



The resilience of New Zealand dairy farm businesses – a post downturn evaluation

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EXECUTIVE SUMMARY

The NZ dairy sector has a history of innovation, success and development and has grown to support a significant portion of NZ's total export earnings. Approximately 95% of NZ's total dairy production is exported to overseas markets. During the 1990's through to the later part of the 2000's the sector experienced a significant growth phase resulting in its expansion and intensification. This led to the greater reliance of farming systems on supplementary feed inputs to boost production. This however reduced pasture utilisation and production efficiencies. At the same time, the average level of farm debt also increased, driven by continued sector growth and expansion. The result of these two elements was that NZ dairy farms became more exposed to risk. Between 2014 and 2016, the average farm gate milk price took a dramatic dive resulting in average farm incomes falling below production costs and debt servicing levels for many NZ dairy farm businesses. The downturn period provided an immediate reminder of the correlation between global dairy market volatility and farm gate milk price (i.e. the price farmers received for their milk). The result of this was a critical need for the sector to return its core fundamentals (i.e. a focus on optimising grazing management) to build resilient farm businesses.

This research project sought to determine if NZ dairy businesses have become more resilient following the farm gate milk price downturn period. This was investigated through the analyses of a survey completed by dairy business operators and industry commentators in addition to face-to-face interviews. A total of 107 respondents participated across both surveys. Analysis of the findings showed that most surveyed dairy farmers had responded favourably to the downturn period by seeking to build greater levels of resilience into their farm operations. There has been a shift back to efficient pasture based production systems and greater awareness and understanding of farm financial performance. Despite the greatest risk to farm businesses from downward FGMP movement, there is still a low uptake of price risk management tools being used by the sector.

While this research suggests that NZ dairy farm businesses are likely to be more resilient because of the milk price downturn period, there is still a need to continue building resilience levels through increased production efficiencies (for example maximising pasture utilisation) and a reduction in farm debt. There is a need to foster greater understanding of individual resilient traits in dairy farmers as resilient farmers will be more likely to operate resilient businesses. It is also necessary to support dairy farmers with the use of price risk management tools that can be used to protect their businesses against the risk of downward farm gate milk price movement. Provided dairy farmers maintain a focus on these aspects, the resilience of the NZ dairy sector will continue to grow over time. This will ensure that dairy farmers will be far better placed to deal with any future events of downward farm gate milk price movement making their businesses less exposed to the risk of global dairy market volatility.

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INTRODUCTION

The New Zealand (NZ) dairy sector has a long history of innovation, development and progression that has allowed it to evolve into a revenue generating powerhouse. Approximately 20% of NZ's total goods and services export earnings can be attributed to the NZ dairy industry (DCANZ, 2019). The growth of the industry can be credited to an export-based model with approximately 95% of NZ's dairy production sold to overseas markets. In 2017, the national dairy herd consisted of approximately 5 million cows and the land area occupied by dairy production totalled approximately 1.7 million hectares (DairyNZ, 2017). Dairy exports were valued at approximately NZ\$17 billion dollars in 2018 (DCANZ, 2019).

The NZ dairy production system is based upon a seasonal pasture model where cows calve once per year, (typically in spring), so that pasture growth rates align with livestock feed demand. Consequently, NZ dairy production results in a peak production spike (typically occurring around October). This necessitates the need for milk processing companies to have sufficient processing capacity to manufacture large milk volumes in the Spring. New Zealand's largest dairy business, Fonterra Co-Operative Group Ltd, collects around 75-80% of the milk produced in NZ, therefore it must maintain a significant manufacturing asset foot print to process peak milk volumes. The most efficient method to process peak milk volumes is by processing it into powder. The added advantage of dried milk powder is its extended shelf life; a desirable characteristic given NZ's geographic location and distance to key global markets. NZ's global dairy commodity exports are primarily comprised of whole and skim milk powders, butter and cheese.

Though the NZ dairy sector accounts for only 3% of total milk produced globally, it contributes 8% to total global milk exports (DCANZ, 2019). It is however dwarfed in size by other larger international dairy producers and the European Union, India, and United States (US) who respectively produce eight, seven and four times more milk than NZ each year (DCANZ, 2019). The scale of these larger dairy producing countries and regions result in their significant influence on global dairy supply and demand dynamics. Given the relative scale and size of the NZ dairy sector comparative to other global producers, this has meant that competing countries only need to marginally increase production to have an influence on dairy commodity prices. **Figure 1** shows whole milk powder prices from 2006 to 2017 have significantly more price volatility than the period 1990-2005.

Despite this influence of this larger global dairy producers, growing global dairy demand has seen the NZ dairy sector historically achieve favourable financial returns comparative to other agricultural production systems. This has resulted in the marked growth of the sector and the substantial expansion of dairy farming into traditionally non-dairying regions of NZ, namely the Canterbury and

Southland regions of the South Island. Expansion into these regions has been stimulated by historically cheaper land prices and improvements in irrigation capability (primarily within the Canterbury region) has seen production gains achieved by scale. Increased growth in dairy consumption, particularly in Asian countries, has continued to drive global dairy demand and this over time has contributed to a positive influence on farm gate milk price (FGMP) received by NZ dairy farmers. Up until the FGMP downturn period, NZ dairy farmers had generally continued to receive a favourable income. Over time this had encouraged dairy farm producers to intensify farm production systems away from traditional pasture-based systems towards those that require higher levels of inputs (e.g. supplementary feed) to maximise production to achieve the highest levels of gross farm income. The outcome of the period of rapid expansion and intensification has increased land values and thus dairy sector debt. Cook (2016; as cited in Reserve Bank of New Zealand, 2015) found that dairy debt rose from \$11.3 billion in 2003 to \$37.9 billion in 2015. Grieg, Nuthall & Old (2018) reported that the average NZ dairy farm debt level per labour unit was approximately \$1,007,000 of debt/employee.

While the NZ dairy sector has been a success story of growth and development, it would seem these ‘golden days’ of expansion and continued intensification have come to an end. The environment in which dairy farmers now operate has changed markedly in the last 10 years. This is especially noticeable in the last five years with farmers experiencing increasing environmental pressures, biosecurity, animal welfare challenges, global market volatility and the public lens constantly contesting dairying’s licence to operate. As up to 95% of NZ’s dairy production is sold overseas (primarily into commodity markets) the sector is now more than ever increasing exposed to instability of global dairy supply and demand dynamics. This can have a direct influence on how NZ dairy companies perform. The impact of global dairy global volatility has a direct influence on farm income attained by dairy producers as it largely determines the FGMP they receive.

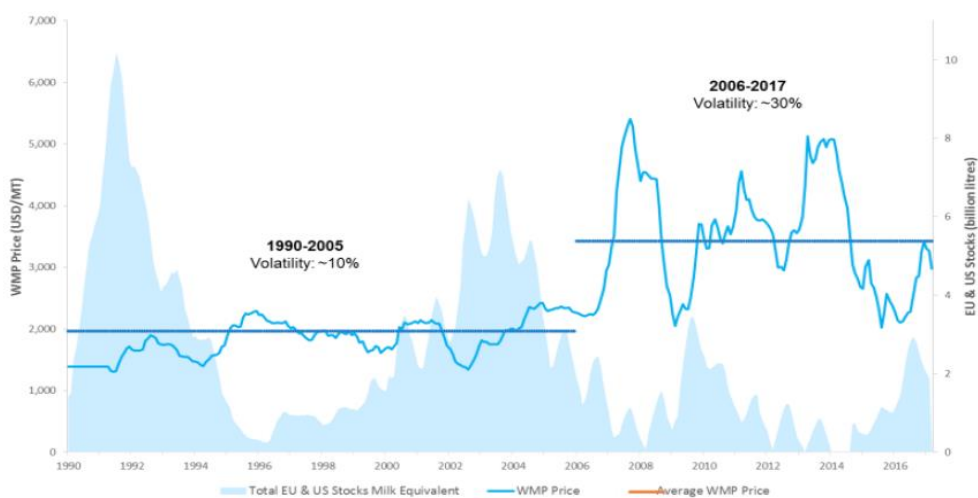


Figure 1: WMP Global Price Volatility 1990- 2016 (Source: Fonterra Co-operative Group Ltd)

This volatility makes it challenging for NZ dairy milk processors to forecast FGMP for its shareholders which in turn makes it correspondingly challenging for dairy farmers to budget, forecast and anticipate likely farm income. **Figure 2** highlights the variation in seasonal opening FGMP (forecast by NZ’s largest dairy processor) and closing FGMP (the actual FGMP received by farmers) from the 2013/14 season through to 2018/19 season. The volatility was especially evident in the 2013/14 season when FGMP was at all-time high of \$8.40 kgMS, and dropped to \$4.40 kgMS in the 2014/15 season, followed by \$3.90 in the 2015/16 season. Both the 2013/14 and 2014/15 seasons had an opening forecast FGMP of \$7kgMS.

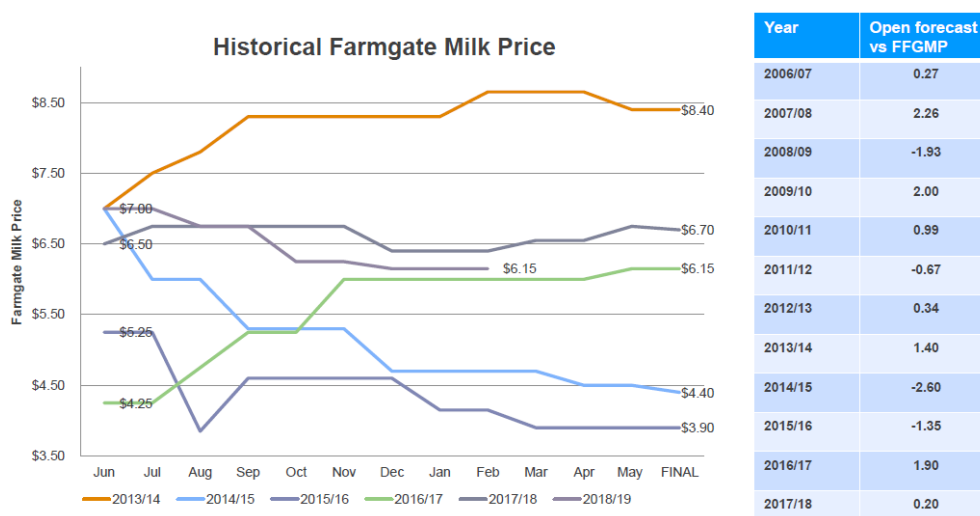


Figure 2: The impact of global dairy price and influence on FGMP (Fonterra Co-Operative Group)

The variability in FGMP has a significant influence on farm income and profitability. It is challenging for farmers to make tactical seasonal decisions within a production period as the operating environment can change very quickly. A reduction in FGMP has a direct impact on farm income directly influencing a farming operation to manage expenses and meet debt commitments. While a farm may be a highly efficient producer, a FGMP that results in an income per unit of production less than the cost of production will result in the operation running at a loss. During the global dairy downturn event, this was the case for a considerable portion of dairy businesses in NZ, where gross farm income was less than farm working expenses (FWE) and debt servicing.

