'.[2] A widely cited stage model is that by Churchill and Lewis. It is shown below. The point argued in this paper is that repeated cycles of stages 3G, 4 and 5 in Table 3 will be the future for most current dairy farmers.

	Stage 1: Existence	Stage 2: Survival	Stage 3-D: Success – Disengagement	Stage 3-G: Success – growth	Stage 4: Take Off	Stage 5: Resource maturity
Management Style	Direct supervision	Supervised supervision	Functional	Functional	Divisional	Line and staff
Organisation	Simple	Growing	Growing	Growing	Growing	Sophisticated
Extent of Formal Systems	Minimal to non-existent	Minimal	Basic	Developing	Maturing	Extensive
Major Strategy	Existence	Survival	Maintaining profitable status quo	Get resources for growth	Growth	Return on investment

Table 3: Adapted version of the characteristics of small business growth at each stage of development

Source: Adapted from Churchill and Lewis 1983, p. 38

The lesson to learn from the study by Churchill and Lewis (1983) is about how management needs to change over the business 'lifecycle'.

Churchill and Lewis (1983) distinguish eight essential management factors (the first four relate to the enterprise and the later four relate to the owner):

- Financial resources, including cash and borrowing power.
- Personnel resources, relating to numbers, depth, and quality of people, particularly at the management and staff levels.
- Systems resources, in terms of the degree of sophistication of both information and planning and control systems.

- Business resources, including customer relations, market share, supplier relations, manufacturing and distribution processes, technology and reputation, all of which give the company a position in its industry and market.
- Owner's goals for himself or herself and family, and for the business.
- Owner's operational abilities in doing important jobs such as marketing, inventing, producing, and managing distribution.
- Owner's managerial ability and willingness to delegate responsibility and to manage the activities of others.
- Owner's strategic abilities for looking beyond the present and matching the strengths and weaknesses of the company with his or her goals. (Churchill and Lewis 1983, p. 40)

Like Peck (2001) and Heald and Holden (2001), Churchill and Lewis highlight the importance of people management (the ability to motivate, to delegate, to train) as well as information management as important changes as a business grows.

The transition between starting to expand a business and reaching the stage when the business is in a relatively 'steady state' is critical to medium term success. Boehlje and Eidman (1984) have mentioned this as the '"start up year" problem' (p.759). Most managers take time to adjust to an expanded farm. This is attributable to learning new technology, or learning that increased sized requires greater management skill, especially risk management, and how priorities change. Boehlje and Eidman (1984) said: 'The learning curve or the speed with which the manager can adapt to and efficiently operate the larger farm is important in obtaining a high payoff from the expansion' (p. 759).

Many researchers have studied the challenges of transition for businesses. One result is what is known typically as the transition curve below. Kakabadse (1983) writes about the need for an individual to be flexible and responsive to change. He draws on work conducted by English and American psychologists who have found that when people experience change (such as a promotion or marriage or demotion or redundancy) they exhibit a similar cycle of thoughts, feelings and behaviour. Such a cycle is known as the transition.

Kakabadse argued that knowing about this transition is helpful because everybody experiencing change endures the transition.

Kakabadse (1983) found the transition for an individual to believe they have the skills necessary to manage a significantly changed situation can take greater than two years. He found that it took the average middle manager 18 months to negotiate this transition successfully. For a senior executive it took on average three to five years to negotiate this transition. Employees too have to adjust. The skills that farmers have to develop, immediately following growth, range from managing labour, logistics and time, to more complex technical management, and enhanced financial and risk management. A firm that expands at a rate that is faster than the rate at which individuals in the organisation can adjust to manage the changed situation, runs into inefficiencies.

