

Appendices on CD

For thesis:

Path dependence: an approach for framing constraints on adaptation on
Australian dairy farms

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Appendix C: Farm Narratives

Farm Narrative 1: Albert

Albert runs a dairy business in northern Victoria. He currently milks 140 cows on a 37-hectare dairy farm. Albert is a third generation dairy farmer on the 37 hectares. Albert's grandfather started out as a share farmer on the property. Albert laughingly described himself as having probably first milked a cow on the farm when he was five, and that was 60 years ago. Albert started working on the farm, with his father, in 1965. Albert and his wife took over the farm in 1978, after they were married. At that point, Albert's father stepped back from active farm management

Breeding

Early on, Albert's father borrowed Jersey bulls from the neighbour for joining. Albert's father also used to get some cows from the market in Bendigo, though half would have to be returned because of poor performance or bad temperament - 'they'd chase him out of the shed'.

When Albert came to work on the farm in 1965 he told his father that they needed to try and do something to sort out the mixed-breed 'motley group of cows'. Some cows dried off after six months, not achieving the typical 10-month lactation. There were also cows with bad temperaments and poorly-shaped udders. To improve the herd Albert and his father changed how they bred the cows

Artificial breeding started in Victoria in 1962. Even though the neighbour warned that 'the udders drop off' artificially inseminated (AI) bred cows, Albert persuaded his father to try AI on some of the cows, while continuing with the use of Jersey bulls for the rest of the herd. While they could have gone into any breed, as any single breed would have meant improvements, Albert and his father decided to focus on breeding Jerseys. Albert's father had recently bought 25 registered Jersey cows. They decided to use AI on the better Jersey cows, though Albert and his father didn't keep registering subsequent Jerseys on their farm as pure bred. They also stopped keeping replacements from the cross-bred cows.

Changing to AI did not require significant changes to the farm system. An important aspect of using AI for Albert was to start herd testing, which was new to the farm. Herd testing was fundamental to the AI breeding programme so that they could identify on paper, in an objective way, which cows were producing.

Over the following three to four years they could see improvements in animal quality from AI. They were getting a 'nice line of even heifers'. The cows were more 'true to type' with better temperaments, better udders and were easier to milk. There were increases in production associated with the cows having a longer lactation. Albert and his father got to the point where they could be 'confident at two years when they come into the dairy that they were going to be equal or better than their mothers'. Over time the farm was converted to exclusively AI breeding.

In addition to milking on the farm, in 1969 Albert began working as an artificial breeding inseminator off-farm, which led to a 26-year part-time career in AI in which he artificially inseminated over 50,000 cows. This part-time work led Albert to become 'more involved in the herd improvement side' of the farm business. Diligent historical breeding records enabled Albert to register his Jersey cows in 1980, when the Jersey Society opened the books to register Jersey cows with sufficient records.

Albert's focus on breeding quality Jerseys has enabled him to build up a totally registered Jersey herd that is in the top two per cent (or top five herds) in Australia on a genetic index. The value of his herd now is about \$500 per head better than the average standard commercial herd of cows due to the breeding potential. Genetics Australia have organised regular tours of the farm over the past 15 years because of the evenness that Albert has been able to achieve in his herd.

He is able to sell surplus heifers into special sales and he has developed a profitable product line in selling bulls for use in artificial breeding. While only one to two bulls a year make it through the selection and testing process for AI breeding, Albert also sells some young bulls (up to yearlings) as breeding bulls. They are used for joining with Friesian heifers, to minimise calving difficulties. Generally, Albert has a 'good strike rate' with the bull and surplus stock sales, which make up about 5 per cent of farm business profit. It's something else Albert can sell 'other than just putting milk through the vat'.

Albert described how making improvements to efficiency was crucial if the business was going to survive, because 'if you stand still, the costs just kill you'. When Albert started helping with farm management in 1965, his father was milking 80 cows. Today, with the same size farm, Albert milks 140 cows and has doubled production. While Albert identified small increases in production associated with breeding (longer lactation), Albert thinks that

the production increases he has been able to achieve are predominantly related to feed management.

Improving the feeding system

The family farm was initially just laid out using horses and ploughs. By the early 1980s, Albert had laser graded 50 per cent of the farm and the whole farm was sown to summer pasture. In 1981 Albert built a new herringbone dairy that allowed him to milk 16 cows at a time, while in the old dairy he could only milk six. He has stuck with this herringbone dairy since, as he would need to be milking 250+ cows to get a benefit from going to a rotary dairy.

In 1982, Albert put a feeding system into the new dairy. Given that only 50 per cent of the farm was laser graded at that time and the other 50 per cent was 'old pasture, fairly inefficient', Albert was looking for another source of feed for the cows. The feeding system in the dairy allowed Albert to feed pellets to the cows as they came through the dairy. Albert could see an immediate positive difference in the cows from feeding pellets. He has continued to use them for the last 30 years, though the mix is more fine-tuned these days to suit the cows' needs (e.g. early lactation, joining).

Historically, Albert had a 132-ML surface water irrigation entitlement and would consistently get 100% of his entitlement plus 100% in sales water. In the early 80s there were 'some dry years'. Once water got scarcer Albert needed to find another way to get the water.

In 1985 the Department of Agriculture had a scheme to reduce the water table levels by subsidising the installation of spear point systems for irrigation. It required a commitment to pumping groundwater into the channel system when the table was high. Albert took out a loan to pay the \$28,000 for installing the spear point bore. A grant covered the cost of connecting the power for the groundwater pump to the electricity grid, which was an extra \$30,000. This worked well for Albert as it gave him access to 85 ML of saline shallow groundwater, which needs to be shandied for use on his pasture.

Throughout the 1980s and 90s, things went along reasonably smoothly for Albert on the farm. He worked off the farm for quite a few of those years and would just come home and milk to keep things moving along. Money that could have gone toward farm improvements had to be used elsewhere, to meet other priorities. Albert and his wife were putting two kids through university during that period. In 2000, Albert's father passed away. Before his father passed away, farm debt would have been at about \$100,000. With his father's passing Albert

needed to buy out his two sisters from the farm, at a significant, though reasonable, cost. To pay the costs, Albert had to take on a bit more debt. Albert reflected that things have worked out with regard to the farm business ownership.

The deregulation of milk in 2000 didn't have a significant impact on Albert's business. He sells his milk to Murray Goulburn Co-operative, and since 55 per cent of Murray Goulburn's milk is used for manufacture and the rest is consumed locally, his business wasn't (and still isn't) dependent on whole milk.

Managing drought

A drought started in 2002-3, and continued for a number of years. During the drought Albert was only getting 30 to 50 per cent of his entitlement, depending on the year, and sales water was now non-existent. The lack of available irrigation water meant that Albert couldn't water any of his pasture adequately and it died off. Albert then had to change how he fed his cows. This had a significant impact on Albert's farm and led him to make some changes to his farm system.

Early on in the drought, when Albert thought it would last a year or two, he borrowed heavily to try and get through it. A large cost in the first year of the drought was to build a feed pad at the dairy, to get another way to efficiently feed the cows after they had been milked. As the drought continued he realised that he couldn't keep borrowing and just feeding out. All of his income was going to feed the cows. He had to get a lot smarter if he was going to maintain the business.

Extra water was out of the question for Albert. Even when the temporary water was at around \$300/ML he was right out of the market. In the middle of the drought, Albert's spear point bore also ran out. This increased the pressure on his business. Since carry over water became available, later in the drought, Albert has been buying a bit each year, when the price looks to be at its lowest. He bought 100 ML last year at \$5/ML. While it looks as though some of that will be lost as spillover, he really 'hasn't lost any money' at that price.

Albert oversowed the farm pasture with a new hybrid annual rye grass, which he was able to water in the autumn and dry off over summer. He also used nitrogen to boost the growth. Each year he just continued to oversow with annuals through the drought. This pattern meant cows were 'finished on a little bit of grass' and would come back into production early in the spring. This worked well for Albert, given his routine of spring calving.

There were a couple of occasions where Albert had a little bit of surplus annual pasture which he put into silage. He ended up with 60 rolls of silage one year and 40 the next, which he fed back out later in the year to his cows.

He set up a feeding pattern that included strip grazing, pellets in the dairy, feeding out on the feed pad and providing hay in the paddock. He upgraded the pellets he fed out in the shed. He bought in failed crops with high protein and energy and he purchased lucerne when he could afford it. He also fed supplements to the young stock to help improve the break down of poorer quality hay.

While production 'stagnated' during the drought, Albert was surprised that the cows were able to maintain their production through the drought, given the changes to the feeding system. The reared bulls, which tended to live on just hay and pellets, also did all right.

When Albert started feeding out to his cows during the drought, he started feed testing what he brought onto the farm with the help of a nutritionist. After a couple of years Albert worked out what the nutritional needs were for his cows and didn't use the nutritionist anymore.

Where Albert buys his hay is regularly feed tested anyway.

Albert had 120 cows at the beginning of the drought. During the drought he dropped the number down to 90 cows at home. Thirty of his cows were parked in the western district, on three different farms over three different occasions. He chose middle-aged cows that he thought would travel well and still be productive. This was 'moderately successful' as it took some of the pressure off of the farm.

Looking back at it Albert doesn't think he would park his cows again because he ended up bringing bugs back into his herd that stuck around for a few years, such as a coughing bug. Given he'd had a closed herd up until then, his cows hadn't been exposed and were more susceptible to these new bugs.

Considering a switch to autumn calving

Albert has always spring calved on his farm. This gives him a six week break from milking in the year. However, towards the end of the drought, Albert considered switching to autumn calving. All of his good green feed was available over the autumn, winter, spring period, in the dryer conditions. He wondered if trying to milk over the summer made sense, especially

if 'they're talking about climate change' and things are going to stay dry. Autumn calving would mean that Albert was producing milk over winter, and winter milk has a premium.

There were some challenges to the transition to autumn calving. Albert would have had to milk the cows for an extra six months to wait and join them all in autumn rather than spring. This means the cows would have been 'staler for longer,' with a lower output. As well, it would have taken a year or so to get all of the cows 'up and running'. Over all, financially it would have been a bit of a struggle for the first couple of years. Projections indicated that the change would have led to a \$14,000 increase in the first year. Another negative of autumn calving was that the farm's out of production period, with no income, would be shifted to right over Christmas. This was seen as a major impediment by Albert and his wife.

Generally, Albert believes that the region's growth pattern naturally lends itself to spring production. It just seems that you can grow your best feed through spring and summer as long as you've got water for irrigation. In the winter it takes more feed just to keep them warm and dry, let alone to produce milk.