The downturn period provided a perfect opportunity for a sector ‘reset’ as NZ dairy businesses needed to be far more resilient to global volatilities that have a negative influence on the FGMP farmers receive for their milk. Increased levels of dairy sector resilience are not only critical for the NZ dairy industry, but is also vital for NZ’s economy and therefore for all New Zealanders (given the contribution of the sector to NZ’s export earnings income). Ensuring that NZ dairy farm operations can

accommodate variability in FGMP is a fundamental aspect of farm businesses financial resilience. Farm businesses with higher levels of resilience have a greater ability to withstand fluctuations in seasonal FGMP and therefore can remain agile, responsive and in control during any event of disruption.

This research seeks to define dairy farm business resilience and determine if NZ dairy farm businesses are more resilient since the FGMP downturn period that occurred in the 2014/15 and 2015/16 seasons. If the downturn period has resulted in fundamental changes to NZ dairy businesses (that have made them more resilient); then the impact of this event can perhaps be viewed as a positive outcome for the NZ dairy sector and for NZ. However, if the sector remains in a state of unpreparedness that is associated with low levels of farm business resilience, then this research will provide an important reminder for dairy farmers to build greater levels of resilience into their businesses before another downturn period is experienced in the future.

RESEARCH OVERVIEW

Research Purpose

The purpose of this research is to investigate how NZ dairy farmers responded to the FGMP crash (i.e. the downturn period) that occurred during the 2014-2016 seasons. It aims to determine if the responses made by business operators have made their businesses more resilient to future downward FGMP movement.

The need for this research has become more pertinent in recent years due to the pronounced market volatility of dairy commodities and the direct impact of this on FGMP. While FGMP has largely recovered since the downturn period, informal discussions with dairy farmers have made me wary of a degree of 'spend and production creep' occurring (i.e. rising costs as some farmers seek to maximise milk production). It is important that NZ dairy farm business operators keep undertakings that they may have incorporated into their farm operations to cope with the downturn period, such as looking for ways to reduce production costs, at the forefront of their business operations practices. The risk for the dairy sector is that while FGMP has largely recovered, the lessons learnt during this event could be easily forgotten. The fundamental purpose of this research is to act as reminder that the dairy industry must be fully prepared, to ensure its future survival during any future events of downward FGMP movement.

Given the value of learning from the past, a specific focus of this research is to understand what permanent changes dairy farmers incorporated within their business operations. Additionally, it seeks to determine if dairy farm businesses are now more resilient than they were prior to the downturn period. It is envisioned that the findings of this research may be beneficial to banks, dairy processors, DairyNZ, Government and other key stakeholder groups.

Research Gap

The first concept of this research was conceived during, informal discussions with dairy farming contacts about how they adapted their business to survive the FGMP downturn period. These conversations extended to discussions with both farmers and rural professionals around the need for the industry to shift away from maximising production through intensification, towards maximising production efficiencies (through reducing production cost) ultimately leading to more resilient farm businesses.

The responses during these discussions indicated that this subject is worthy of further investigation, particularly to ensure that dairy farmers have improved the level of farm resilience due to learnings attained from the downturn period. The review of the literature revealed that there was a clear

research gap specifically related to how NZ dairy farmers tactically and strategically responded to the FGMP downturn period and it fails to determine if the sector is now more resilient. There is no documented research investigating and analysing the extent to which NZ dairy farmers currently perceive their exposure risk to FGMP fluctuations and downward trends that influence the overall resilience of their farm businesses. This research seeks to investigate this.

Research Questions

Are New Zealand dairy farm businesses more resilient following the farm gate milk price downturn period that occurred during the 2014/15 and 2015/16 seasons?

What are the key learnings from the farm gate milk price downturn period?

How do dairy farmers perceive their business risk to FGMP fluctuations today?

Research Objectives

The key objectives are:

- Determine how dairy farmers responded to the FGMP crash and what tactical and strategic measures were implemented;
- To investigate how dairy farmers perceive their current exposure to future FGMP volatility;
- To collate key learnings from dairy farmers to share with the wider sector.

Research Methodology

A literature review was performed to investigate the specifics of the definition of 'resilience' in a farm related context. The purpose was to identify if research on resilient farm systems had already been conducted, specifically in relation to evaluating whether NZ dairy businesses were more resilient because of the FGMP downturn period. Through the literature review process, a research gap was identified. It revealed that no investigation or research had been performed in any context to determine the resilience of farm dairy operations post the downturn period.

From the identification of the research gap, research objectives were defined. To answer the research question and associated objectives of this research; two surveys were utilised for raw data collection. This was deemed the most practical way to obtain data from a wide audience in a short period of time. A survey was developed for dairy farm business operators – those operating and running farm business operations and another for those involved in the sector from an extension/advisory/services capacity. Both surveys were formulated to ensure that raw data was collected from participants that were working within or associated with the dairy sector at the time of the FGMP downturn period.

For this research, the surveys are hereafter referred to as Business Operator Survey (BOS) and Industry Commentator Survey (ICS).

Both surveys included a series of closed and open questions, with the latter allowing participants to provide commentary, specifically as to how they responded to the FGMP downturn period and for industry commentators to comment on what was observed during and post this period. A pilot BOS survey was carried out before the surveys went live to test survey questions. A decision was made to not pilot test the ICS. This was because the survey was created to provide an observational perspective to data provided by BOS respondents.

Once the questions were finalised for both the BOS and the ICS – these were entered on an online survey tool platform – Survey Monkey. A survey link for the BOS was sent out on Facebook farming related pages as well as shared on personal profiles of dairy farming contacts. Participation in the ICS was sought using the LinkedIn web pages with a link provided to the survey posted on the author's personal profile page. The survey links were also shared through industry contacts via email with a request attached to forward the email onto anyone else that would be able to participate. Both surveys were open for a month period and during this period the posts were occasionally refreshed. This was to ensure that the posts remained in a prominent page feed position to attract a greater level of participation. At the close of the month period, the BOS had received 68 responses and the ICS had received 39 responses.

In addition to the online survey questionnaires, local dairy farmers and industry commentators (known to the author) were interviewed in person using the same questions. The rationale for this was to compare the data obtained from an in-person interview to that obtained through the online survey tool. In addition to this, the in-person interviews provided a mechanism by which to contrast the data provided through the online survey method. The data collected through the online survey was analysed using the Survey Monkey analytical tools which identified key themes within responses.

LITERATURE REVIEW

NZ Farm Resilience Definition

A key finding from the literature review was the existence of various definitions of farm system resilience. In classical mythology, the symbol of resilience is the reed because of its dual ability to sway in the breeze, and withstand fierce storms that would uproot mighty trees (Paronson-Ensor & Saunders, 2011). The concept of ecological resilience was first studied by Holling (1973) who considered the persistence of organisms within ecosystems, their tolerance to disturbances and their ability to not only withstand the disturbance, but to maintain the same relationships between populations and state variables. Walker et al., (2004) later defined resilience as the capacity of a system to absorb disturbance and re-organise while undergoing change, to retain essentially the same structure, identity and feedback systems.

The concept of this original research has since been applied and adopted by other disciplines including agriculture, and agricultural academics have used it to describe the ability of farm systems to withstand disturbance and change termed 'farm resilience'. Duranovich (2015) stated that resilience is an important attribute of a farming business that allows it to cope with unplanned shocks and changes within its operating environment, to ensure that the farm operation can persist with its purpose. Resilient farm systems have also been defined as those that have the flexibility to overcome unforeseen circumstances (e.g. a low milk price or adverse weather events) that lower short to medium-term profitability, while farm production systems remain constant (Roach & Horan, 2015; Rodriguez et al., 2001). Similarly, Mounsey (2015) defined a resilient farm operation as one that can prosper and succeed in a volatile and changing environment. Based on these definitions it is likely that many NZ dairy farm operations, at the time of the FGMP downturn period, were not resilient.

A common theme to the various definitions of farm resilience is the ability of a farm system to withstand unplanned turbulence or shocks that affect the operation from a financial and/or productive capacity. The definition by Shadbolt et al., (2011) is perhaps the most encompassing of all and states that resilient farm systems are "those with the capacity to not only adapt to change in the environment, but to take advantage of opportunities created by a disturbance while maintaining productive capacity in the face of variability in production, financial and market related factors." While defining farm resilience is the first step, a more challenging aspect is its measurement. How can we determine if a dairy farm business is resilient, and to what degree? It is rational to assume that farm business resilience is based largely on the resilience attributes of an individual or individuals that are directly responsible for making farm management decisions. It is therefore vital to understand

the psychological influence of people on the resilience of their business operations and this foundational understanding is critical background to conducting this research.

Psychological Influence

Six attributes have been associated with an individual’s resilience and these were used in a research thesis to rank an individual farmers resilience (Duranovich, 2015). These attributes are: self-efficacy, willingness to change, locus of control, open mindedness sense-making, and strategic thinking. The behaviours exhibited by an individual who possesses these attributes are summarised (**Table 1**).

Table 1: Characteristics associated with the six resilience attributes identified by Duranovich (2015)

RESILIENCE ATTRIBUTES	RESILIENT BEHAVIOURAL CHARACTERISTICS
Self-Efficacy	Set goals, are focussed, persists in the face of failure, approaches threatening situations with confidence and views difficult tasks as something to master rather than avoid
Willingness to change	Faces reality in a situation of significant change with a positive outlook and ability to cope in the face of obstacles
Locus of control	Believes they have power over events in their lives and can influence events and their outcomes and responsible for their own actions
Open-mindedness	Accepting of other ideas, other situations and other people
Sense making	Ability to quickly make sense of a situation and adapt to capture opportunities and/or minimise threats
Strategic thinking	Perceives risk as an opportunity and are focused on future outcomes.

A significant finding of the research conducted by Duranovich (2015), and a critical aspect to this research, was the confirmation that farmers who possessed more of the resilience attributes, were more likely to respond in a positive manner to turbulent events, remain optimistic and consider options and identify opportunities. As a result, the businesses of these individuals were more resilient. In consideration of this in relation to the dairy downturn period, these were the individuals who made plans, adjusted their operations tactically and strategically and dealt with the event in a calm, collected and opportunistic manner.