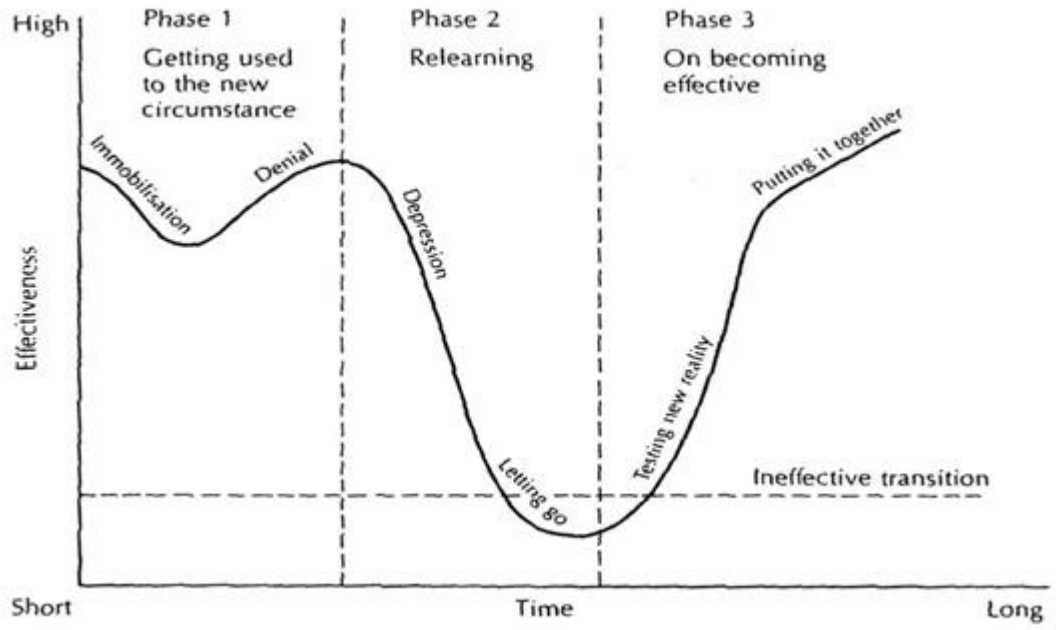

Figure 12: Work effectiveness during transition

Source: Kakabadse 1983, p. 150

Personal stress is one of the adjustment costs faced by management implementing change. Kriegl (1998) and Sinnett and Malcolm (2006) found that a major adjustment is about making the transition from the person who does most of the physical work, which is mostly enjoyable, and manages the farming enterprise, to someone who does much less physical work. Instead they are busy managing labour and information and logistics.

Studies have shown that during this transition there are unexpected costs. That is, Teese (1998) and Sinnett and Malcolm (2006) found that expansion did not immediately bring increased profits. Heald and Holden (2001) found the farm business they examined expanded and ran into difficult economic conditions. This exposed their limited capital and the difficulty of finding employees. Unexpected costs can happen anytime, but occurring soon after expansion can be devastating for a business. Brown and White (1973), Gardner (1997) and Heald and Holden (2001) found that average milk production per cow after expansion fell relative to pre-expansion levels. If the effects of adjustment costs are not fully counted the benefits of expansion are overstated. Unprepared businesses are vulnerable.

Growth is a process. What happens within the business and within the farmer during the growth process critically determine the success or failure of expansion. Narrowly focussed views of the growth process can miss, or inappropriately weight, important factors that significantly affect the ultimate profitability and the success of growth. Issues that are particularly critical are capacity to obtain finance, attitude to risk, labour quality, labour management, and change-in-role of the manager, and capacity to manage.

Understanding growth requires a broader view than the narrowly technical. Indeed, it is when farmers stop obsessing about the narrowly technical that the bigger possibilities and opportunities emerge – and growth happens!

The development of the farmer in relation to the development of the firm is important. Related to the development of the farmer is the notion that what the farmer has already done with their business influences the further development of the business – that is, history matters.

Whilst incremental productivity-increasing change is continual, the major growth steps are discrete and often so demanding of the farmer's resources and resourcefulness that there may be only a few times in their farming career that dairy farmers will embark on a big growth step in their business. Pursuing and achieving growth, and achieving a desired business and lifestyle state of affairs, changes motivations. So does time. This is different to how growth is often represented: as growth of an impersonal business entity irrespective of the history of growth or the people involved. Growth of a business is a very human process.

Succession: the ultimate growth challenge

Supposing you have managed well the operation of the principles outlined above and gone a fair way towards achieving your goals, which included farming successfully for a working life. The principle of reorganization for continual improvement has an ultimate, inevitable, phase – succession. The challenge is to make it orderly (and civil).