While he was a bit reluctant, he felt that if the dry years were going to continue then he needed to ensure he was making the best use of available feed. That would mean switching to autumn calving. Given his reluctance, he ended up milking a fortnight longer than usual, just to give himself time to decide. He finally decided not to switch, after due consideration and discussions with factory field officers.

As things have turned out, with better rainfall and more irrigation water, Albert feels he made the right decision. In the January following his decision the milk price dropped and Albert thinks he was very lucky; if he had switched he 'would have been in trouble'.

The drought did finally begin to ease and Albert had some 'really good fresh rye grass' in late 2009 when locusts come through and ate out all of the pasture on the farm and 'sucked all the goodness out of the base of the plant so it died'. The locusts 'stayed, laid eggs and then had another shot' at the pasture once they hatched. This meant that Albert had to spray for locusts and go back to feeding out hay and pellets.

Upgrading irrigation

Not long after his decision about autumn calving, the milk price drop and locusts, things started to look up for Albert. In the last two years, from 2010 to 2012, Albert has been

redeveloping the on-farm irrigation infrastructure. He was successful in acquiring funding through two state and federal programs that are providing him considerable funding towards \$225,000 worth of on-farm improvements. He never could have afforded this kind of upgrade without the funding.

Half of the farm, which had been laser graded in the early 80s, has been set up with gravity fed pipes and risers. On the other half of the farm, the changes include laser grading to improve efficiency during open channel flood irrigation. Pipes and risers were not possible here, because there was not sufficient gradient to use gravity fed pipes and risers. The irrigation upgrade has also included the installation of new lanes and a reuse system.

As a part of the upgrade Albert's connection to the irrigation system has been reduced to one outlet, on the backbone, which will service the whole farm. As well, the spear point bore has been tapped into the on-farm channel system and can be used across the whole property. This means he has an extra 85 ML to supplement his water.

Half of the water saved through the increased irrigation efficiency programs had to be given back to the government for environmental flows. This reduced Albert's irrigation allocation. These days, generally, Albert gets a little under 200 ML of water, with the surface and groundwater. While he does have about 88 ML of low security water, there is no sign of that becoming regularly available. The reality is he needs 300 ML / year to water the farm. This means that he is likely to be in the market every year for 100 ML of temporary water.

Buying temporary water for \$30-50/ ML is well worth it to Albert; he is better off running with as much irrigation water as he can. He has a stocking rate of about 4.5 cows/hectare, which he thinks is quite high compared to other farmers around the district. That means having enough water to produce enough feed is important to Albert as he has to 'get it right' with a high stocking rate.

With the irrigation upgrade Albert has done a considerable amount of work to reconfigure paddocks so that he now has 36 fairly even bays for strip grazing and irrigating. He has also put in 250 pine posts as a part of fencing off check banks. The check banks have also all been planted out to gum trees for shade. The trees will also 'take care of the farm, help the water table, keep salt under control: all those things'.

Albert also put in a reuse sump and upgraded the laneways on the farm. The seven metre wide laneway runs right through the middle of the farm with drainage on each side. The

drainage all runs into the reuse sump, which means that all of the farm's water runs into it with no waste. Albert sees this set up as having a big impact on the farm, because it allows for a very well-organised farm and was crucial in redesigning the paddocks.

Albert's debt was generally under control up until the 2002-03 drought. He went backward by \$60,000 -70,000 in the first year of the drought because of extremely high feed costs. Also, during the drought, not only was there no water, but the price of milk fell as well, due to the strength of the Australian dollar. Since then he has been able to maintain the debt but hasn't been able to lower the debt over the last few years.

He is hoping that the farm upgrade will mean he can now make major inroads into lowering farm debt. He needs a few good years where there's a reasonable amount of water available or he can buy temporary water pretty cheaply and the Australian dollar starts to go down and the price of milk is good; that's when he will be able to reduce his debt.

Albert is now in the process of sowing his farm back to pasture since the improvements. Some pasture needs a bit of maintenance due to pugging from the wet weather last winter. Since the laser grading there are still a couple of bays that need to settle down a bit before being sown to pasture, so he has planted some oats initially.

By this time next year he thinks he should be at a 'maximum feed output' for the money he's spent on the total irrigation and pasture upgrade.

Albert's current pasture management consists of morning and evening strip grazing when possible, followed by cleaning up the bay after the cows with a mower to promote even fresh growth. The bay will then be watered and occasionally fertilised.

While Albert had annuals through the drought, he is going back into perennial pasture on about 50 per cent of the farm. He plans on having 20 per cent in lucerne and 30 per cent still in annual pasture. His overall aim is to have a bit of flexibility in his feeding system.

Albert will keep 50 per cent perennial rye grass because the modern hybrid rye grasses are just so productive. His perennial and annual pasture can go on his heavier topsoils. He is keeping some annual pasture because he is reluctant to go into all summer pasture, given it is not assured that he will get 100 per cent of his water into the future. What are called annuals 'will actually last three years these days before they need to be renewed', and if he keeps

watering them they may last up through February in the season. If water is a bit short he will be able to drop off watering the annuals for a couple of months.

He plans on putting in some winter dormant lucerne; that way, if he has surplus feed, he can cut it for hay and feed it on the feed pad when there's a shortage of feed. As well, the lucerne, which is more deeply rooted, will go on the most sandy soil on the farm. If water is short in the future it will only need watering once every three weeks in that country to maintain reasonable production.

Planning for the future

Generally, Albert is hoping to grow as much feed as he possibly can, breed the cows as efficiently as he can, and then hope that the price is okay and there's a reasonable amount of water to 'do the job'. There are many things that are outside of Albert's control; like electricity costs, factory costs and fixed input costs.

None of Albert's three sons is interested in dairy farming. Albert has retired from his off-farm artificial breeding work and he has stepped back from some other long-term volunteer community work he has been involved in. He plans on spending some time focusing on doing a few more things around the farm.

Albert is hoping to milk cows for probably the next five years at least, depending on health and wellbeing. He wants to keep the farm in the family as it has been for four generations. He wants to pay off the last \$100,000 of debt so that he and his wife could either stay on the farm or move to a retirement facility. With the improvements Albert has made, the better irrigation system and good quality pastures, one of Albert's children should be able to maintain the farm and have a reasonable lifestyle here.

Albert is currently milking 140 cows. With the current improvements he thinks he could go up to 150 cows next year. If he milked 150 cows for five years that should clear the debt and allow him and his family to have a reasonable lifestyle. Also, if none of his children were interested in farming, he and his wife could stay on the farm for longer if there was no debt. They could live on the farm with a part pension, without cows. However, if they do not clear the debt then they couldn't stay on the farm. They would have to sell.

Farm Narrative 2: Ben and Betty

Ben and Betty have an 808-acre flood-irrigated dairy farm in Northern Victoria with 865 ML of high security water. They currently milk 330 Friesian (Holstein) cows. The business supplies milk to Tatura Milk, now merged with Bega Cheese, and has always done so.

Ben's parents bought the original 80-acre farm block in 1961 and set up the dairy business. A few years later, the couple bought the adjacent 80 acres to increase the farm size. In 1979 another 160 acres was purchased to create a large, connected, 320-acre block with a single dairy. Overall, the 320-acre farm had 450 ML of high security water. There would have been some low security water as well, though the exact amount is unknown.

When Ben's parents first bought the farm, they started herd testing and using AI. When they started having children they stopped using these practices. Using bulls was a bit easier and allowed them to spend more time with their children. Ben left school in 1981 and became an apprentice on the farm. As a part of his apprenticeship he got an AI certificate and he pushed to get back into herd testing and using AI. Ben has been doing his own AI ever since.

When Ben started working on the farm they were milking somewhere between 140 and 160 cows. His parents were actively trying to build up the herd numbers, given the recent doubling of the farm size. The cows at that time were a mix of cross-breeds. It was like 'liquorice all sorts.' Ben's parents had started with a Jersey herd and over time had tried different crosses with Guernseys and Friesians to try and breed good cows. There was a lot of talk back then about how to manage cross breeding. It was a bit confusing and while it sometimes worked, other times it didn't. For example, his father sometimes put a Jersey over a Friesian or young heifer and would get a 'nice little cow'. The problem was that it was hard to breed something again out of that cow, as she would be small, limiting what breed could be put over her. With breeding choices 'it was just a decision that if you went one way you had to keep going'. They were going to have to 'go Friesian or go back to Jerseys and stop there'.

When Ben introduced AI back into the farm they focused on shifting the herd over time to be entirely Friesian. Over this transition he used American genetics when they first came to Australia. He then swung back to just using Australian bred bulls, which he has been using for a 'fair few years'. A lot of the Australian breed bulls were sired by overseas Friesians but are 'more reliable' because they are proven for Australia. This means they are used to

Australian conditions and are from more pasture-based grazing cows. This is compared to the differences with the United States, with different conditions and where they use more barns and feed pads.

Overtime he has continued to use AI from Australian proven bulls. While he has bought in some cows, he has only done so occasionally. He generally manages his herd numbers internally rather than through purchasing outside stock. He has only once had a problem with a disease that came in from a bought cow. Ben hasn't had any problems from agistment either. Generally, where he agisted his heifers, the properties were beef or sheep farms that were known to be reasonably clean. They didn't produce hay and weren't heavily stocked properties.

1982/83 drought

In 1982-1983, a couple of years after Ben came to work on the farm, there was a drought that led the family to start feeding cows 'in the bail'. This means that Ben started supplementary feeding the cows in the shed during milking. Up until that time supplementary feeding in the shed was very unusual in the district. Ben and his family bought in grain and some hay.

The family tried to get better at conserve feeding over the next few years. In the mid-1980s Ben and his family started producing silage. At that time, 1986-87, the herd-size increased to about 180 cows, which was the maximum the farm could carry. If numbers went beyond 180 it would have required a lot of imported feed, which 'was one of the things you just didn't do' back then. It would have also required increasing the agistment of their young stock. The strategy to manage the 180 cows on the 320-acre farm was to feed the cows on some grass, conserve some good fodder and buy in grain and pellets so that the cows were producing well.

Changes to the dairy

One of the governing factors on herd size according to Ben is the dairy, or 'milking shed'. This means that when Ben and his family have wanted to increase herd size over time they have had to significantly change the dairy. When Ben's parents bought the farm it was a walk-through dairy, in which only one cow could be milked at a time. In the early 1970s, when the farm was only 160 acres, the family built a six-a-side herringbone dairy with a round yard. They could milk 12 cows at a time with it.

In 1980 Ben's parents altered the dairy by replacing the zigzag rails with straight rails and 'pushed an extra cow in the shed'. They need to be able to milk more cows, as they had just bought 160 acres, doubling the farm size. They also put feeders in front of the shed stalls so that they could start offering supplementary feed to the cows during milking. Looking back at it Ben thinks it was 'probably the worst thing' that they could have done because the new set-up cramped the cows into too small a space so 'they weren't happy in the shed' which made it hard during milking.