Duranovich (2015) also identified that resilient farmers possess the ability to think strategically. Strategic thinking connects past, present and future events by using memories of past experiences to understand and deal with present situations. The historical context therefore helps to shape the future (Liedtka, 1998b as cited in Duranovich, 2015). Farmers that possess strategic thinking attributes are

more likely to adopt changes within their businesses and have a future focus that ensures that future risk is managed and controlled. Farmers that possess a higher level of resilience place increased importance on strategies that position their business for the future (Duranovich, 2015). The notion of a future-focussed and opportunistic outlook by resilient farmers is identified in research by Shadbolt et al., (2011) and Rodriguez et al., (2001). In both research articles, resilient farmers were identified as those more likely to take advantage of opportunities created by disturbance. Farmers that viewed the FGMP downturn period as an opportunity (and may have purchased animals, assets, plant and equipment when prices were low) were more resilient compared to those that viewed it with fear and trepidation. It is likely that the resilient farm operations, prior to the downturn period, were in a better position to take advantage of the situation, while others were just struggling to make ends meet. Hence the gap between the most and least resilient farmers widened during this event. It is important that dairy farmers adopt a resilient mind-set and incorporate key learnings and behaviours into their businesses attained during the downturn period to build greater overall farm resilience. Failing to make changes exposes a business to greater risk of failure should any future event(s) of unplanned turbulence and disruption occur.

Farm Resilience Models

The literature indicates a direct correlation between individual farmer resilience attributes and the resilience of farm businesses. If an individual has a low level of resilience, it is likely that the business they operate will also have a low level of resilience. Conversely, an individual with higher levels of resilience is more likely to operate a more resilient business. This notion is captured by Shadbolt & Olubode-Awaosola, (2016) who acknowledge the inability to separate business performance from the performance of the people operating the business; they are inherently connected. Therefore, it can be reasonably concluded that individual resilience attributes and levels directly determine business resilience.

Shadbolt et al., (2011) considered the degree to which farm businesses can accommodate unplanned shocks and how whole farm resilience can be defined and measured. The responses to various levels of turbulence and disruption were categorised into three levels: buffer capacity, adaptive capacity and transformability (**Figure 3**). The degree of impact (determined by the rate or degree of change in the environment) incurred by the farm system from turbulence and disruption determines the degree of the response. Where the impact of disruption is minimal and results in little or no response; the response is categorised within the buffer capacity zone. If the impact is more significant and prolonged, the response is categorised as an adaptive capacity response. If the impact on the operation is sufficiently monumental, for example results in a total shift from the current farm

operation (such as the conversion from dairy to cropping), the response falls within the transformability zone.

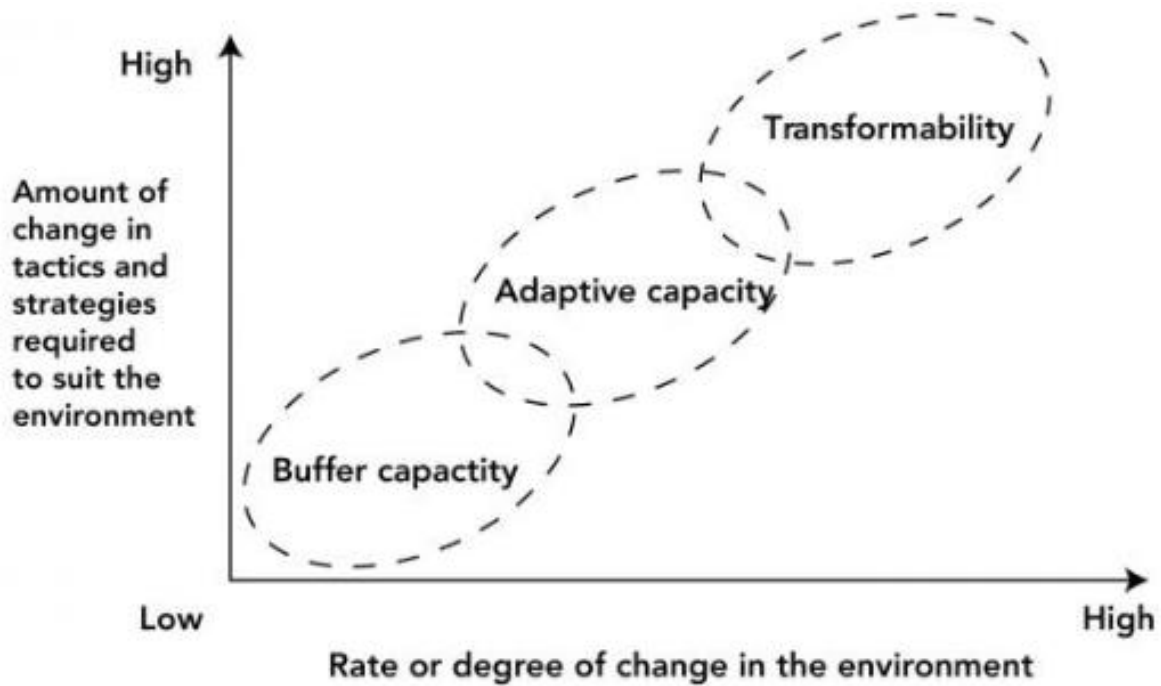


Figure 3: Continuum of change and strategies and tactics between buffer capacity, adaptive capacity and transformability (Shadbolt et al., 2011).

In consideration of the FGMP downturn period it is likely the response tactic for most NZ dairy farms occurred within the adaptive capacity zone of the model. There was a need to make immediate and significant changes to business operations to ensure business survival. Examples of adaptive capacity responses include reduction in farm stocking rate, reduced supplementary feed inputs, and reduction in fertiliser spend. These responses had an impact on overall farm productivity, but at the time were a necessary method by which to immediately control business operating costs.

According to research by Shadbolt et al., (2011) and Rodriguez et al., (2011) a more resilient farm operation is likely to respond to turbulence and disruption events at a 'buffer capacity' level. A response at this level, ensures that disruption to the business is less significant and the farm operation is more likely to be able to maintain productivity and financial performance. This ensures that disruption and turbulence events are readily accommodated with minimal impact and disruption on the farm business, leading to greater levels of farm business resilience. Farm business resilience is therefore achieved through an increased capacity of a farm system to weather the impact of uncontrollable and external factors where it has minimal impact on farm operations, i.e. results in minimal change to the operation regardless of the level of disruption.

Despite the uncertainty of unplanned disruption events, these should not be perceived in a negative context by farm business operators as this is a fundamental characteristic of the NZ dairy sector that is unlikely to change. Farm resilience is largely determined by the preparedness of a farm business to respond to these events through planning and preparation undertaken before an event occurs. Research by Parson-Ensor & Saunders (2011) observed that in any system, on-going small or medium-sized disturbances may be beneficial for productivity and growth. The rationale behind this is that regular events of minor to medium turbulence will ensure that those affected are readily prepared and less likely to engage in ‘bad habits’ that are detrimental and/or counter-productive to their business. Examples of ‘bad habits’ in the dairy sector include spend and production creep (e.g. chasing higher milk production over profitability) and inefficient use of resources (e.g. pasture wastage through poor grazing management). Longer term disturbances to any system may present opportunities for entrepreneurs to identify gaps to generate economic growth, such as the purchase of land when prices are low.

An extension of the model depicted by Shadbolt et al (2011) includes the element of time and management output. In the model, Duranovich (2015) classified decision making into three levels; strategic, tactical and operational. Strategic management decisions are normally associated with longer lasting, greater impact and future-focused management. They aim to create future business value and have a planning horizon of up to 10 years (Shadbolt & Bywater, 2005). Such decisions associated with business growth, development and investment opportunities - an example of this may be the purchase of the neighbour’s farm.

Tactical management is the link between strategy and annual operations of the farm. The time frame for these management decisions is typically up to one year. On a dairy farm, tactical management decision examples include the development of annual feed budgets and seasonal fertiliser decisions. Operational decisions revolve around day-to-day and weekly operations and may include herd feeding requirements and rosters as examples. Examples of farm business management decisions in each category, are shown in **Table 2**.

Table 2: Examples of Farm Management Decisions in the different categories

Operational	Tactical	Strategic
Farm rosters	Stocking rate	Investment/divestment
Mating	Farm budgets	Farm governance structure
Calving	Farm Production System	Succession planning
Livestock feeding	Feed budget	Debt Management

During the FGMP downturn period, various industry agencies, including DairyNZ, responded by providing advice, information and facilitating workshops and support groups to help farmers get through this period. As the depressed state of global dairy trade continued for a second year, (and FGMP remained suppressed) discussions around global dairy trade volatility and resilient farm systems took the fore. These discussions centred around how farmers could reduce the impact of global dairy market place volatility on their businesses and associated operations and the subject of farm resilience become more widely discussed at farm, extension and research levels. The onset of the downturn period generated an immediate need to define farm resilience in a NZ dairy system context as well as to provide the research, understanding and tools to assist the sector to become more resilient to protect it against this risk.

To immediately manage the downturn period various responses were made. Tactics implemented included an immediate cease to farm expenditure such as reducing the purchase of farm inputs (e.g. fertiliser and supplementary feed), and in many cases, cow numbers were reduced to reduce reliance on supplementary feed inputs. Other tactical decisions included borrowing money to cover the deficit between farm income and outgoings. This was enabled through banking facilities or through Fonterra Co-op Group Ltd as a loan which was required to be paid back once FGMP recovered. Other options to cover the income shortfall included replacing sharemilking contracts with employing Farm Managers, selling assets or investments and/or using savings generated from previous seasons.

Roche & Horan (2015) illustrated a holistic representation of a resilient farm model that includes four pillars; resources, animals, business and people (**Figure 4**). The model encapsulates the physical and financial components of a resilient farm system and details the integrated components of each pillar.

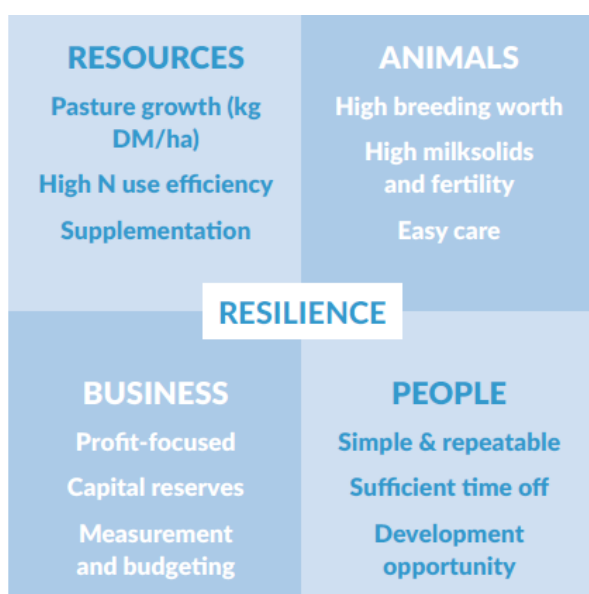


Figure 4: Resilience Farm System Model (Roche and Horan, 2015)

This model provides a framework that can be adopted by NZ dairy businesses to develop relevant plans as part of a continuous improvement journey to achieve greater overall farm resilience. The development of strategic and tactical farm management plans and objectives along an improvement continuum, will help to ensure that NZ dairy businesses are resilient to respond to future events of disruption and turbulence.