Finally, the best managers are masters of information. Good decisions use as much relevant information as can be obtained at the time the decision is made. Decisions about the next step in a farm business require good information that is well analysed and judiciously judged. In part six, are some observations about measuring and understanding what is happening in a farm business.

6. Concluding comment on measurement and understanding

Compared with what?

Though it is most sensible to compare yourself with yourself over time, farmers are also keen on comparing their business with someone else's business. Such comparisons need doing with much caution and considerable subtlety. Comparisons are often in terms of various partial productivity ratios or technical efficiency measures. Partial ratios and technical efficiency measures alone tell nothing of whole farm profitability. Nor do they inform about the changes needed to maintain or increase profit in a particular system.

Indeed, in a volatile agriculture, partial productivity ratios vary so much from one time to the next because of the influence of matters completely beyond the farmer's control, that drawing sound conclusions from these ratios alone from one time to the next or from one farm to the next, is extremely difficult.

Measures of the whole farm performance inform the analyst best. In any case, farmers put combinations of inputs together before the event (output) happens. Much changes along the way. In many instances, planned and actual outputs are only distantly and sometimes coincidentally related, as weather and biology and markets intervene in a big way. Chance is a keen player.

One empirical test of success in business is survival over time. This tells what you have done. It does not tell what you could have done, or could do. It is important to keep in mind that conclusions from study of successful businesses usually exhibit 'survivorship bias': only farms that have

successfully expanded and survived are investigated – the farms of the failed ideas and management are now being run by the survivors.

Measurement and Understanding

Johnson (1999) discussed problems of quantitative measurement and related it to a 'metaphorical Mississippi of numerical data'. He too said to 'handle with care'. Johnson argued that accountants and economists are guilty of assessing numbers 'at a distance' from the actual business. He makes an analogy to a river, where he sees accountants and economists as camped beside this 'metaphorical Mississippi' picking the river data and compiling measurements. He goes on to say that by sitting far away from where the numbers are coming from, these accountants and economists are losing vital information. It would be better to move further 'upstream' (continuing with the river analogy) and look at the systems and work practices that are producing the data that was analysed downstream. By moving 'upstream' and into the actual business Johnson believed that you could look for the 'underlying assumptions that lay beneath the layers of abstraction that conventional measurements had generated' (p.3).

Building up a head of steam, Johnson (1999) examined the work of Gregory Bateson, who was interested in:

…the difference between the way nature works." Nature, as Bateson said, doesn't measure. Nature deals only with the 'pattern which connects', not with quantification'. There is no objective standard for how high a tree should grow, or how fast an animal should run (Johnson 1999, p. 3).

Johnson (1999) went on to paraphrase W. Edwards Deming, saying:

'Perhaps W. Edwards Deming was resonating with this point when he said that 97 percent of what matters in an organisation can't be measured'. Johnson (1999) added that the result of conventional measurement was 'tampering': manipulation without genuine understanding (p. 4).

Johnson (1999) was not advocating removing measurement; however he believes that:

… when measurement becomes a tool for fragmenting our understanding, and assessing one process, or one person, as better than another on some objective scale, then its inherently unnatural.

… describing the world through any mechanistic set of measurements is like partaking a meal by eating the menu (p. 5).

These thoughts of Johnson (1999) are relevant to understanding the challenges and processes of change necessary to improve productivity in farming and help feed the looming extra 2.5 billion people in the next fifty years. The popular saying is 'we cannot manage what we do not measure'. This does not get it quite right. It should be "we cannot manage what we do not understand: our understanding is aided by measurement'. The economists jargon would have it: measurement is a necessary but not a sufficient condition for understanding and for management.

Now seems as good a time as any to take up Johnson's analogy to move 'upstream' and work further on deeper understanding of the processes – human, technical, economic, financial, risk and institutional- that shape the systems that

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[2] There are critics with these models (Storey 1994, Stanworth and Curran 1976) but, Burns and Harrison (1996) clearly explain how stage models are best used:

predictors of problems that the firm is likely to face as it grows; and

imperatives that the firms ought to have if it wishes to grow at different stages of development (Burns and Harrison 1996, p. 66).