In 1989, Ben got engaged to Betty, and they were married in 1990. In 1989, Ben and his parents knew that there were going to be 'two families trying to make a living' from the farm. An extra house had to be built and, while Betty did work off-farm, there was a 'push to try and milk more cows'.

At around this time, in preparation for managing more cows, Ben's parents bought a 250-acre dry outblock right on the edge of the bush. They were able to put dry cows on the outblock over the winter and they were able to use the block for young stock at other times. In 1989 Ben and his parents replaced the old dairy with a 20-a-side herringbone dairy with a straight yard, which increased the number of cows they were able to milk at a time. The business also started buying in more feed to meet the needs of the growing herd.

Since then Ben has put stall gates in the dairy, so the cows all have their own spot, their own feeder and are not 'pushing and shoving in the one spot'. He has also put automatic cup removers in the dairy which has saved some time.

Change in management/ownership

From 1990 until 1995, Ben and his family focused on building the business to support two families. In 1995 there were significant changes in the family; Ben and Betty had their first baby, a daughter, and in late 1995 Ben's mother died of cancer. This increased the pressure on Ben to do more on the farm as Ben's father decided that it was time to transition away from owning and managing the farm.

The farm business had been going well up until 1995 and while Ben's parents' owed money on the farm, 'it wasn't a huge amount.' At that point Ben's parents owned the farm and Ben was employed on a wage for his work. While he was on the wage he was able to also do some off-farm seasonal work each year, for a few weeks here and there, to earn a bit of extra

money. He used to cart hay or work on tomato harvesters as there were a lot of tomatoes grown in the area.

Ben, Betty, Ben's father and the accountant 'sat around the table' and came up with a plan for Ben and Betty to take over the farm and to buy out Ben's father over time. The accountant was very experienced in this area and was able to offer ideas for how they could minimise the amount of tax that Ben's father was going to have to pay based on how Ben and Betty paid him.

Ben and Betty started off by buying the herd of cows and the machinery from Ben's father and becoming share farmers. This meant that half of the profit went to Ben's father. They developed clear guidelines regarding who covered what costs and what were shared costs. Ben and Betty paid for the costs that were associated with the cows and machinery. Ben's father paid for the costs associated with the land and infrastructure, such as farm improvements.

In 1998-1999, while Ben and Betty were share farming, they bought a 100-acre block of land, two-and-a-half miles away from the home block. This river block had a 72-ML high security water allocation that they could pump directly out of the river. They bought this block for grazing young stock and producing extra silage for the home block. This enabled them to 'milk a few more cows'. They were getting up to close to 300 cows.

Having the river block didn't make a difference to water on the home block, as it was hard to transfer water between the river and home blocks. It didn't have a huge amount of water on it anyway and was just used on the block. The block was all laser graded at the time of purchase but it wasn't fenced and didn't have irrigation outlets on the bays. While they had to do a little work to the river block, it 'shaped up to be a good little property and it's been very handy' for the business.

It took about four to five years to pay off the cows and machinery. As well, in 1999 Ben and Betty had another baby, another daughter.

After that period of time, Ben and Betty were able to then borrow 50 per cent of the farm value to buy the farm itself. They completely bought out Ben's father in 2000. They had 'six months of good money' with the milk prices 'probably better than they had been in the last 20 years'. However, a year after they bought the farm 'the first of the drought hit'.

Changes to pasture

Before the drought in the 2000s the farm was made up of about two-thirds perennial pasture and one-third annual pasture. They had some annual pastures because some of the farm has fairly flat, heavy and waterlogged soils that didn't suit perennial pasture. When the drought hit and there was not enough water to water the perennial pasture Ben and Betty dried off the pasture and converted it all to annuals.

Shifting to all annuals also meant that Ben spent a lot more time on the tractor reseeding. They developed a program of reseeding the pasture each year with new varieties of rye grasses and Persian clovers. As well, they had to manage their annual pastures differently than they did before the drought. They started the annual pasture later than was typical because they didn't have the water to water them in several times and had to rely on some rainfall to carry the annuals through.

Ben and Betty grew and cut their own silage. Ben and his parents historically used round bail silage, and were probably one of the first farming families to use round bail silage in the district. They had their own wrapping machine and baler. When Ben and Betty switched from perennial pasture to all annuals this meant that they had to feed out through the summers. With the increased pressure to produce more silage they shifted during the drought to bulk silage in bunkers. As well, while they tried to grow as much as they could on the farm, Ben and Betty did have to purchase in some extra feed, such as cotton meal.

The change to feeding out over the summer and producing bulk silage meant that they needed to buy a mixing wagon and put in a feed pad with concrete troughs to enable them to feed out to the cows. These changes were significant and 'it was an enormous amount of money'; however, 'it all evolved over a few years'. If they could have afforded it, Ben would have put in a concrete pad rather than a gravel one. In hindsight, the feed pad, as it is, has ended up not being the best in the winter. As well, while Ben and Betty were supplementary feeding the herd before the drought, when they shifted to just silage and no grass over the summer they had to put a lot more thought into it. They hired a nutritionist to help ensure they achieved the right blend. This was very important because 'it can have big consequences on your milk production if you haven't got it right'.

The drought was around for three or four years before it really reduced reserves and farmers got a 27 per cent water allocation. Ben and Betty had already changed their infrastructure 'to

some extent' by that time and were 'well on their way' to managing their farm in dry conditions.

The farm had around 300 cows when the drought began. Even with the shift to annuals and feeding out during the summer, Ben and Betty were struggling to feed all of the cows. One of the ways that they managed the feed deficit was to park 50 cows in Southern Victoria. They ended up selling the parked cows to the place where they had been parked. As well, with the reduction in cow numbers they were able to run the farm without needing extra help. Their paid worker left at around that time and Ben and Betty decided not to replace him, to take some of the financial pressure off of themselves.

Calving

The farm had always been a spring calving enterprise up until the mid-2000s. By the mid-2000s they were calving nearly 300 cows in the spring, which was a big job with a lot of pressure. In 2004-05 Ben and Betty started to transition toward split calving. They had thought about commencing some autumn calving for a couple of years. The pricing system at the factory offered extra money for winter milk. The farm was 'pumping out a lot of spring milk', for which the factory offered the least amount of money. Ben and Betty realised that if they 'wanted a piece of that extra money' they had to make a change towards some autumn calving.

Ben thinks that the drought helped to 'force' the move regarding split calving. They had no summer pasture during the drought and had a lot of autumn and winter pasture. If they wanted to make the most of what they had, they needed to milk more cows through the winter, to make use of that grass.

The shift to split calving wasn't really difficult. Ben and Betty already milked a few empty cows through the winter each year. They thought 'well, if we're milking a few we may as well milk a few more but fresh cows'. The transition happened gradually over time to where they are now at around 50/50. Split calving has made it easier for them to manage calving overall, as it has meant there are fewer cows calving but over a longer period of the year.

Ben and Betty both grew up with the 'traditional dairy farm holiday' in May and June. Historically, Ben would be doing a lot of irrigating over the summer period. But since the drought, and the change to pasture management, they are not irrigating much over summer. As well, in January he is now drying off cows for autumn calving, so it is now the farm's

'slackest times'. This means that Ben and Betty can enjoy their summers as holiday time with their children.

Bought another farm irrigated block

In 2005-06 Ben and Betty sold off the 250 acre dry block that was on the edge of the bush and used that money to buy a 238-acre irrigated block with 360 ML of water. This took the farm business to 808 acres. The new property is only a little more than a kilometre away from the home block. They bought the new irrigated block because they needed to be able to run more young stock than they could carry on the dry block. Given they were milking more cows, that meant they had more young stock. They could also use the irrigated block to bring home more fodder for the herd.

While buying the new irrigated block increased the farm's capacity to carry and feed more cows it also increased the farm debt load. It was a 'fairly risky thing to do' but Ben and Betty had to try and improve their position. In a way Ben thinks they 'were lucky' with their timing of the purchase. Just after the purchase the price of permanent water went way up. If they had turned around and sold the water separately they 'could have paid the block off, still had a bit of money and still had the land'. They didn't do this though, and were able to hold on through the drought without having to sell any permanent water. They wanted the water; they wanted to be able to grow feed.

With the new irrigated property this meant that the business had a total of 882 ML of high security water, including the river block. Just after this, the drought worsened and in 2007 severe shortages of water occurred. The extra water was crucial, especially when the allocation was only 27 per cent, and there was barely enough water to 'get everything started'. While they didn't have the water, they also didn't have the money to go and buy temporary water when the price was really high. The price of temporary water got up to \$1000 or \$1100/ML at one stage and they 'just didn't have that sort of money'. One year they actually sold 50 ML of temporary water at \$1100 a ML. They used the money they made to buy-in silage, which was more feasible than trying to grow it themselves.

In 2007-08, with a 27 per cent allocation, Ben and Betty did buy a little bit of temporary water a few times later in the season when they 'desperately needed it' to get the annuals started. From that point on, they focused on being able to carry over as much as possible, to guarantee some water for the beginning of the next year; everything was still so uncertain.

During the drought Ben and Betty finished up having no pasture at all. Towards the end of the drought they ended up growing more crops because they didn't have the water to start all the annuals that they wanted to. That led them to having 'a lot of cereals' at the end of the drought, which meant that coming out of the drought they had to buy a lot less fodder.

At about that time, towards the end of the drought, Ben and Betty acquired another 150-acre block of land that is about two and a half kilometres away from the home farm. Betty got the property from her parents, after her parents sold their farm. Ben and Betty will be paying it off but haven't so far. Betty jokingly referred to it as her 'inheritance' property. This 150-acre block is set up for irrigation but is actually a dry block. This is because it could be irrigated out of a creek that is filled by outflows from other irrigated properties. With modernisation, these outflows do not occur and there is no water available to irrigate this property. Ben and Betty have been successfully using the dry block for cropping. For example, last year they stripped 220 tonne of wheat off it, which was fed to the cows. This meant that they didn't have to buy as much grain.

With all of the infrastructure changes, buying the irrigated block and increased costs of feeding throughout the drought, Ben and Betty's debt on the farm increased and Ben said that they are 'still in more debt' today when compared to before the drought.

Irrigation upgrade

The upgrading of the public irrigation system hasn't had a lot of effect on the farm, as yet. Ben and Betty have been waiting for about four years for their Dethridge Wheels to be converted to flume gates. Other than this, the new channel regulators have led to better delivery of water, given the farm is on the backbone. They now only have to give a day's notice to get water, while before it was four days.