Farm Financial Resilience

Over the last 20 years there have been two significant changes in on-farm operating expenses with imported feed and debt servicing requirements greatly increasing. There has been a rapid shift from traditional pasture-based systems towards intensified farm production systems that are reliant on purchased supplementary feed inputs. Sector expansion has been stimulated by borrowed capital to fund land purchase and farm development. NZ dairy sector debt increased from \$11.3 billion to \$29 billion from 2003-2009 (Cook, 2016) and reached \$37.9 billion by June 2015 (Reserve Bank of NZ, 2015). Mounsey (2015) reported that average dairy debt in the period from the early 2000's to the mid 2010's had added an average servicing cost of \$0.7/kgMS produced.

Increasing debt levels across the sector has led to the pursuit of higher animal production which has been supported by increased levels of supplementary feed inputs to farm. This has ultimately led to more intensified farm production systems. In many cases, the growing focus on supplementary feed inputs to maximise production, had resulted in a reduced focus on pasture productivity and utilisation. Attesting to this, the average cost of production (and corresponding farm working expenses) has increased markedly in addition to debt servicing requirements. DairyNZ reported that during the 2014/15 season, 72% of NZ dairy farms would have been unprofitable and most required a FGMP of \$5.30 to break-even to cover farm working expenses alone.

This situation highlights that prior to the downturn period many dairy farm businesses had become unhealthily reliant on higher levels of FGMP to satisfy the cost of production and debt servicing and therefore were highly exposed to the risk of downward FGMP movement. The downturn period brought an immediate need to decrease FWE as this was one of the few mechanisms available to dairy business operators to control farm finances. During the FGMP downturn period, while various methods of cost cutting were implemented, one of the most prominent tactical approaches was reviewing production costs. This reignited an on-going sector debate on the 'optimal' production system. In the context of the downturn period the discussion that ensued was whether lower input farm operations were more financially viable (and therefore more resilient) than higher input farm operations.

Research conducted by Mounsey (2015) sought to investigate the aspects of production systems in the NZ dairy industry with profitability as the key driver. It was identified that while other farm input costs such as labour, fertiliser, animal breeding, maintenance and running costs had remained at constant levels over time, supplementary feed costs had increased markedly over the same period. During the 2013/14 season, imported feed inputs were the largest category of farm expenditure at 31.8% and this was fundamentally responsible for increases in FWE over time. Mounsey (2015) reported that FWE had increased from \$3.66 in 04/05 season to \$5.17 in the 13/14 season. An analysis of operating costs per kilogram of milk solid is shown in **Figure 5**. The graph shows that while other costs have remained relatively constant, feed prices have continued to trend upwards over time.

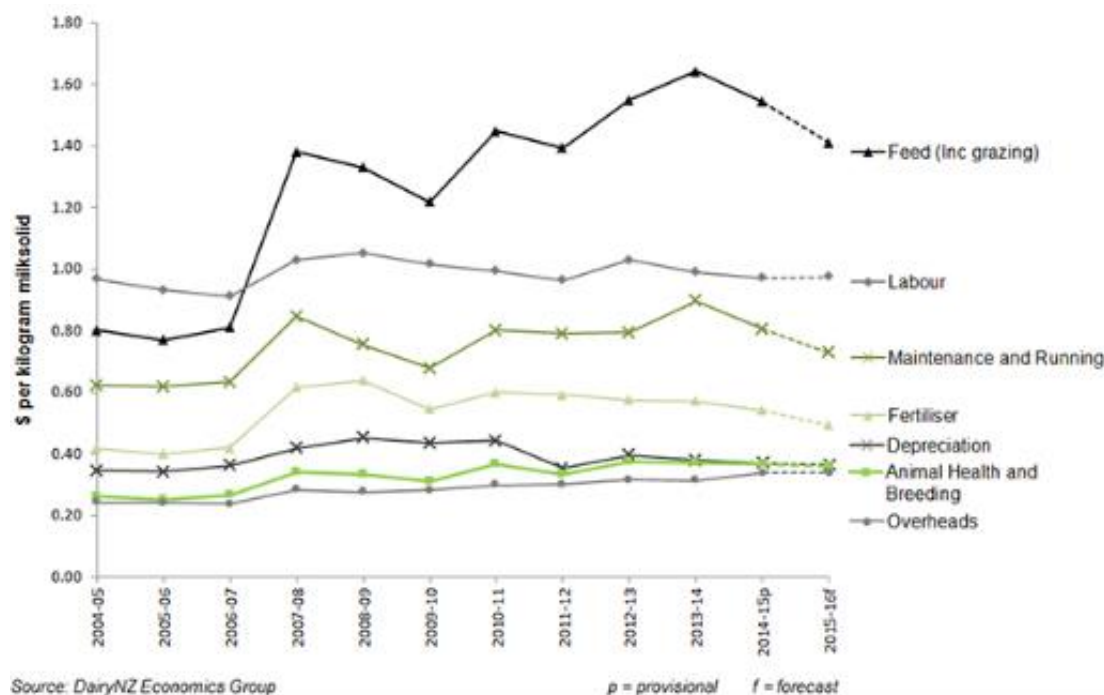


Figure 5: NZ Operating Expenses per kg of MS since 2004 (DairyNZ)

Mounsey (2015) identified that prior to the downturn period the pursuit of production had reduced the ability of dairy farmers to maximise pasture utilisation, resulting in feed inefficiencies and increased production costs. He concluded that to build farm business resilience, it was necessary to focus on maximising pasture utilisation to promote increased production efficiencies. Another significant finding of this research was that during periods of lower FGMP, this had a more pronounced impact on higher input farming operations. This finding is consistent with DairyNZ research which indicated that pasture utilisation is responsible for driving more than 85% of total profit for most farms at a \$7.00 FGMP price, and 98% of total profit at a \$4.00 FGMP.

A study of DairyBase data Neal et al., (n.d.) identified the key attributes of a financially-robust dairy businesses. It was identified that the most profitable and resilient dairy farm businesses were

operations that could maximise pasture utilisation and had a lower reliance on purchased supplementary feed inputs. During periods of lower FGMP, farms that maximise pasture utilisation are more resilient than operations that are less effective at this. In consideration of the FGMP downturn period, farms that were least impacted by the event were the ones that maximised pasture utilisation and maintained typically lower production costs (achieved through production efficiency and/or lowered input).

[Influence of Farm Production System on business resilience](#)

While higher input farms are more exposed to FGMP volatility, the control of FWE (including cost efficient milk production) is the key driver of farm profitability for any farm business, regardless of production system. Cook (2016) identified that farms with greater resilience are those that produce more milk per hectare and per labour unit, and thus are financially more efficient. This is supported by Shadbolt et al. (2017) who identified that farm businesses with a greater resistance to disruption events were the ones that managed their costs in line with income (FGMP). It is therefore important in the event of a future downturn period, that higher input farm operations don't lose focus on the ability to maximise the harvesting of pasture. From a farm financial perspective, Olubode-Awaosola & Rusito (2017) identified that maximising production efficiencies generated more liquidity and managed debt servicing capacity, contributing to overall improved levels of farm resilience. It is important for all farm businesses to maintain positive cashflow regardless of FGMP. This was often not the case during the downturn period for a majority of NZ dairy farm businesses who required borrowing to get through this period.

The different production systems operated in NZ have been categorised into 5 categories, based on the level of supplementary feeds imported to the farm production system (**Table 3**). Cook (2016) sought to identify where the 'sweet spot' lies, in terms of farm production system and FWE using a qualitative investigation method. The sweet spot is defined as an optimised farm production system where farm profitability is maximised by farm productivity that is relative to the cost of production and debt servicing. It was identified that farm businesses with higher levels of financial resilience were more likely to operate System 2-3 and have FWE ranging between \$3.00 and \$3.50.

Table 3: Definitions of the Five Production Systems in NZ

Production System	Definition
1	All grass self-contained, all stock on the dairy platform No feed is imported. No supplement fed to the herd except supplement harvested off the effective milking area and dry cows are not grazed off the effective milking area.
2	Feed imported, either supplement or grazing off, fed to dry cows Approx. 4 - 14% of total feed is imported. Large variation in % of feed imported as in high rainfall areas and cold climates such as Southland, most of the cows are wintered off
3	Feed imported to extend lactation (typically autumn feed) and for dry cows Approx. 10-20% of total feed is imported. In the Westland region feed to extend lactation may be imported in spring rather than autumn.
4	Feed imported and used at both ends of lactation and for dry cows. Approx. 20 - 30% of total feed is imported onto the farm.
5	Imported feed used all year, throughout lactation & for dry cows. Approx. 25 - 40% (but can be up to 55%) of total feed is imported.

Olubode-Awaosola & Rusito (2017) identified that Production System 3 operations were more able to mitigate downward FGMP risk, but were also more likely to capture upside opportunities when FGMP recovered. This is because their farm production system allows greater flexibility to increase milk production through the tactical feeding of supplementary feed. In principle, the concept of adjusting a farm production system to FGMP would seemingly provide a solution to mitigating FGMP risk and provide opportunity on upward FGMP movement, however this should be undertaken with caution.

Mounsey (2015) recommends that dairy business operators should avoid making reflex decisions because of short-term changes in milk price (within a season). This is because global dairy commodity price volatility can have a significant influence on FGMP within a seasonal timeframe period (as discussed in the introduction), therefore adjusting farm production systems not only creates risk for farm businesses, but it may be challenging to implement. For example, supplementary feed costs are typically higher when the FGMP is higher, so importing these with little notice is more expensive and may erode some of the benefit gained from increasing milk production. In addition, greater attention to detail by managers is required when supplementary feeds are used to ensure that the ability to maximise pasture utilisation is not impeded. Avoiding system complexity is also acknowledged by Mounsey (2015) who supports the need to keep farm production systems simple and states that “the decisions, skills and management required for intensive farming systems are far more intricate than

pasture based systems". The level of management required to operate a high input farm system that maximises pasture utilisation requires a very specific skill set and constant focus. Despite the caution by Mounsey (2015), Shadbolt et al., (2017) identified that businesses that are more financially resilient can manage both upside and downside risk, meaning they can respond to favourable and unfavourable conditions in the most efficient manner. Although there are differing opinions as to whether a constant farm production system should be maintained year-in year-out, there is little doubt that a farm production system that is fundamentally focused on maximising pasture utilisation will most likely have a decreased risk of spend creep occurring.

An example of a constant low cost and low input approach is seen in the multiple successful dairy farms owned by Greg and Rachel Roadley in Mid Canterbury. The Roadley's farm production system is a pasture-based with minimal inputs and focuses on 'repeatable' behaviour and decision making to have a positive influence on profitability regardless of seasonal FGMP fluctuations. The Roadleys' claim that this model avoids complexity and ensures a constant and consistent message as well as key performance measures regardless of seasonal FGMP variation. Ma et al., (2018) identified that during periods of average FGMP there was no difference in profit per hectare between low and high input farms despite higher levels of production per cow and per hectare with increased levels of imported feed. It is likely that while low input farms are more resilient during periods of lower FGMP, high input operations will be less resilient during these periods. On the contrary, during higher pay out seasons, high input operations are best placed to capitalise on elevated FGMP, while low input operations will forgo the opportunity to increase marginal milk production, boosting overall farm income.

While there are merits to a consistent low input farm production model, particularly during seasons of lower FGMP, a number of farmers and industry professionals disagree with this approach. In agreement with Shadbolt (2017), they argue that strategically boosting farm production through the use of supplementary feed, during seasons of higher FGMP is more efficient provided pasture utilisation is maximised. It is argued that production should not be forfeited during periods of low FGMP particularly for farms with high debt levels as reducing production (by cutting inputs) increases the debt loading relative to production output (DeKlerk, 2014).

De Klerk (2017) states that "chasing production at all costs could be just as costly a mistake as chasing lowest cost/MS, it's not about highest production or lowest cost MS, but rather about maximising total profit." He stresses the importance of finding the level of production where operating costs are controlled, but where a farm operation is producing sufficient milk to dilute input costs. In support of this, Woodford (2016) acknowledged that the best outcome is to have an equal focus on both the numerator (input costs) and the denominator (milk solids production). The opinion of de Klerk (2014)

and Woodford (2016) share a similar message, in that by maintaining a 'one-sized' approach production system and by not feeding supplement when there is positive return for doing so, is a missed opportunity.

It is evident that farm business resilience cannot be judged by production system or financial status alone, rather it is measured through a combination of these factors. To achieve greater levels of farm business financial resilience requires having a strategy, budgeting and planning tools. The importance of planning, monitoring and adjusting as a part of a 'Plan, Do, Check, Act' process (i.e. a continuous improvement process) in terms of financial management and planning is identified as a key aspect of building more resilient farm businesses. Utilising 'risk to resilience' indicators, such as profitability, liquidity, solvency and financial efficiency as key financial performance measures is an important tool to help provide an early warning system for potential problems (Paronson-Ensor & Saunders, 2011). Notwithstanding this, these indicators should not be considered in isolation to determine overall farm financial resilience as these do not provide an accurate measure of farm business resilience viewed independently (Shadbolt et al., 2017). An example of this is the comparison of two farm operations with differing levels of farm financial performance. One farm that has positive cash flow and low personal drawings may have poor productivity efficiencies and overall lower profitability while another may have excellent profitability but high debt and a corresponding negative to breakeven cash flow (Shadbolt et al., 2017). Given this, it is therefore vital for farm business operators to consider farm financial and production KPI's holistically and not as independent measures of financial performance.

During the downturn period, an increased focus on the level indebtedness of the NZ dairy sector arose. At the time there was a risk that highly leveraged dairy operations were at greater risk of not meeting financial obligations and commitments. While it is acknowledged that primary sector debt is a critically important strategy enabling land and asset purchase and farm development, there were concerns that debt may have increased to support inefficient farm operations. However, an assessment of primary sector indebtedness found that 81.2% of dairy debt was associated with land purchase and buildings and only 2% had been utilised for operational expenses (Greg et al., 2018). This finding confirmed that in fact, average dairy sector debt is primarily attributable to the purchase of land and development as opposed to supporting inefficient production systems.

While the outcome of the finding by Greg et al., (2018) showed that debt had not been used to support inefficient farm production systems, the finding of this research would suggest otherwise given the responses from survey participants. Notwithstanding this, the greater concern for the sector is the risk of debt over-leveraging and the risk of businesses being unable to meet obligations should a future

FGMP downturn period occur. It is likely that more highly debt leveraged businesses are at greater risk of defaulting (more so if they are inefficient producers) and therefore will have lower levels of farm business resilience.

Given the increased risk of FGMP variability, there is a need for dairy farm businesses to carefully evaluate any decisions with regards to taking on further debt to ensure that they are not exposing their businesses to increased risk. Farm operations that have superior control on production efficiencies and can accommodate downward FGMP movement and debt servicing obligations are more likely to have a greater level of business resilience comparative to operations that are more reliant on higher FGMP to ensure business survival.

Managing downward FGMP Risk

While dairy farmers can control their FWE and the level of farm debt (excluding interest rates) through the decisions they make; the management of FGMP is outside of their sphere of control. NZX, (n.d.) & Rice (2016) respectively identify that of the total risk in an average NZ dairy farm business, between 56% and 69% is from downward FGMP risk movement than any other aspect within their farm business operations.

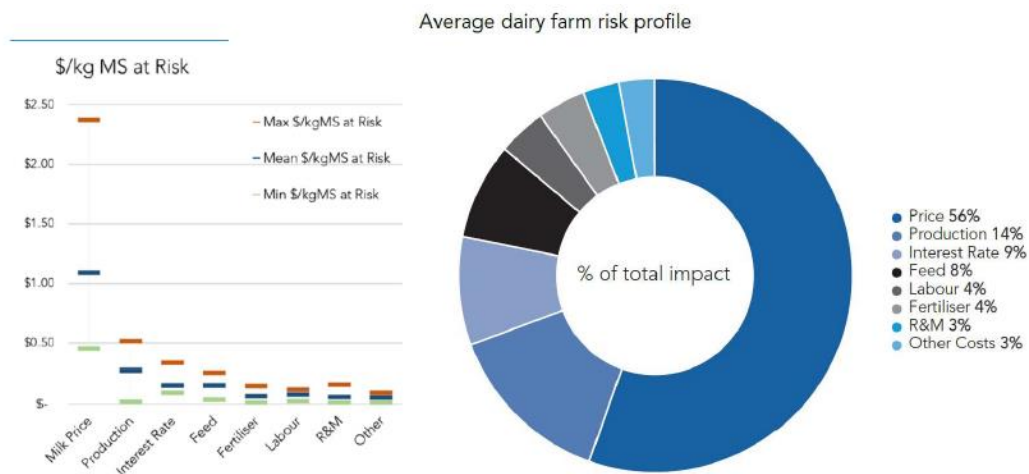


Figure 5: Average Dairy Farm Risk Profile (NZX, n.d.)

Given that downward FGMP movement is the largest business risk for dairy farmers, the need to insulate or minimise the impact of this is of critical importance for the NZ dairy sector. Prior to the formation of NZ's largest dairy processor: Fonterra Co-Operative Group in 2001 (and the amalgamation of the NZ Dairy Board (NZDB) price hedging had been facilitated by the NZDB. The formation of Fonterra saw this process discontinued. It is unknown why Fonterra chose to cease price hedging, but it is likely that continued positive trends in global dairy commodity prices at the time and Fonterra's perceived ability to influence global market prices may have led to the perception that it

wasn't necessary. The significant increase in the level of global dairy commodity price volatility from around 2006 onwards, re-established the need for the Co-op to consider the introduction of a tool to better insulate its shareholders from increasingly frequent fluctuations in FGMP because of global dairy price volatility. In 2014 Fonterra launched Guaranteed Milk Price (GMP) which allowed suppliers to price fix a portion of their seasonal production. Despite the uptake success of the scheme, it was considered controversial and was withdrawn in 2016. The primary reasons for the schemes withdrawal was associated with shareholder concerns that the mechanism was not in keeping with the principles of the co-operative model. This was because shareholders were receiving different levels of FGMP, and those that didn't partake in the scheme felt that they were subsidising the businesses of those that had fixed milk price.

The ability to hedge FGMP provides farmers with greater assurance in terms of farm income and reduces volatility risk exposure. It allows farmers to plan and budget more accurately and therefore better manage debt and associated risk accordingly. Removal of GMP and continued FGMP volatility resulted in the NZ Stock exchange (NZX) launching in 2016 a suite of FGMP futures contracts for dairy farmers to hedge FGMP. However, despite the availability of these tools to combat downward FGMP risk, the uptake of these products remains low by NZ dairy farmers today. Current figures estimate that less than 4% of national milk production is hedged for FGMP risk via NZX while approximately 40% of milk production in the United States is hedged (pers comment JD Van Heerden). It is also possible that Fonterra suppliers perceive the management of global dairy commodity price risk as the role of the Co-operative to protect its shareholders though ensuring a more consistent FGMP regardless of global dairy commodity price volatility. Additionally, previous bad experiences and lack of knowledge as well as the perception that it is 'gambling', are cited as other possible causes of a low uptake of hedging tools by NZ dairy business operators (pers comment JD Van Heerden).

In recognition of the historically poor uptake of hedging tools, and in a bid to ensure its shareholders have more control over farm income, Fonterra has recently launched a Fixed Milk Price (FMP) FGMP hedging programme commencing from the 2019/20 season. FMP allows for up to 50% of farm production to be hedged. The point of difference for the new FMP tool is that while it operates on the NZX platform, it is administered through a Fonterra Farm Source web based portal making the process much simpler than previous offerings. FMP allows Fonterra shareholders to fix FGMP up to 10 times throughout a seasonal period (3 pre-season events, 7 in-season). To encourage its use and educate farmers on its value, Fonterra has initiated workshops throughout NZ with the support of NZX and Lincoln University.

FGMP hedging provides NZ dairy farm business operators with a robust tool for greater control over farm income and therefore greater control over business operations as well as mitigating exposure to seasonal downward FGMP risk. Greater control over farm income provides increased resistance to future FGMP volatility events leading to greater overall farm business resilience, peace of mind and certainty for business operators.

Literature Review Summary

A significant amount of literature and research exists on an individual resilience attributes, and while this has been increasingly interpreted into a farm business context, a deficiency of individual farmer resilience information in relation to the NZ dairy sector is apparent. The literature review has confirmed that farmer resilience is determined by a number psychological elements. Understanding the psychological factors and traits that define attributes of individual resilience is a necessary starting point for developing this research. An individual's genetic make-up, upbringing, situational experience and learning, all contribute to the presence of these attributes. Individual farmer resilience traits are also influenced by age and life stage as well as other external factors such as business phase. These resilience attributes have a direct bearing on how individual(s) manage risk management, strategic direction, planning and other critical aspects which ultimately determines business resilience.

The key findings from the reviewed literature is that to build farm resilience pasture utilisation must be maximised and production costs minimised as this leads to greater production efficiencies lowering FWE. A shift back to a 'pasture is king' approach and the strategic use of supplementary feed is of vital importance to minimise farm production costs provides the foundation of a resilient farm system. Further to this, the importance of overseeing key financial indicators to track performance and regularity with reviewing and forecasting provides operators greater capacity to make informed tactical and strategic decisions. Finally, the management of risk particularly through the option to hedge FGMP provides dairy business operators with the ability to effectively manage the risk of downward FGMP movement. It also allows them to lock-in a farm production system rather than ramping-up or scaling back production dependent on FGMP movement.

SURVEY ANALYSIS & FINDINGS

To answer the research question and objectives; analysis was required to determine how farm business operators immediately responded to the FGMP downturn period and what was adopted and what was learnt during this event. The findings from both the BO and IC surveys were contrasted and key responses and themes identified to determine if the NZ dairy sector was more resilient as a result of the FGMP downturn period.