When Ben's parents bought the farm it needed laser grading. Ben's parents started the process of grading the farm, which was ultimately completed last year by Ben and Betty. The last bit of land that needed to be laser graded, about four paddocks, was graded with the help of a recent federal government water efficiency grant. Ben and Betty had to give half of the water saved through the infrastructure upgrade to the government for environmental flow. These paddocks were the worst to water, especially the largest paddock which was hard to water but was good quality soil and grew good pasture. The grant contributed towards the costs of laser grading. With the laser grading recently completed, Ben and Betty will need to

finish fencing it and to purchase a few water troughs, but this is 'not a huge amount' of money on their part.

The next change that Ben is thinking about making to the on-farm irrigation system is to put in Padman Stops on all the irrigation bays. He already has a few. A Padman Stop is a type of irrigation bay outlet with rubber doors. It means he can have big bays and get a lot of water on. Also, they have a winch which makes them easy to stop. They can be automated. Ben would like to be able to automate his irrigation system as this would save him a lot of time.

The farm today

The farm currently has 330 cows and Ben and Betty have someone working for them again. Currently, it takes about three people to run the farm. Over the last few years Ben and Betty have employed another person to help on the farm through an overseas exchange program where young people come to work on the farm for nine months and live with the family. Ben liked that he and Betty looked at resumes themselves and picked who they wanted. After employing a couple of workers in this way Ben and Betty decided to offer their milker a fulltime job. He and his partner have moved into the house at the dairy.

Since the drought, up until this year, there has been no permanent pasture on the farm. The farm lost in a short period of time what will take 'six, eight, ten years to get back'. They have 'only just started to put a little bit' of perennial pasture back in. Ben does want some perennial pasture because it provides a bit more versatility, so that he doesn't have to always feed out over the summer. Ben said that it is really 'trial and error at this stage' to see what the right balance of pastures is for the farm.

In the last couple of years Ben and Betty have had enough water to 'nearly drown' themselves. For example, this year they have 100 per cent of their 865-ML water entitlement, plus they have about 1100 ML of water in carryover from last year. That means the farm has about 2000 ML of water this year. Even if some of the water spills over the dam they do not care as they have plenty. The issue now is to try and use it all. That is why they can put in some perennial pasture. They have also grown some summer crops like maize and millet. They have been doing this in the last couple of years to try and use up a bit of the water they have been carrying and to grow a bit more fodder.

They have put in a small amount of lucerne this year and want to see how that works out. Ben is trying the lucerne because it is high in protein. He wants to get away from having to buy in

any protein; he wants to be more self-sufficient. Ben is thinking about growing more lucerne and perennial pasture, but he isn't sure how much at this stage.

The future

In the near future, Ben would like to fix up the irrigated block that they bought in 2005-06. While it is mostly laser graded it needs some new irrigation channel pads and stops, as well as some fencing. Other than this, into the future it would be great to be able to make it easier milking the cows, such as by using robotic milking. However, it would require 'some significant changes' to the farm to be able to fit that in, such as looking at how the cows are fed. It comes back to money. Is it worth the cost when you are talking about changing the whole farm system?

It is too early to tell if either of Ben and Betty's daughters will be interested in farming into the future. Ben thinks that farm kids sometimes only see the disadvantage because a lot of their mates can be in town. 'It is only when your own kids come along that you realise how great it is to bring up kids in the country.'

Ben has two main concerns about the future of the farm: the pressure on prices and water. He worries that Australia's governing bodies may not be looking after our agricultural industries. He wonders where the next generation of farms are going to come from. He knows that he 'can't do much about it' but worries none the less. There isn't much to look forward to 'with only two major supermarkets and milk at \$1 a litre, that's not a free market'. Ben thinks that they are probably getting less for their milk now than they did when they bought the farm. The export market dragging the prices down doesn't help.

Water is the other enormous pressure. Ben thinks that it is 'ridiculous' that water policy seems to be 'changing every Monday morning' over the last 12 years. He also believes that the drought wouldn't have been so bad if our water policy had not changed so that water was tradable.

Ben thinks the dairy industry is not the only industry getting 'squeezed to the max' because costs have gone up and because of drought. Cropping farmers and horticulture are also struggling. There has been a lot of pressure put on agriculture in general and Ben believes that Australia is missing an opportunity. Agriculture could be a huge employer if our government would only 'realise it and support it more'.

Farm Narrative 3: Colin

Colin milks 130 cows on a 300-acre flood irrigated dairy farm with a 350-ML water entitlement. The farm has been in his family since 1905. Colin's great grandfather, who originally bought the 300-acre farm, was known as 'a trendsetter in the district,' the first to try new things. Colin's grandfather didn't work the farm, preferring to lease it out to a brother-in-law. The farm was split into two 150-acre blocks and given to Colin's father and uncle who ran them as two separate businesses. Colin eventually took over both 150-acre blocks and joined them back together into one farm business. The 150-acre block that Colin grew up on, his father's block, is what Colin describes as the 'home farm'.

The 300-acre farm has 'pretty much' been a dairy farm since 1905 and run entirely as a dairy business since Colin's father and uncle took over the farm. Early on the cows were all milked by hand. On the home farm, in the late 1960s, Colin's father built a six-a-side double-up dairy which meant that 12 cows could be milked at a time.

Colin started working on the home farm in the early 1970s as a waged employee. At that time they were milking 98 cows. In those days, Colin's father could afford to employ Colin while milking 98 cows and 'ended up with a great swag of money in the bank'. Today Colin 'couldn't employ anybody on 130 cows.' As well, Colin described his father as 'a good farmer for his time' but said that he got to a certain point and stopped investing in the farm. This meant that the farm business 'fell behind' compared to other dairy businesses.

Colin took over his father's farm in 1993. He inherited rather than purchased the home farm. At the same time he bought his uncle's farm which brought the original 300-acre farm back together. The milking operation on his uncle's part of the farm had declined or 'lapsed' so it worked well for Colin to consolidate the two farms and milk on the home farm. At that time Colin was married and had four children ranging in age from seven to eleven. He had plans to laser grade and build a new dairy.

Colin never borrows money. As Colin developed his farm he preferred to do it slowly and avoid debt, only investing in improvements to his farm when he had the money. He thinks he may be a bit slower than others to make improvement because of this. However, Colin also has a large family and put four children through university. There has been a lot of pressure to keep his costs down so he 'wasn't burdened with children at university on one hand and low milk prices and bank interest on the other hand'.

When Colin took over the 300-acre farm the pasture was about half perennial pasture. The other half was annual southern rye and sub clover. He didn't do any cropping. Colin has generally always tried to feed the cows on grass as much as possible. He used to feed out more hay over the winter for a few weeks each year, when half the farm would end up under water, though this isn't currently a problem. As well, there are some times in the year where there may be a feed gap, such as late autumn when the summer pasture is trailing off and annuals haven't 'kicked in'. He does have to feed out a bit then. Generally, Colin produces his own hay on the farm and only crops when putting in oats for hay in preparation for laser grading.

Problem with wet

A persistent problem on the farm is that it 'isn't a good farm in a wet year'. Historically, they had trouble getting water off the paddocks because they are a bit 'landlocked' and the water had nowhere to go. For 20 years, from 1973, there were a few weeks each year in which half the farm was underwater 'except for the odd drought'. They used to 'dread the wet weather' and had to plan for it: make sure the drains were clean, getting pumps and fuel ready and figure out where they could put the cows.

Colin and his father would spend weeks shifting pumps around to five or six different points on the farm that were not necessarily easy to access. It was very time consuming. As well, given that half of the farm was wet they would also end up feeding out hay to the cows.

From when Colin took over the farm, laser grading was in his plans. He saw it as a way to reduce drainage problems in the wet and increase production. Laser grading was more than getting the right slope; it enabled Colin to set up his paddocks as he wanted them, with greater uniformity in paddock size which helped with production.

There was a big difference in the slope of the land between the two halves of the farm, which influenced how easily he could laser grade. He started on his uncle's half and was able to laser grade it fairly easily because all the land basically fell the one way. This meant that Colin could laser grade smaller amounts at a time, for less cost and as he could afford it. In comparison, the home farm has been incredibly difficult to laser grade. The land falls in different directions, requiring that Colin laser grade in 40-acre blocks. This meant that laser grading on the home farm was much slower.

Colin made 'fairly good progress' with the laser grading between 1993 and when the drought hit in the early 2000s. 'Really if you just made it through the year and were still there at the end of the year it was enough without making any real improvements as far as laser grading.' While he did keep up laser grading, it was slow progress and in small amounts. 'Virtually nine years of drought really slowed him down' and all of his 'ambitions just were put to the side'.

Colin has seen considerable production improvements on the laser-graded blocks. Pasture 'grows that much better and the management is so much easier'. Since the drought ended he has continued to work on laser grading the home farm and only has a corner 40 acres to go before the entire 300 acres will be complete. He has 'left the expensive area till last'.

Breeding

When Colin took over the farm in 1993, the herd was about two-thirds Friesian and one-third Jersey. He was having some fertility issues with the Friesians. While he had some 'really nice Friesian heifers,' many of them were not going into calf. The Friesians were also problematic during calving. There were times when it was like Colin was 'pulling every second calf'. It was stressful and time consuming. This is especially true as Colin has set up his business as 'a one man operation' and keeping that side of the labour down is important. Another impact of Friesians was that they are bigger cows and tended to pug out the paddocks in wet weather. Colin had 'an awful lot of wet years' when he had a real problem with pugging because of the Friesians.

In 1995, Colin started breeding Jerseys. Not only were they better with fertility and calving but they were better on the ground. Today the herd is 'predominantly Jersey'. There is 'nothing out there virtually that doesn't look Jersey'. Even so, Colin does have some cross-breeds. He doesn't know if he really wants to cross-breed, but just last year decided to try some Aussie Reds, a Scandinavian red breed. He was looking for more milk and bigger cows. Aussie Reds give him that and they have health benefits; they are 'very easy calving' and they are bred 'for things like mastitis resistance'.

The laser grading has really changed things for Colin. While he hasn't had to deal with wet weather recently, he knows that when it does get wet again it will be easier to get water off. The farm is now graded so that everything is joined together and he will only need two pumps and they will be at the head of the recycle system which already has a pump set up

there. He could just point it toward the main channel and put it in, though this does rely on G-MW allowing him to pump water into the channel.

The farm business has used AI in the breeding practices 'for a long time', since well before Colin took over the farm. The business has also always focused on spring calving. Colin doesn't know 'how they get the energy', those who go for split or autumn calving. He sees that it would add a lot more work during the time of year that he is 'oversowing pasture and watering the whole of the farm'. The last thing he would want to be doing then is 'tending to calving cows and feeding calves'. His workload would just be too high to add to it. It would be different if he had a son on the farm and they were looking to make the most of the money; then he would autumn calve.