Tactical Responses

An immediate tactical management response to the FGMP downturn period identified through both the BO and IC surveys was the immediate reduction in farm expenditure to reduce FWE and any other associated farm costs. While respondents identified various methods to reduce farm expenditure, the most common was the reduction in stocking rate and corresponding reduced reliance on imported supplementary feed inputs. Other responses included the reduction, or even complete elimination, of capital fertiliser applications, as well as halting capital spend, changes to farm labour and reduced pasture renovation. Four respondents (10%) in the BOS indicated that they made no changes to their farm operations (**Table 4**).

Table 4: Tactical Response made by business operators to FGMP downturn period

Theme	No
Reduced Supplementary feed inputs	14
Reduced Operational spend	10
Reduced or no fertiliser (including Nitrogen)	9
Reduced stocking rate	7
Reduced or stopped capital spend	7
Changes to on-farm labour	7
Herd Management changes (OAD, early dry-off, mating changes)	5
Reduced off farm grazing	4
Nothing, carried on the same practices	4
Completed work with existing resources instead of contractors	3
Reduced or stopped regrassing	2
Culled or removed unproductive livestock	2
Off-farm income	2
Swapped contract (VOSM, contract milker etc)	1
Reared beef calves	1

It is important to note that most of the changes to farm operations that decreased farm expenditure would have also potentially reduced farm production levels. DeKlerk (2014) identified that during periods of lowered FGMP, farm productivity should not be forfeited (particularly for operations with higher debt levels) as this increases debt servicing across a smaller production base, (i.e. the amount of debt servicing per production unit increases). This most likely would have been accentuated on farms with reduced production efficiencies and/or higher debt obligations.

In support of DeKlerk (2014), a respondent indicated that they wished they had strategically fed supplementary feed to maximise marginal milk production and to improve mating performance rather than the blanket cost cutting approach they had adopted. A total of 10% of respondents in the BOS indicated that in hindsight, they regretted their aggressive approach to cutting farm costs at the time of the FGMP downturn period. These respondents wished that they had not reduced or eliminated important farm expenditure such as teat sealing, pasture renovation and fertiliser applications. Some acknowledged that these decisions had a negative impact on farm productivity after FGMP had recovered.

It is obvious some of the decisions made during the FGMP downturn period were to the detriment of future farm productivity. For farms to have greater levels of resilience, Shadbolt et al., (2011), identified that events of disruption need to be accommodated at a level where productive capacity is maintained (i.e. in the buffer capacity zone). Farm business resilience must also not be limited to time – it should encompass both the current and future states of any farm business and production system. Therefore, for NZ dairy farms to have greater levels of resilience; farm businesses must be able to accommodate disruption (such as downward movements in FGMP) without being forced to decrease current and future productivity and/or profitability.

A positive response to the FGMP downturn period was a renewed focus on maximising pasture utilisation, resulting in increased production efficiencies. One respondent in the BOS succinctly captured this element by stating that they went “back to basics with feed and pasture management”. The benefits of a simple system were clearly identified in the literature review (and unanimous amongst all authors) was that to increase farm resilience dairy farmers needed to ensure that pasture utilisation is maximised, regardless of farm production system. This is therefore identified as an important management strategy to build farm business resilience and is consistent with the findings of the literature review.

Strategic Responses

One of the key strategic responses to the FGMP downturn period was an increase in the level of borrowing to supplement the deficit between farm income and cost. One Industry commentator

noted that ~ 75% of their clientele who supplied Fonterra took up the loan facility offered by the Co-operative during this period. For those dairy farmers who were non Fonterra suppliers, lending appeared to be attained from traditional sources such as banks in the form of overdrafts and loan facilities.

Table 5: Strategic Business Responses to the FGMP downturn period

Theme	No
Fonterra loan (loan provided by the Co-operative to offset lower FGMP)	13
Borrowed money	8
Nothing	6
Increased Overdraft	3
Utilised deferred payment options (Ravensdown, LIC. Farm Source)	3
Sold stock	3
FGMP Hedging	3
Additional farm income	2
Sold land	1
Switched dairy company – sought a premium	1
Survived on savings	1
Established board	1

It is evident from responses in both the BOS and ICS that borrowing during the FGMP period was critical to the survival of a significant number of farm businesses. Thus, Fonterra and lending facilities played a critical role in the survival of many business during this period. The necessity of loans during this period highlights the general unhealthy reliance of the NZ dairy sector on banks and other lending institutions. There was agreement on this by a number of IC respondents who suggested that NZ dairy farmers had become too reliant on borrowing, particularly prior to the FGMP downturn period, but also during the event.

While there is a level of acceptance that primary producers have traditionally used borrowing facilities to cover periods of lower farm income (Grieg et al.,2018); the extent of borrowing required during the FGMP downturn period suggests the sector was not resilient. Despite a continued rise in FGMP since the downturn period, it was determined in both the IC and BO surveys that many farm operations still carry significant levels of debt. This suggests that the sector has largely not recovered from the downturn period and remains financially exposed and vulnerable to risk if a similar future event was to occur in the future. To build farm business resilience, it is critical that farm businesses are less

reliant on borrowing to cover any future downturn period events. This is achieved through maintaining productive and efficient farm production systems, but also carefully managing debt and ensuring that increased repayments are made during periods of greater farm profitability.

The growth phase of the NZ dairy sector (between the mid 1990's and 2010) was focussed on growth and development and was largely funded by borrowing. Now that sector growth and expansion has slowed there is a need for farm businesses to focus on financial consolidation – particularly those businesses that may have higher levels of debt. Farm businesses that are more reliant on higher FGMP to service debt obligations remain in a precarious position of weakened farm business resilience. One participant in the ICS identified this and responded that “getting bigger and weaker is not always best”. It is therefore critical for farm business operators to strategically grow their businesses within their means to service debt. This means that they will be sufficiently able to service debt irrespective of FGMP movement.

While most respondents in both surveys acknowledge that most farm businesses took on greater levels of debt during the FGMP downturn period, this was not the case for all. One BOS respondent indicated that their farm business was profitable during this period. This respondent operated a low input, pasture based production system and made very few changes to their operations because of the FGMP downturn period. Mounsey (2015) identified that low input farm operations are less exposed to downward movements in FGMP and the findings in this research are consistent with this. Secondly, Duranovich (2015) identified that low input farmers are also likely to be more risk adverse and by default, generally carry lower levels of farm debt. Given these two aspects, it is likely that low input farmers not only operate farms with low production costs, but they are also more likely to carry lower levels of farm debt. The combination of these two elements suggests that these farm operations possessed higher levels of resilience during the FGMP downturn period. The findings of this research validates this notion. While this finding does not imply that all farm operations should switch to low cost farm production systems to be more resilient, it does however highlight the importance of maximising production efficiencies and managing debt levels accordingly. This is consistent with the findings of the literature review and confirms that farm operations that adopt these strategies will be far better placed to accommodate future FGMP downturn events.

It is evident from responses in both surveys that despite the significant importance of farm debt management, most farm business operators are now more cautious with farm debt levels. Responses in the BOS suggest a renewed focus on being able to service debt, but also a significant portion of respondents seeking to reduce as much debt as possible during more profitable seasons. This is a critical strategy to reduce business risk exposure and build levels of resilience. While dairy business

operators are increasingly more focussed on debt management, 31% of ICS respondents suggest that debt management was still an area of risk for many dairy businesses. Continued learning in relation to debt management knowledge amongst dairy farm business operators is identified as an important strategy to increase farm business resilience.

While it is acknowledged that efficient and productive farm systems and good debt management are critical elements to building farm business resilience, a further option to protect farm income is through the use of price risk management tools. The risk of downward FGMP movement is identified in the literature review as the largest and most significant risk to dairy farm businesses. The level of risk was confirmed by respondents in the both the BO and IC surveys with 55% and 73% respectively identifying that downward price movements is the greatest risk to NZ dairy farm businesses. Despite the level of risk identified by survey respondents, only 8% of respondents in the BOS indicated that they utilised FGMP hedging as a risk management tool leading into the FGMP downturn period. It is likely that the highest ever FGMP of \$8.40 in the season prior to the downturn period provided farmers with an illusion that elevated FGMP was a trend set to continue and that FGMP hedging may have not been viewed as unnecessary at the time. However, even after the FGMP downturn experience, the uptake of hedging options amongst dairy farm business operators remains low. One respondent in the ICS suggested that the low uptake of price risk management tools is due to a lack of knowledge by dairy business operators that they can manage downward FGMP movement risk. This is consistent with the finding in literature review which identifies that dairy farmers are still wary and/or unsure of FGMP hedging. This is also confirmed through the significant reliance on banks and other lending facilities that took place during the FGMP downturn period.

Despite most farmers not using hedging as a tool to reduce farm business exposure to downward FGMP movement, 66% of respondents in the BOS were confident how they managed the impact of the downturn period. This high response rate is surprising as a significant portion of the debt incurred during the FGMP downturn period could have been reduced by utilising price risk management tools. These findings indicate that there is a significant lack of understanding of price risk management tools by farm business operators. Further research into this specific area should be considered, particularly with the recent launch of the Fonterra FMP platform and the protection business operators could achieve should a period of downward movement FGMP transpire in the future.

In terms of farm business financial practices, it was identified in both surveys that farm business operators are now preparing seasonal budgets, tracking performance and undertaking sensitivity analysis. There was significant commentary in both surveys that most farm business operators now have a more rigorous process to controlling and managing farm expenditure including capital.

Budgeting, planning and performance tracking as part of a continuous improvement process are all key tools that farm business operators can utilise to build greater levels of farm resilience. In addition to this, it was noted that a number of respondents acknowledged that they now seek support in terms of advisory and extension services which they had not engaged with prior to the downturn period.

To validate if farm business operators have a greater level farm financial awareness, a question was included in the BOS where respondents were asked if they knew their farm business breakeven FGMP. The importance of farm business operators having knowledge of their breakeven FGMP provides them with a figure upon which they can base tactical and strategic business decisions in relation to FGMP movement. Knowledge of this figure provides farm business operators with increased agility to make tactical business decisions in a dynamic operating environment. Business operators that do not have knowledge of their breakeven FGMP lack a signal mechanism to make critical adjustments to their business and associated operations based on FGMP movement. The result of this is that operations are less likely to be resilient to downward FGMP movements and will be unable to seek any opportunity in the event of upward FGMP movement.

Knowledge of a farms respective breakeven FGMP is also critical to preparing, monitoring and managing aspects of farm financial performance. It also confirms farm business operators have an intricate knowledge of their business FWE and debt commitments. In response to this specific question 90% of respondents answered that they were now aware of their businesses breakeven FGMP. This high response rate validates the finding that the majority of those surveyed have a greater understanding of the intricacies of the farm financials and therefore will be able to focus on lifting the resilience levels of their respective farm businesses.