Drought

Colin thinks he 'was making fairly good progress' with farm improvements from when he bought the farm business up until the recent drought. Then for nine years from the early 2000s it was enough to just make it through the year. The drought really slowed Colin down; all of his 'ambitions just were put to the side'.

During the drought, with the small amount of water he had available, Colin couldn't irrigate all of his perennial pasture, which made up half of his farm. Instead he maintained what he could, a much smaller proportion than typical for his farm, and would irrigate it as close as he could to Christmas. He was 'irrigating virtually nothing'.

This meant that Colin had to rely much more heavily on annual pastures. With the change to emphasise annual pasture he didn't have to make significant changes to the farm itself. He kept his costs down by using 'contractors rather than investing in machinery'. He did diversify what he sowed; trying a few different crops (e.g. oats) and pasture varieties (e.g. Medics) that had reduced or no irrigation water requirement. Even with the crops, Colin grew them for direct grazing rather than fodder production. In hindsight, Colin thinks he 'probably would have been better off putting down a rye grass'. Colin oversowed a 'fair bit of ground' each year as he oversowed a lot of his perennial pasture as well. He kept hoping it was the end of the drought.

Colin saw that some dairy farmers were paying 'a ridiculous amount of money for irrigation water because they just wanted to milk their cows on green grass'. Colin didn't think that this would work financially for him and decided instead to supplement what pasture he could

grow with some purchased feed. As the irrigation season progressed during the drought, there was generally a little increase in his irrigation water allocation and he would purchase a little bit of temporary water. He used this to water all of his pasture towards the end of the season, when he was oversowing all of his pasture. Sometimes he would just get one watering in, depending on the season and how much water he had, before winter came.

While Colin generally had a bit of a feed gap each year, the amount of feed required during the drought to keep his cows fed increased significantly. He generally had to rely on feeding the cows hay from just after his final irrigation (prior to Christmas) until he got into the autumn. While Colin was feeding out to his cows during the drought years he did so directly in the paddocks rather than installing a feed pad. He has been thinking about putting in a dirt feed pad 'for the future' when he next laser grades.

During the drought he had to buy in significantly more feed than usual. Buying enough feed was hard over the drought, because there were not enough people set up to sell hay. A lot of the hay Colin ended up getting were failed crops from crop producers. Colin found that he had to purchase his hay early in the season which required money up front. Colin said that they 'just squeaked through', though he had to borrow some money from his wife's inheritance to pay upfront for hay. He did eventually pay the money back to his wife, at the end of last financial year.

While Colin generally has about 130 cows during the drought he dropped his numbers back slightly, to about 120 cows. In doing so Colin culled a bit more harshly; anything that was getting mastitis or anything that he thought was extra. During the drought Colin's herd didn't drop in milk production due to the change in diet. Nor did they have significant problems with animal health. Colin had a minor problem with 'compaction or something' at one stage, 'but it was not serious'.

Post drought

While the drought has ended, Colin is still irrigating less perennial pasture now. He currently has about one-third perennials and two-thirds annuals. He has the perennial pasture in laser-graded paddocks and thinks he is getting the same feed out of the 100 acres that he used to get 'in the old days' on 150 acres. As well, two years ago Colin put in 15 acres of lucerne. This provides him with good quality feed for hay and grazing. Colin thinks that now he could

carry more than 130 cows on his farm. He is 'growing ample feed' already and with the last 40 acres laser graded he will have 'a few handy paddocks' in which to calve cows.

Up until today, Colin has focused on developing a WFP and then laser grading to get the farm the way he wants it. Any money he has made has gone back into the farm. Last year Colin 'seemed to be making money hand over fist' but then he laser graded 30 acres and put in a 2-ML recycle sump (with channels and laneway pads) at the same time, because they were already moving the dirt around. He put in the recycle sump because he didn't have one previously and knew it was best practice to manage his water in this way. He ended up spending over \$50,000 out of last year's income on farm improvements.

Colin's irrigation system has changed a little in recent times. The farm originally had seven outlets. In a current irrigation modernisation program Colin rationalised one outlet, which means he now irrigates out of six outlets. He thinks six outlets are 'probably a lot' for a 300-acre farm. However, given he has the main channel running through the middle of his farm, and given his layout with different slopes, he needs more outlets than usual.

During the modernisation process NVIRP put in five mechanised gates. Having the new gates has 'saved a bit on labour'. Even so, Colin thinks G-MW keep increasing the charges on the outlets all of the time, making the rationalisation not much of a saving for him. Colin still has one Dethridge Wheel on a spur channel which 'NVIRP haven't got round to modernising', but Colin will probably decommission it eventually anyway.

Colin has a farm management deposit account that before the drought was used to save money for expensive jobs, such as laser grading. During the drought this money got used for hay. Basically, his finances are 'year-by-year'. If it has been a tough year, he spends less on the farm and he seems 'to strike it lucky' in that, every time he has made a commitment to spend money on the farm, the money has been there. He has got a bit of money put away so he can 'sleep a little bit better'. Colin thinks there is 'not a lot of margin' these days. He worries about the potential for more and more costs associated with farming - such as water, irrigation allocations and government policies.

The future

Colin knows that his children are not interested in farming and that he cannot farm forever. Even so, he makes decisions about the farm based on him continuing to be there; hence he is maintaining it as a going concern as a dairy farm.

If Colin sticks around on the farm into the future but doesn't have the energy to 'face those cows twice a day', he may consider changing his business. He may consider hay production or carrying other people's replacements and maybe beef. If he were to change enterprises, he thinks it could be feasible given the way the farm is set up now. The one thing that does worry him is the returns he would get from those other enterprises. For example, 'with beef you are up and down'.

The tricky thing is that his wife is no longer interested in working in the dairy. Colin needs to work out how to work in the dairy by himself at the start of the season. When he is trying to break in the new heifers it is challenging as these cows do not know what it is like to have the cups put on them.

Colin's dairy doesn't help. It is a 'difficult dairy' because the cups are put on in front of the leg, which means the cows can kick. Colin thinks it would work better in a modern dairy where the cups are put on between the back legs and there is a kick bar. Colin's dairy is the main issue he has on the farm at the moment.

Colin has the same dairy that his father built in the late 1960s. Now 'it's considered primitive'. When he took over the farm in 1993 he thought 'I'm going to laser everything up and I'll be able to milk 180 cows and I'll build a new dairy'. Colin is 56 now and 'just can't be bothered going through the stress of building a new dairy'. He has seen friends put in a new dairy shed 'relatively cheaply', but under very short timelines and considerable pressure. Even so, Colin is a bit worried that when he wants to advertise to sell the farm and retire the dairy may be a bit of an issue.

Farm Narrative 4: Dennis and Donna

Dennis and Donna milk 200 cows on a 222-hectare (551-acre) dairy farm with a 318-ML water entitlement. They had no prior farming experience when they bought the original 54-hectare (133-acre) farm in 1989. The farm was already a fully functioning dairy farm when they bought it in a ‘walk in walk out’ arrangement. This means that in addition to the land and a 170-ML water entitlement they bought the existing 70 cows and all of the equipment on the property.

Prior to buying the farm Dennis and Donna had both been working and had a 20-acre property in the Gembrook area. The publicity after the Ash Wednesday fires in 1983 made people realise how close Gembrook was to Melbourne and the ‘property prices really went up’ in that area. This meant that Dennis and Donna could afford to sell that property and use the money as a deposit on the farm. They ended up having to borrow about half of the cost of the farm.

When Dennis and Donna were making the decision to become farmers they chose dairy farming partly because ‘you got paid every month’. When they first bought the farm, finances were tight. This limited what improvements could be made to the farm. Dennis and Donna focused mostly on maintenance, such as fixing fences.

One thing that was hard when they arrived was the irrigation system. It was a flood irrigated system with 3 inch outlet pipes at the head of bays that needed to be dug out every time the bay needed irrigating. This meant digging out the channel opening with a shovel and filling them back in after irrigation. It was tough work and ‘there never seemed to be enough dirt’.

Whole farm planning and laser grading

Dennis and Donna had heard that the farm used to be ‘really bad’. The previous owners of the farm had developed a WFP to improve the farm layout, which included designing the laneways, paddocks and laser grading. These owners then laser graded the worst 10% of the farm before selling the farm to Dennis and Donna.

In the first few years on the farm, between 1989 and 1993, Dennis and Donna continued the work started by the previous owner to set up the farm according to the WFP. This included laser grading, changing fences and paddock sizes. As they laser graded Dennis and Donna also changed the on-farm irrigation system to what were considered ‘standard at the time’ 9

inch pipes with manual gates. They continued to laser grade over time and today the whole farm is laser graded.

While Dennis and Donna were not familiar with the farm when they arrived, Dennis had a relative who was a laser contractor, so Dennis felt that he knew enough about laser grading to follow the WFP. Dennis didn't feel constrained by having an existing WFP as the planning is based on 'the falls of land, how much dirt you have to shift and stuff like that, so it's a fairly settled formula. Paddock sizes might be different but you balance those to the size of your cow or the amount of cows you've got.'

Dennis thinks the biggest constraint on him laser grading the farm was financial. Dennis and Donna 'weren't ever big into borrowing money to make improvements' to the farm.

Nutrition issues

Prior to buying the farm, Dennis and Donna took some courses to learn the basics about farming such as feeding cows and artificial insemination. They thought that they 'had a fair idea about how to grow grass'. Looking back, Dennis thinks 'you probably shouldn't let people without more experience own animals'. They did not get the nutrition right to begin with and it was 'fairly hard on the animals'; some of the cows 'got a bit skinny' and a few died. It took Dennis and Donna a while to learn more about the nutrition.

When Dennis and Donna bought it, the farm was about two thirds perennial pasture and one third annual pasture. The pasture mix that was there and its location on the farm 'had more to do with the availability of water than with soil type'. This is because the 'soil types are fairly consistent over the whole farm'. Annual pastures were put on the parts of the farm that are the farthest away from the irrigation outlets.

They started having problems with nutrition very quickly. They arrived on the farm in March, milked for two months and then started to dry cows off. That was when they started having trouble with being able to keep enough hay and the right quality hay. They had too many cows to feed and not enough quality feed to do it.

Looking back, Dennis thinks the pasture mix was too heavily paspalum dominated (i.e. summer active perennial pasture), which didn't grow over the winter. They had heard from other dairy farmers that 'you didn't put your dry cows on pasture; you certainly didn't rotate them round the farm'. Instead Dennis and Donna understood that the standard practice was to

feed out hay to dry cows over winter, which is what they did. There were two factors that contributed to the nutrition problem. First, they were not feeding enough. Someone had said 'three cows to a small square' which really wasn't enough. Second, they were using the supply of hay that was on the farm, which was 'not up to standard'. The nutrition problem started in May and then extended through calving in July and August. They worked through the problems in that first year and ended the year milking 80 cows with probably 10 to 15 heifers.