Future Sector Outlook

As part of the BOS, participants were asked if their farm businesses had greater levels of resilience than prior to the FGMP downturn period. 95% of participants responded favourably to this question indicating that the FGMP downturn period had provided farm business operators with a significant learning of the need to build resilient farm businesses. When questioned if they thought a future downward FGMP would occur in the next five years 62% of respondents thought it would. The responses to both these questions suggests that there is an increased general awareness amongst respondents of the risk associated with global volatility and its direct influence on FGMP. Respondents are therefore aware of the need to build resilience farm businesses to insulate against any future events of lower FGMP. Another question asked respondents if they believed their farm businesses could withstand similar FGMP downturn periods in the future. They were required to answer along a continuum ranging from 0 to 100 with 100 indicating that they were completely sure their business

would survive and 0 indicating they were sure they would not survive a similar downturn. The range of responses can be viewed in **Figure 7**.

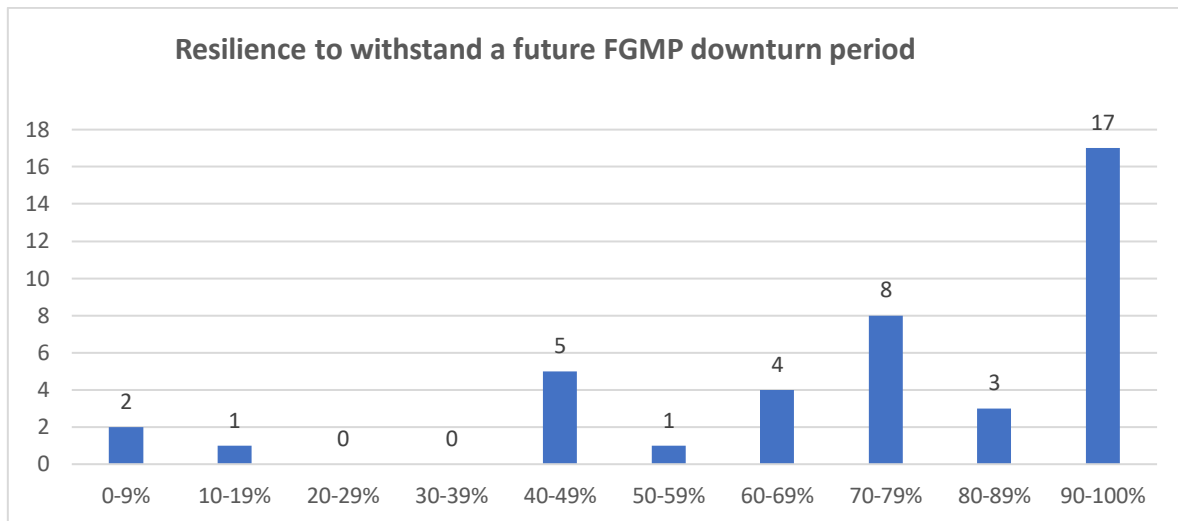


Figure 7: Farm business Resilience to withstand a future FGMP downturn period

Most respondents (17 or 41%) were 100% confident that their business operations would be able to fully survive a future downturn period. 62% of respondents were still positive they'd survive an event, but lower scores between 50 and 90% suggest that not all surveyed were fully confident. It is likely that business survival would be directly influenced by the extent of downward FGMP movement, i.e. survival confidence is directly correlated to FGMP movement. Only 3 respondents (7%) (scores ranking below 20%) indicated that they were not confident their businesses would survive a future downturn period. These responses suggest that there is still a need for dairy farm businesses to build greater levels of resilience despite the finding that a significant portion of respondents felt their businesses would be fully resilient should a future downturn period occur. In contrast to the findings of the BOS, only 37% of respondents in the ICS felt that the dairy sector would be able to withstand another period of lower FGMP. Despite this, it was acknowledged that farm business resilience will continue to increase over time. An ICS respondent identified that provided farm businesses continued to focus on increasing production efficiencies and debt reduction, this would continue to build levels of farm business resilience.

In terms of assessing individual farmer resilience traits a question in the BOS asked if participants perceived the future of the NZ dairy sector in terms of threat or opportunity. A 0 score indicated threat, while a 100 indicated an opportunity. A score of 50 indicated that the individual viewed the future of the NZ dairy sector as both a threat and an opportunity. The results as shown in **Figures 8 & 9** indicate that most surveyed farmers have a general positive and optimistic outlook for the sector. This positive outcome shows that the farmers who participated in the survey were more likely to

possess higher levels of individual resilience and therefore based on the findings of the literature review are more likely to operate resilience farm businesses by default. Although the majority of BO surveyed held an optimistic view, other results suggest that there is still an element of pessimism in the sector. A direct correlation existed between those who viewed the future as a threat also considered that their respective farm businesses would have a low level of survivability if a future event of depressed FGMP occurred.

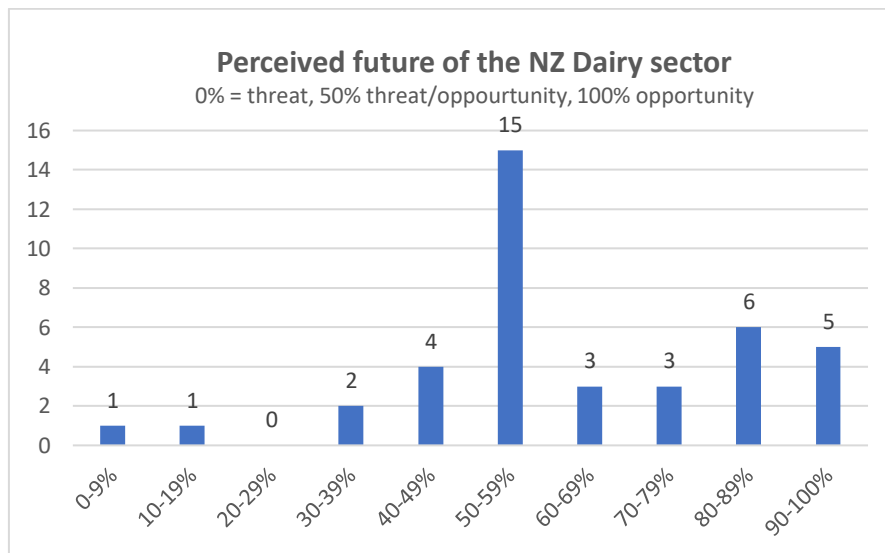


Figure 8: Perceived future outlook for the NZ dairy sector – threat vs opportunity

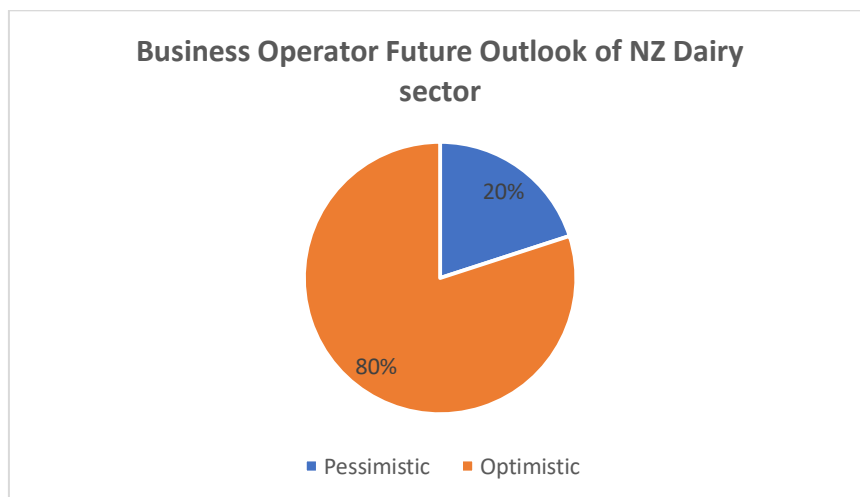


Figure 9: Perceived future outlook for the NZ dairy sector

Farm Resilience

A question was included in both the dairy business operator and industry commentator's survey asking participants to define dairy farm business resilience. The responses from these surveys from various respondents are compiled below.

Industry Commentators:

Ensuring the sufficient financial and emotional resilience for farm business and farmers themselves and to be able to 'bend without breaking'. To be able to produce milk profitably and sustainably and to adapt to changing circumstances in the short and long term to not compromise on business performance and profitability. This includes having sufficient flexibility and agility to make change quickly and appropriately from the onset of adverse events including FGMP volatility to ensure capacity for the social, physical and environmental and biological components of the farm system to protect an inter-generational asset.

Dairy Business Operators:

Ensuring mental and business resilience by building a farm structure that is able to withstand shocks and maintain output and profitability into the future. This includes being able to seize opportunities, be able to adjust in a timely manner to changing environments and have strategies to deal with the unexpected events in a proactive and positive stance.

It is evident from these responses that dairy farm business operators have a clear understanding of farm business resilience and what this means to them and their respective businesses. The definitions in both the BO and IC surveys are consistent with the definition of dairy farm resilience as identified in the literature review, specifically acknowledging the aspect of maintaining production and profitability. In the context of the FGMP downturn period, these definitions incorporate elements of a resilient mind-set and attitude pertaining to individual farmer resilience traits.

Dairy farm business operators that maintain a positive and future focussed outlook and embrace the future with optimism will generally possess higher levels of personal resilience traits and are more likely to operate more resilient farm businesses. The importance of understanding personal individual resilience traits, knowing weaknesses and seeking to improve these is critical for increasing one's personal level of resilience, but to also enable the creation and development of resilient farm businesses. It is therefore important to recognise that in order to build resilient farm businesses starts with building the resilience of the people that manage them.

"Knowing yourself is the beginning of all wisdom" – Aristotle.

CONCLUSION

Throughout the literature review process, a significant research gap was identified. It revealed that no investigation or research had been performed, in any context, to evaluate the resilience of farm dairy businesses post the FGMP downturn period. This research sought to determine if farm businesses were more resilient because of the FGMP downturn period. While the downturn period caused significant impact and disruption to the NZ dairy sector it can be concluded that it also provided a valuable lesson that dairy businesses had become unhealthily reliant on intensification, inefficient production systems and debt. The downturn period offered NZ dairy farm business operators an opportunity to reset the strategic direction of their businesses to increase resilience, insulating them from increasingly volatile global dairy market environments that can have a negative influence on FGMP.

If the survey participants are representative of the wider dairy sector, analyses of the data would indicate a shift in focus towards the establishment of more resilient farm businesses. Using the findings of this research as a representative sample suggests that NZ dairy sector farm businesses are likely to be more resilient than they were prior to the FGMP downturn period. The majority of surveyed dairy farm business operators are aware of the need to ensure greater levels of farm business resilience to protect them against the future risk of global uncertainties and the direct influence on farm income.

One of the key findings from the research is that for farm businesses to build greater levels of resilience, business operators must improve farm production efficiencies by maximising pasture utilisation. This is necessary in any dairy production system. The research suggests that surveyed dairy farmers are now more aware of their cost of production and there is a distinct return to focusing on maximising pasture productivity and utilisation. In addition to improving production efficiencies, the research shows there is greater financial awareness and understanding of operational and capital spend by farm business operators. The development of budgets, forecasting and monitoring in addition to sensitivity analysis and knowledge of breakeven FGMP all contribute to greater farm business financial resilience. There is an increased focus on farm debt management and understanding of the need to reduce debt obligations over time rather than pursuing growth, expansion and development. A trend of farm business consolidation appeared to be present in some of the responses from both industry commentators and business operators, as well as a greater awareness of the importance of undertaking better due diligence with regards to making business decisions.

Despite the finding that downward movement in FGMP is the largest risk for dairy farm businesses, a notable aspect identified in this research was the low uptake of price risk management tools. While the scope of this research did not investigate why price risk management tools have been undersubscribed to date, it is evident that they are not well understood by the NZ dairy sector. The recent launch of Fonterra's FMP scheme administered through the Farm Source web platform for the 2019/20 season may provide an opportunity for farmers to use FGMP hedging with greater ease, increasing the future uptake of this tool and reducing the exposure risk of the sector to downward FGMP movement.

The individual resilience of farm operators determines the resilience of their business. The future success of the NZ dairy sector will therefore be shaped by the ability of individuals in the sector to build and strengthen their resilience traits. While most farm business operators who participated in the survey appeared to view the future with optimism, it is apparent that there is still an element of pessimism present within the sector. As confirmed in the literature review, a correlation exists between individual resilience attributes and farm resilience, therefore there is a need to bolster those in the sector who have lower levels of personal resilience. There is also a need to educate those within the sector that may not have experienced the FGMP downturn period or other events of unplanned disruption to build farm business resilience. The research suggests that while the sector still has progress to make in terms of building farm resilience, most of survey respondents were aware of the need to continue this process.

A significant number of respondents felt that their businesses were now more prepared for future events of global volatility than they were prior to the downturn period, hence the conclusion that there is now a greater level of resilience within NZ dairy businesses because of the FGMP downturn event. To continue building farm business resilience, it is important that farm business operators consider the report recommendations. Adoption of these practices (if not already being used) will support the development of more resilient farm businesses that are more able to withstand any future events of FGMP disruption.

RECOMMENDATIONS

It is critical that NZ dairy businesses continue to build their levels of resilience. This will ensure that overall, the sector is better positioned to accommodate any future events of disruption. Farm business resilience can be further developed by farm business operators and the NZ dairy sector focussing on the following elements:

1. Focus on maximising production efficiencies and cost of production

A focus on continuing to optimise farm production efficiencies through maximising pasture growth, quality and utilisation as well as the strategic cost-effective use of supplementary feed is critical to achieving greater farm resilience. This will lead to a greater understanding of the cost of production and improved production efficiencies. The importance of maximising farm productivity regardless of biophysical, climate and any other constraints will also ensure that business operators are deriving as much value as possible from their farm production systems.

2. Adopt good financial management practices

It is important that dairy farm business operators continue to set budgets, review performance, forecast and undertake financial sensitivity analysis. Ensuring that debt obligations can still be met in the event of a future FGMP downturn period and/or that FGMP is hedged to reduce the impact is a vital strategy for farm businesses. Continued learning in relation to debt management knowledge amongst dairy farm business operators is identified as an important strategy to build greater levels of farm business resilience.

3. Monitoring business performance indicators

Regular monitoring of key business performance indicators (both financial and productivity related) is critical to the success of any business on a continuous improvement journey. The review of performance tracking is necessary to make agile decisions that maximise production efficiencies and optimise financial performance.

4. Utilise FGMP hedging tools

An increased awareness and understanding of the use of price risk management tools amongst dairy farm business operators to hedge downward FGMP movement is recommended, particularly for farm operations that have higher debt obligations and that may be more reliant on higher FGMP to cover business outgoings.

5. Farm business planning

It is important that dairy businesses have well-defined goals and objectives. This is achieved through the clarification of business purpose which can be developed through mission statements and key business objectives/drivers. These high-level business directives will contribute to the development of strategic and tactical plans that will essentially provide a road-map to achieving these key elements. It is important that any farm members that have influence on the outcome of these plans have a fundamental understanding of them. Review of planning documents should also take place at least seasonally to ensure that the key objectives of the business are being achieved and are still relevant.

6. Business Risk Assessment

It is recommended that farm business operators undertake regular risk assessments to determine the impact and likelihood of external elements on physical and financial components of their business. These plans should detail contingencies and alternative options to deal with any unplanned or unforeseen events. Plans should also be reviewed on an annual basis.

7. Industry Support

There is a need for farm extension services (such as consultants) as well as DairyNZ to provide the tools and frameworks to support dairy business operators with these various recommendations. It is recommended that farm business resilience KPI tools (as well as the use of Dairybase) are established that allow farm operators to undertake resilience 'spot checks' to help to track their performance with meeting resilience objectives. This will provide farm business operators with the ability to track their respective levels of farm business resilience and make responsive and decisive decisions.

8. Understand Personal Resilience Traits

There is a need for dairy farm business operators to better understand their own personal levels of resilience so they can enhance areas of strength and improve any areas of deficiency. Learning opportunities to help foster farmer resilience traits will aid in the improvement of building farm business resilience. Consideration also needs to be given as to how to support those within the dairy sector that are less resilient and less engaged and/or may have mental health issues.

9. Knowledge Sharing/ Support

There is a need for the dairy sector to share experience and knowledge, particularly with those that are progressing through the dairy sector and starting their own businesses that may not have experienced the FGMP downturn period. It is important that these people are sufficiently supported to ensure that they build and develop resilient farm businesses. Resilience verbatim advice from BOS

respondents to those in the sector that are early in their careers is included in **Appendix 1** of this report.

10. Building Partnerships

Finally, it is important the dairy farmers take a medium to longer term approach to their businesses and the dairy sector and seek advice and support to develop, grow and strengthen their businesses. To achieve this, it is critical that they partner with those that are ultimately concerned with the future success of the NZ dairy sector such as advisors, mentors, advocacies, industry good agencies and businesses. Supporting dairy farm businesses to have greater resilience levels will secure the future prosperity of the sector and will continue to align the collective and co-operative partnerships and values upon which the industry has been long established.

Final Comment

Increased levels of farm business resilience will be achieved by farm business operators who continuously drive production efficiencies, make smart and informed business orientated decisions, manage their debt and minimise business risk exposure through increased use of price risk management tools. Collectively these actions will promote greater levels of farm business resilience and reduce the exposure risk of farm businesses to unplanned and unforeseen future event(s) of suppressed FGMP.

It is critical for the future success of the NZ dairy sector that learnings from past events are kept at the forefront of the minds of those that are responsible for defining the future of the sector. Paronson-Ensor & Saunders, (2011) acknowledge the importance of building knowledge, sharing and networking as a way for farmers to achieve this. Learning from experience will enable farmers to prepare and be able to effectively respond with strength and resilience to future events of disruption. Finally, considering this, the FGMP downturn period can perhaps be viewed as a positive event for the sector despite it having such a profound impact at the time. It's important that the NZ dairy sector uses the learnings from this event to make it stronger for the future.

"Those who fail to learn from history are condemned to repeat it" - Winston Churchill.

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APPENDIX 1: Words of Advice

The following commentary was provided by BOS respondents in response to a question in the survey that sought to seek their wisdom/advice that could be shared with those in the sector who may not have experienced the FGMP downturn period.

“Be in the lowest cost of producers (bottom 30%) Surround yourself by people that are better than you Seek help Talk to other successful people in your industry Understand the numbers. Diversify your risk. Don't be involved with the industry unless you are passionate. Smell the roses, get off the farm it's all about empowering your people, become an employer or business partner of choice”.

“Work hard budget on the tight side look after your stock”.

“Learn how to manage pasture without a feed pad. Learn from the best even though it can be mentally tough in a controlled starvation unit. There's opportunities everywhere and don't be afraid to back yourself. Do you really want to be milking in 40 years? No? Then get sharemilking ASAP so you can be comfortable in your retirement”.

“Never stop learning, networking and having a deep understanding of where your business is at.”

“Make informed/educated decisions, set goals but make sure you are enjoying the journey, look outside traditional pathways to ownership. Be prepared to work hard, there are no shortcuts.”

“Look for win/win scenarios”.

“Make sure it's what you really want to do before you even begin. Have a backup plan e.g. saleable skills”.

“Look at all the options”.

“Budget, entry point and cost at entry, support network, accountability and plan”.

“Don't give up, majority of us started off doing the hard yards. It taken some time to get to self-employed positions, but never lose focus on your goals because as soon as you forget you begin to give up”.

“Farm ownership is still very possible. Everyone has to make sacrifices. Decide what's important to you and what you're willing to sacrifice to get there. Think outside the square. Good business relationships are far more valuable than the job with the higher salary”.

“Finding the best/right farming system for you is so important. Working for people who have proven business performance and can challenge you sets you up to succeed during your career especially the tough times”.

“Be wary of banks’ lending money. Interest is a killer. Don’t work for peanuts. It will catch you out..!!”.

“Don't borrow too much”.

“Don’t give up”.

“Don't put your eggs all in one basket, Know how to budget and budget well”.

“Know your business. Be prepared for anything Plan for the worst”.

“Focus on pasture management first. That is the best way to make money. If you do that you will be in demand as a manager and a profitable farm owner in the future”.

“Focus on your business, have a written strategic plan. Always analyse KPIs and adjust plans if necessary and accordingly. Prepare for opportunities others may not see. Don't be afraid to take risks but be calculated in those you take. Constantly learn as much as you can as you don't know what you don't know.”

“Be prepared for fluctuations and build a business model that can flex when it is really tested by a low pay out”.

“Work hard, listen to advice, follow your heart even if it's a little left field, as if you're not happy you won't be a happy to go to work in all the elements life throws at us”.

“Get your balance sheet correct from the outset”.

“Take opportunities but don’t become someone’s opportunity”.

“Plan .make sacrifices. Work hard. Be clear on goals. Have a clever wife or husband. Diversify”.

“Make only good sound financially viable opportunities, do your background on companies and farm owners, chances are they will be all good when things are going well but when things turn to shit they’ll only be looking after themselves”.

“Networking with farming leaders, network with rural professionals, know your why”.

“Research, research, research”.

“Work hard but take time to lice life as well. Create a good balance”.

“To always have a backup, and ensure you do your budgets on a worse case no matter what the bank says”.

“Don’t give up, if you want your own farm you can get it still, but you have to do hard yards and sacrifice flash household stuff, holidays, flash vehicles etc. We contract milked big herds and owned some small blocks of land.”

“Go for it if you really want to but its lots of hard work. I’m not sure that the same progress can now be made through sharemilking steps. You need to be prepared to always be learning and be prepared to take on lots of debt”.

“Watch the dollars and cents in all spending”.

“Don't buy the flash stuff, always budget well below the milk price, i.e. 30 year average milk price”.

“Don’t buy expensive toys, grow equity through stock not erode it by buying a \$2000 cow that is only with \$1675 on bank values”.

“Have savings”.

“Stick in there. Monitor monitor monitor. Attention to detail”.

“To take calculated risk, surround self with those who have the skills you don’t and learn from them”.

“Work hard - Seek opportunity with older farmers wanting to get out of the work and running side of things but don't want to sell their farms”.