Dennis and Donna learned from that first year and have developed their own approach for over-wintering the cows. The cows do get some winter grass and their nutrition is looked after 'a lot better'. There have been years where Dennis and Donna have rotated cows around the farm. As well, Dennis and Donna have bought more land and improved the pasture to increase the farm's production of quality hay.

Dennis and Donna have always had the intention of growing sufficient feed on the farm to meet the needs of their cows. While it 'hasn't ever worked' yet, they keep working towards this aim. In 1992 they bought a 64-hectare (160-acre) block 'over the road' from the farm. There was no water entitlement with the block, but it was possible for Dennis and Donna to use a pump to irrigate some annuals. However, it was generally used as a dry block. The block was bought for over-wintering cows. Twenty four hectares (60 acres) of it was cropped for hay.

Calving

When Dennis and Donna arrived the cows were on a spring calving cycle. Dennis and Donna continued to do this up until 1993, when the farm was flooded. All but 12 hectares (30 acres) was underwater. Dennis and Donna were milking about 120 cows by 1993. The flooding meant that the cows couldn't get enough grass and it was hard to get hay as everyone else needed it. Subsequently, the cows' nutrition wasn't good enough during joining and they ended up with 'a lot of empty cows'. There was also 'a big push from the factory' with incentives for winter milk. They decided to try joining the dry cows later so that they could take advantage of the winter milk incentives.

Dennis and Donna shifted part of the herd over to autumn calving so that the farm had 30% autumn calving and 70% spring calving. They continued to build the herd size, up to about 200 cows, and kept the proportion of autumn calving. This worked well for them.

Converting to split calving did alter their downtime on the farm, especially early on when finances were tighter. They had come from outside farming and were used to having four weeks holiday. They didn't have four weeks holiday once when they started some autumn calving. After a while they got someone to milk on Sundays, which made a difference.

Around that same time, Dennis and Donna decided to try a new way to get the nutrition they needed for their cows. They purchased maize to feed out to the cows, which was unusual in the mid-1990s. They also retrofitted an old manure spreader to turn it into a silage wagon. 'They just didn't have silage wagons at the time'.

Calving pad

In the late 1990s Dennis and Donna put in a calving pad. They set up the calving pad near the house, with walls around two sides and a trough. The ground was covered in rice hulls and stones were used to fill in the low spots. The calving pad had to be cleaned, dried out and redone every year. Putting in a calving pad 'wasn't really expensive, but it wasn't cheap' either.

The intention was to make it easier to check on the cows when they are close to calving. It also enabled Dennis and Donna to have more feed control up until calving, to 'lead feed for milk fever' and get the cow's 'gut ready for pasture' after calving.

While they used the calving pad for a few years they found that it led to more problems than benefits. Cows would get dirty really quickly. 'Spring cows with big udders squirt a little bit of milk just before they calve, pick up mastitis and all sorts of bugs.' Calves would also get sick from the dirty rice hulls. Dennis and Donna had a lot of problems with 'navel knee'. Navel knee is where the calf gets an infection in the navel that makes its knees swell up. These are expensive things to treat.

They actually had more trouble with the cows calving: a lot of 'non-presented calves'. They learned from their vet that the problem was caused by the cows being moved to the calving pad in the week or so before calving. Bringing the cows to the calving pad entailed chasing them around on the motor bike to gather them in a group and run them home.

After a few years of trying the calving pad Dennis and Donna decided to try leaving the cows to calve where they were. They had a 'bush block', a paddock with some sheltering trees, where they put the cows. They checked them two or three times a day and it 'worked

fantastically'. Now they just don't have the calving problems that they had with the calving pad.

Breeding

Dennis and Donna have used AI and herd testing as a part of their breeding program for the entire time they have been on the farm. At first the herd was half Friesian and half Jersey. They decided to breed Friesians exclusively. Jerseys had been slower getting into AI so the 'gene pool and the cow type and production type wasn't as good' as the better-established Friesians, which had been around in AI since the 1950s.

Looking back at it, Dennis thinks that they may not have made the right decision because they were chasing production: 'litres of milk instead of profit'. Just because you get more milk doesn't mean you make more profit. They kept going with the Friesians until about 2002. Then they started getting a 'high empty rate'. They generally had about 10% of the cows empty. This worked with the autumn calving because they could just carry the empties through and rejoin for autumn. But the Friesians were having increasing fertility problems.

At that point they started to look around for other options in breed selection. They were looking to increase solids (i.e. fat and protein levels) and fertility. They were also looking for slightly smaller cows that were around 500-550 kilos. A neighbour was selling New Zealand genetics part-time and Dennis decided to try Kiwi crosses, which were a Friesian cow crossed with a Jersey bull. Dennis 'liked the colour; liked the look of them'. They ended up trying it out and thought that they were 'just fantastic'.

Dennis and Donna got right into using all Kiwi crosses. Over time, however, they found that the more they used Kiwi crosses, the bigger the gap between the best and worst heifers.

The problem with the larger gap between the best and worst was that Dennis and Donna had to keep more heifers through a first calving in order to determine which ones to cull. So while production wasn't negatively affected, there were increased costs associated with carrying the extra heifers.

Dennis and Donna were into crossbred cows before it got fairly popular. Now there is more information and articles you can read about why these problems happen. When they found out what the problem was they dropped off using the Kiwi crosses. They used Kiwi crosses for about seven years, and stopped using the breed in 2009.

Dennis and Donna now use a three way cross of Friesian, Jersey and Red. There are a lot of red breeds, including Scandinavian reds and Australian reds. Dennis and Donna are 'not fussed on what red; hybrid vigour' is what they are looking for. So far the three way crosses are going well. Currently, the 'most profitable cow does 6-7,000 litres and about 500 kilos of solids'. They are happy with the three way crosses.

2002: new block and dairy

Dennis and Donna bought an 85-hectare (211-acre) block 'across the road' in 2002. The land had 48 ML of water with it and an irrigation outlet, though it was not set up for irrigation in any way. They amalgamated the water into their home farm water entitlement, increasing it to 218 ML. Like the block purchased in 1992, this block was used for annuals and cropping for hay.

About the same time Dennis and Donna built a new dairy. When they bought the farm it had a five-a-side herringbone dairy. In 2002 they upgraded the dairy to a ten-a-side herringbone. The new dairy suits 200 cows. While they generally get about 26 litres per cow, depending on weather and pasture composition that can increase to 32 litres per cow. Then it takes a lot longer to milk. While they could milk more cows, they would have to be prepared to spend more time in the dairy.

In around 2003 Dennis and Donna bought another 100 ML of permanent water. They paid \$900 per ML for the water, or \$90,000. They always used more water than their allocation and they thought that they needed to secure another 100 ML. While they used to get their full irrigation allocation plus sales water, with the start of the drought they were no longer getting sales water. Later, it turned out that they were not even getting their full allocation. They also had plans to develop the recently purchased 85-hectare (211-acre) block, so that it could be irrigated, which meant they would need more water. The development was started in the mid-2000s (i.e. set up to plant 20 acres of lucerne), but stalled when the modernisation process was started. The additional 100 ML got them up to a 318-ML water entitlement, which is what they have today.

Drought

During the drought Dennis and Donna managed the reduction in irrigation water broadly in three ways: changing how they fed their cows, irrigating a reduced amount of pasture and reducing cow numbers.

Since their second year on the farm Dennis and Donna used a feed pad up until the drought. They knew that the cows needed to be fed more, hence the need to feed out. They used a feed pad to reduce wastage of the imported feed. They had old baths next to the dairy that they filled with chopped maize. While it is very popular now, back in the early 1990s 'people just thought you were crazy' for feeding chopped maize.

They then put in concrete troughs on the laneway near the dairy that they used as a feed pad. They would bring the cows in a half hour early before milking and they would feed. Then the cows would be milked and sent back out to clean up whatever was left. Having the feed pad in the laneway to the dairy 'was a mistake'. Cows would come in for milking, 'leaking milk and they're getting muddy and dirty and manure on them'.

They had always fed hay out in the paddocks and fed out fine chopped silage on the feed pad. During the drought they went away from chopping silage back to hay because of the cost. They had to buy in a lot more feed during the drought. When buying in feed, one of the things they learned was that they needed to feed test any imported feed to ensure they understood what they were getting. They couldn't afford to just guess.

As well, they changed from using a feed pad and started feeding out in the paddocks. They developed a feed regime that suited their cows and 'suited our style of farming': palm kernel and cereal hay. The cows did really well during the drought. With their feeding regime, the 'cows milked unbelievably consistently'.

Dennis and Donna used to have problems with mastitis when the feed pad got messy. When they went away from using the feed pad during the first year of the drought, Dennis and Donna tried sacrificing a paddock. They had the same problem when they tried to sacrifice a paddock. 'It just filled up full of shit'. Cows were getting mastitis and when they tried to re-sow at the end of the season, 'there was just so much stuff that you couldn't get rid of it'.

When they realised that sacrificing a paddock wasn't going to work they started thinking about how they could move the feed around the farm. They used a 6'x4' trailer to haul palm kernel and they built a trailer to go on the back of the tractor that they could just pick up with the forks. They filled the trailers up with the front end loader, picked them up with forks and took them to the paddock. They also welded mesh on the bottom of the hay rings so that they could be picked up and shifted.

They would put the cows in a paddock for a few days or a week, until ‘the paddock had had enough’ and then shift them. It worked well because all of the paddocks were dry. There was one paddock with more trees on it that they used a bit more than others because it provided some shade.

Dennis and Donna never really had a lot of surplus money during the drought to go out and buy water; so they would just use what they had the best way they could. That meant that as they were re-sowing annual pasture they often only got one or two waterings. They just ‘couldn’t afford to buy water to keep it going’.

During the drought Dennis and Donna did put ‘more effort’ into their irrigation system. They worked to improve any ‘slow spots’ to make better use of the water. When looking for alternative irrigation options Dennis and Donna looked at irrigation pods, with three inch irrigation lines, sprinklers and a pod that gets put in a paddock to water for two hours. The pod is then hooked to the bike and moved to a different spot. They ended up, during the second year of the drought, buying a travelling irrigator with big sprinklers for \$10,000. They had hoped to keep about seven paddocks (16 hectares (40 acres)) of the home farm irrigated through the drought. They stopped irrigating the other 38 hectares (94 acres) of the home farm and ran the other blocks as dryland.

They only watered at night and irrigating the seven paddocks meant they had to shift the travelling irrigator every day. They couldn’t water if it was a windy night or the irrigator would breakdown and knock them out of schedule. As soon as they missed a day or two they fell behind; they had no margin for error. The theory was good and if they’d had a couple of rain events then it ‘would have been fantastic’, but it just didn’t rain at all. In hindsight, Dennis realised that he should have watered during the day to keep the irrigator moving and he ‘probably should have cut back to five paddocks’.

During the third year of the drought Dennis and Donna decided to water four paddocks with the travelling irrigator. They irrigated two paddocks of summer pasture and put in two paddocks of sorghum for grazing. They decided to try sorghum because it was the ‘recommendation at the time as it grew more tonnage per head’. It was the first time that they grew it.

The cows liked the sorghum and ‘it was nice to see the cows in on some green feed’. However, the benefits were ‘more psychological than financial’. Also, when cows eat

sorghum they leave a fairly big stalk. Dennis and Donna had a couple of cows that stabbed their milk vein on the sorghum stalks when they went to sit down. The cows just bled to death. 'It just poured out like a tap.' That just put Dennis and Donna 'right off' growing sorghum again.

Leading up to the drought the farm was sitting at about 50% net equity, because Dennis and Donna had just bought the 85-hectare (211-acre) block across the road. During the first year of the drought they made a loss. It was the first time they had ever made a loss. They ended up having to borrow about \$30,000.

Dennis and Donna were milking 190 cows at the time. In the second year of the drought they decided that they needed to drop their cow numbers. They sold some of their cows. 'It was terrible; they were good cows.' They dropped their number back to 160.

To relieve some of the feed pressure Dennis and Donna also parked 40 or 50 cows 'down south', where they took cows to milk for the season and then sent them back. It worked for Dennis and Donna. When the cows were brought back, the people who were looking after the cows had replaced a couple of cows that had died. As well, there were no issues with diseases or anything when the cows were brought back.

Early spring calving

Dennis and Donna split-calved for about 12 years. They went back to spring calving in 2005. While this was in the middle of the drought, the drought was not the driver of changing back to spring calving. Dennis and Donna sat down and worked out all of the costs and premiums associated with split calving. They figured out that they would be better off financially going back to spring calving. The difference was due, in part, to the fact that the cows were dried off earlier for autumn calving so they had a shorter lactation and a lower overall milk production throughout the year. Changing the autumn calving cows back to spring made them more money. The shift was easy too. They just milked the autumn cows right through to the same time so they joined really well.

When they shifted back to spring calving, Dennis and Donna moved the spring calving back to the 1st of July. They did this during the drought so that they could make use of the winter pasture. This enabled them to bring in some winter milk money. It was pretty easy for them to do this because they generally calve a bit earlier compared to others anyway. While most cows calving in the spring start in August, Dennis and Donna tend to start on the 20th of July.

They just needed to come back a few weeks. They prefer to calve earlier anyway as it 'follows the natural curve of grass growth through spring and summer and the demand on the cows'. They aim to get all of the cows calved just before the peak of their spring growth.

The cows started to develop fertility problems again after they had converted back to spring calving. Dennis thinks that the problem had to do with nutrition. They had hired a nutritionist who 'was all about production'. Dennis and Donna got 8,500 litres out of cows, which was a lot for them, but they actually made less money. This was because the empty rate went up from 12-14% to 33% and then 39%. With the production focus they had them milking so hard that the cows didn't cycle. While it was nice to get the milk, it 'cost a lot to get that milk'; it wasn't profitable. The cost came out of having to use seeders to try and 'get their ovaries to kick into gear', which was 'very expensive stuff'. Dennis and Donna were not autumn calving anymore either, so that wasn't an option for the empty cows.

After the drought

Since the drought, Dennis and Donna have made some significant changes to their on-farm irrigation system. They have put in a smaller number of larger outlet gates that enable them to water more efficiently.

When deciding how to upgrade the irrigation system they looked at converting to pipes and risers. They discovered that there would really be no water savings as 'gravity fed irrigation is just as efficient'. There were some benefits from not having channels but Dennis was glad that they did not go with pipes and risers, as the electricity prices have really increased. He thinks 'running pipes and risers is going to be fairly expensive into the future'.

On the 85-hectare (211-acre) block they set up about 8 hectares (20 acres) to put in lucerne. But then modernisation of the public irrigation system started. They stopped what they were doing, never put in the lucerne because they thought the system was going to change 'anytime'. Of course, 'eight years down the track they still haven't done anything'.

Dennis and Donna's farm is 600 metres off what has been identified as the 'irrigation system backbone'. They are the third irrigator on a spur channel that has about 15 irrigators. There is a mixture of bigger and smaller farms, including hobby farms. As well, a lot of the water has been sold 'from the bottom' of the spur.

This has made it difficult for Dennis and Donna to plan for anything. They are 'in limbo land'. It doesn't matter how far off the backbone they are, all irrigators not on the backbone are 'put in the same bucket'. 'Nobody wants to buy because it's not on the backbone'. They do not know if they are 'going to have water in five years' time'. While there have been some meetings, NVIRP haven't given any information about 'whether you're going to be on the backbone or you're going to have to make other arrangements'.

While Dennis was aware of the idea of irrigator syndicates on spurs, he doesn't think it will work. All of the water that enters the spur would have to be accounted for. That means all of the irrigators on the spur would have to pay for it when an individual irrigator's channel leaked, or water evaporated or if 'someone pinches it in your syndicate'.

Because the decision has not yet been made about their spur, Dennis and Donna are still waiting for their farm to be modernised through NVIRP. They are still using Dethridge wheels at their connection to the public irrigation system. As well, because they are not on the backbone, they cannot access the on-farm water use efficiency grants. 'They wonder why we're upset.'

If on-farm water grants do eventually become available to Dennis and Donna they are not sure they would want them if it requires giving up water. They 'probably just haven't got enough to be able to hand anything back'. Even if they are just consistently milking 200 cows, they have to make efficiency gains to grow their business at about 10 per cent a year. While there might be a way to be more efficient with water use, Dennis and Donna still have to have enough water to grow the business. Also, what might be suitable for this year and next year might not be enough in five years' time.

The 54-hectare (133-acre) home farm is currently all sown to perennial pasture. This means that Dennis and Donna have a quarter of the farm under perennial pasture. The balance is under annuals and used for crops. They sowed down the home farm to perennial pasture because they are spring calving, that means they need some summer-active pasture for grazing. Dennis said that the farm is 'more flexible now' and that they can change pasture 'depending on water availability'.

Dennis and Donna have built the herd back up to 200 cows. They think that this is a good herd size for the farm. The number is 'probably too many' for the paddocks. They may tend to overgraze a bit, but that has to do with paddock size rather than cow numbers.

In recent times the level of farm debt had decreased 'a little'. It helped that Dennis and Donna were able to keep making payments through the drought. They did not have to drop back to interest-only payments like a lot of people had.

Given that, Dennis and Donna are in the process of buying 19 hectares (47 acres) from the farmer next door. There is no water with the land but there is an irrigation outlet and a half of a delivery share, which allows them to buy up to 170 ML of temporary water to irrigate it. Dennis thinks that they will probably amalgamate that irrigation outlet into the home farm and so that they can use water across both adjoining blocks.

Dennis and Donna acknowledge that it is a bit of a risk, because it, too, is not on the backbone. However, Donna laughingly stated 'it's just next door and they don't make land next door'. Having the new land will help reduce the costs of purchasing feed; however, they are not going to increase cow numbers. They currently have to agist their young stock for 18 months. With this new bit of land they will not have to agist them for as long.

They wouldn't want to bring all of the young stock back for the whole time. They send the heifers down to Colac. Managing the young stock actually takes a fair bit of work. 'There is always something that needs drenching or flies or eyes...'. Plus they have to be shifted around and to have their nutrition and growth rates monitored all of the time. If they were to bring all of the young stock back then Dennis and Donna would have to start employing someone on-farm.

While the cost of paying for agistment would probably be similar to employing someone on the farm, the idea of having an employee seems complicated. There is occupational health and safety regulation, which is a 'nightmare', and then you have to get the right person.

Dennis and Donna do not have a Sunday milker at the moment either. Their previous milker retired and they haven't looked yet for anyone else. They have been having some renovations done in the dairy which caused a bit of interruption. Now that the renovations are finished they do plan to hire another milker for Sundays and for holidays.

Dennis and Donna lost their son in an accident three years ago. At the time they had been 'thinking about moving on maybe to another farm or out of farming'. However, when they lost their son they just 'weren't ready to move'. Since then they are still here, still 'plodding on'. While there are two daughters, 'there's no crossover between the girls and the farm.'

Looking back, Dennis and Donna's son was never interested in farming either. 'No one's going to take it over.'

Farm Narrative 5: Edward and Ellen

Edward manages a 744-acre dairy farm with entitlements for 363 ML of surface water and 1114 ML of shallow groundwater. In 1949 Edward's grandfather bought the original 100-acre irrigated farm with a 260-ML water entitlement. The farm was a retention block from the Soldier Land Settlement Scheme. This means it was the block that was retained by the owner of a big parcel of land when carving up that parcel into soldier settlement blocks. As it was the retention block, the farm only had the original house (now long gone), a shed and two fences on it.

Edward's grandfather bought the farm to enable Edward's father to 'get a start' in farming. Edward's grandfather managed the dairy business and Edward's father worked on the farm up until 1978. In 1978 Edward's father purchased the farm. That same year Edward's father also purchased a 100-acre outblock with a 90-ML water entitlement. This 100-acre block was purchased for raising young stock and fodder production.

Edward was born in 1963. As long as Edward can remember, from when he was growing up and into the time that he has been managing the farm, it has been a dairy enterprise. As a youth he worked on the farm, though most of this work was unpaid. At one stage he did start to get paid for his work but then 'things got a bit tight' on the farm and he told his father not to worry about paying him.

Edward wasn't fully invested in farming at that time anyway. He was pursuing a career as a professional musician. Edward's father had turned down an opportunity to pursue his interest in music because of family 'and he regretted it all his life'. Hence, Edward's father was supportive of Edward pursuing music. Edward left fully intending to return to the farm someday.

Edward got married to Ellen in the late 1980s and they had the first of their three children in 1990. Edward had no intentions of giving up music when they started having children. He thought he could do both. But he would come home after being on the road for a couple of weeks and his children wouldn't know who he was. That changed things for Edward and he moved back to the farm with his growing family.

When Edward returned to the farm it was 'massively under-developed' and the irrigation system was in 'pretty poor' condition. There were two reasons for the farm's

underdevelopment. First, the farm had plenty of water, which meant that there was never a need, at that time, to improve the irrigation infrastructure to achieve better efficiency.

In addition to the 260 ML of surface water, plus 90 ML on the 100-acre outblock, the home farm had a shallow groundwater bore. The bore was installed to help reduce salinity and was unregulated. At some point, Edward is not sure when, his groundwater bore was regulated to 258 ML. The groundwater has always been very good quality which means it can be used for irrigation without a need for shandying and can actually be drunk out of the tap in the house.

Second, Edward's father, at 65, had 'pretty much lost interest', moved into town and semi-retired. This meant that Edward's father was facing a dilemma. The farm had been allowed to get so run down that Edward's father couldn't sell it and get the money he wanted for it unless he sold it to Edward.

Buying the farm in 1993

Shortly after returning to the farm, Edward discovered that he and his father couldn't work together very well as 'two bosses just don't go down'. Edward and his father both understood the problem and that led to Edward and Ellen buying the farm from Edward's father in 1993. At that time, the farm was 200 acres, with 350 ML of surface water and 258 ML of groundwater. Edward's father believed that Edward buying the farm (as opposed to inheriting, leasing or share farming) was important because it meant that Edward could do whatever he wanted to with it.

This ended up being a 'win-win' for Edward and his father. Edward's father received a higher sale price for the farm than he would have otherwise and Edward got the 'leg-in' he needed to enable him to get into farming. They set up a 30 year loan through a solicitor in which Edward pays a set amount each month, with a fixed amount going to principal and interest each month. This arrangement means that the principal component of Edward's debt reduces faster than in a typical loan. This also means that the implicit effective interest rate increases from the beginning to the end of the loan. This worked for Edward's father as it reduced tax losses and it worked for Edward as it enabled him to gain more equity faster.

There were floods in the local area in that first year. Edward and Ellen soon discovered that the farm was positioned and elevated in such a way the flooding was not a major issue. While the farm can get isolated, it has 'actually never flooded as such'. There are a couple of spots

where water could enter the farm but Edward has always been able to successfully fend off the water.

When Edward came back to the farm in the early 1990s, there were 110 cows being milked on a simple grass-based system, supplemented with grain and fodder as needed. With active management Edward started to pick up production on the farm very quickly. The first thing Edward did when he took over was to re-fence the home farm. He was aiming to get more stock control for better pasture utilisation. With the re-fencing he changed some of the fence lines to increase uniformity amongst the paddocks. For example, when he measured what his father described as a 'beaut paddock' he discovered it was so good because it was twice the size of the others.

Within the first year Edward doubled production on the home farm, just through managing the pasture a bit better. The bank was suitably impressed with the production increase that he had been able to achieve. This meant that when the farm next door came up for sale Edward's father was able to take a second mortgage on the home farm to enable Edward and Ellen to buy that property.

This new property was another 100 acres with 173 ML of surface water and 150 ML of groundwater. With the 100-acre home farm, 100-acre adjacent farm and 100-acre outblock, Edward generally had enough to feed the cows. Even so, he would still have to buy in some grain. Edward continued to use the 100-acre outblock for cropping and annuals for fodder production.

After Edward and Ellen bought the adjacent farm in late 1993 they also purchased an extra 110 cows. They really needed to 'get the place pumping' to start bringing in income. They had to milk out of two sheds for a little while. The adjacent farm was in worse condition than the home farm. The home farm had a five double-up dairy when Edward and Ellen took over. In 1994, they built a new dairy that enabled them to milk out of one shed. The new dairy shed was a 25 herringbone swing-over. Edward was milking 220 cows at that point and planned on getting up to 250 cows. Within a year they were milking 250 cows, which is almost the limit for that dairy. Edward has plans to increase its capacity, but hasn't done so yet.

Milking 3 times a day – early on

While Edward was able to increase grass production pretty quickly early on, he found that he was short on cow numbers to get the milk volumes he needed. In about 1995 Edward decided to go to milking three times a day to ‘crank up the intake’ of grass and increase output. People thought ‘he’s finally really lost the plot’ and that Edward and Ellen were going to go broke because it was such a big step. No one milked three times a day. Edward ‘had no doubts that the udder would drive the mouth’, meaning by milking the cows an extra time he could increase feed uptake and production. He got the results that he wanted, which was effectively to increase the stocking rate without having to buy any more cows. They were able to increase milk production by 20 per cent, going from 5,000 litres a day to 6,000 litres a day.

With the three times-a-day milking they ‘pretty much had to be absolutely spot on’ with milking eight hours apart: 4 am, mid-day and 8 pm. Edward and Ellen put on a third person to help with the third milking. The only ‘real tricky thing’ was getting relief milkers as no one wanted to milk three times a day: ‘people were just scared of it’. Ellen thinks that the hours were hard for relief milkers, because it is too early in the morning and late in the evening.

For Edward, the beauty of going to milking three times a day is that he didn’t have to change anything about the farm. There were also no risks, other than ‘going where nobody else had gone’. There were also no expenses involved initially because Edward and Ellen could contribute the extra labour themselves. Milking three times a day was good in the summer as the cows would get milked early in the morning and then they were under sprinklers in the middle of the day and would come in to be milked again when it was cooler. ‘It just seemed like an obvious thing to do’ to Edward.

Dairy cows are ‘more flexible than people think. They change routines relatively easy.’ For example, Edward and Ellen had a concert that they wanted to go to when they were milking three times a day. When they couldn’t get a relief milking they ended up just dropping a milking and going to the concert. They lost a thousand litres overnight and ‘nearly cried’. However, they decided to round them up again for an extra milking and managed to get 800 litres back that they had lost.

Edward and Ellen kept milking three times a day for about two years until the farm had the cow numbers Edward wanted and then they went back to twice-a-day milking. Switching

back to twice a day was not an issue for them, they just did it one day. There were no problems that emerged in dropping the milking.

Herd

Edward and his father have used AI and herd testing since it was introduced to the region. When Edward took over the farm the herd was predominantly cross-breeds. Edward decided to move the herd to Holsteins and he bought a herd of 110 Holsteins shortly after he and Ellen bought the adjacent farm in late 1993. Going with Holsteins was a decision he wishes he never made: 'everything's wrong with the Holstein'. The fundamental problem for Edward was that they were 'not suited to the system' that he wanted to run on his farm. Edward wants cows that are 'able to eat more grass' and he wants to be able to get them into calf within a 12 month cycle if he chooses to do so. Edward found that Holsteins are such big animals that they 'just can't eat enough in the day'. They need a far more energy-dense diet which means they need more supplementary feeding.

Edward used to breed Jersey bulls with his heifers to make calving easier, to prevent his heifers from getting injured. When he wanted to increase cow numbers on the farm he would save the calves out of heifers that had been joined to a Jersey bull. He was saving about 10 per cent of his calves in a year that would be these Jersey/Holstein crosses. However, when looking at his cows, Edward realised that the proportion of cross-breeds was much higher than the 10 per cent. He could see that he was constantly struggling to maintain his Holstein breeding, mostly through infertility.

Edward was spring calving at the time and found he needed to cull cows because of the infertility problems. Edward 'didn't want a cow driving the system': he wanted to drive the system. Even with herd testing and other active management strategies to deal with the problem, infertility was a major issue.

Edward started looking for answers but the information he was getting didn't 'stack up'. He was told that it could have to do with his AI technique. They have been following the same AI technique on his farm for 30 years and he cannot see how it has stopped working. Edward was told that nutrition was also a factor in being able to get cows in calf. Edward struggles to believe that this is the answer given the focus already on improved nutrition; 'well you're kidding me, like we've never had so much nutritional junk kicking around the place as we do now'.

Edward was also told that his infertility problem could be related to the size of the animals that were entering the herd. Edward is not convinced about this and wonders if cows are being 'over-designed'. While they calve all right as heifers, once they are put into the herd they just don't get in calf.

Edward has 'a great suspicion' that the North American genetics being used in Holsteins may not be right for Australia. North America has very different types of dairy systems, where seasonality is not an issue, and they therefore need different genetics. In the majority of places in North America the feed is carried to the cow. It is less of an issue if a cow milks for three years without calving. However, under the New Zealand processing system, with a forced seasonality, the cows are dried off because the factory shuts. Once the cows are dried off there is no restarting them unless they are in calf and there is far better fertility in New Zealand. Edward is now using Australian and New Zealand genetics for his cows.

The reality is that Edward 'isn't that into' the genetics of breeding cows and really only cares about what is going to do the job for him. 'I don't care if it's purple, got one eye or three legs, it's in. You know? As long as I can get the cups on it and it milks right, that's fine'.

Edward has started changing his herd over from Holsteins to three way crosses now. He is crossing his Holsteins with Jerseys and Montbeliarde (a French red breed). He has gone with three way crosses to keep hybrid vigour. Converting to three way crosses took some active management for the first three crosses. After the first three crosses it is possible to look at a cow and tell what breed she is stronger in and determine what breed to join her with for the next time around. Edward is fully aware that for him to be able to breed three way crosses this requires some farmers to be pure breeders out there. He knows he is 'a free rider on this one'.

Edward also found that he had some calving difficulties early on which he thinks is also down to breeding. Edward has a cousin who was checking cows three times a night and had to pull 50 per cent of his calves. Edward thinks that the focus has been on the size of the outside of the pelvis which really doesn't tell you about how big the hole is on the inside, so people have bred cows that are actually going to have calving difficulties

Edward likes to point out to geneticists that 'dairy farmers don't have calving difficulties in the Northern Territory' because, if a cow does have calving difficulties, it is culled. Because Victorian dairy farmers have the ability to milk all year around, there isn't the same cull

pressure. Edward is 'not someone that checks cows every hour or at night' so he had a 'natural culling process on that to a degree'. Edward no longer has calving difficulties.

Edward is 'a huge fan of longevity as a measure' of good breeding. A cow that lasts 12 months longer in the herd is \$1,000 that he doesn't have to put towards rearing a heifer or buying a new cow. He has heard others argue that younger cows bring in younger genetics and are therefore better. Edward has 'learnt the hard way that that's not necessarily the case. The most profitable animal is the one that stays.'

Edward sometimes buys in stock for his farm. When he does he makes sure that he knows the seller and he tends to buy locally. It is important to him to see how the cows have been treated and know the history of the herd. When he goes to a cow sale he brings a laptop and a clear idea of how much he can afford to pay for each cow. He calculates what he wants based on the cow's age and production. He believes he is the only buyer to do this and others often think he is a 'nutter'.

Drought

The prolonged drought starting in the early 2000s didn't affect Edward and Ellen's farm much to begin with, as they had sufficient water to manage. After a while though, their groundwater 'started to peter out'.

In around 2005-2006, when the surface water allocation got down to about 30 per cent, Edward and Ellen bought an 80-acre block next door. The drought was one of the reasons why they bought it. The block had access to shallow groundwater which meant that Edward and Ellen had three properties that had access to groundwater.

The new block was already developed. Edward had promised himself that he wasn't going to buy an underdeveloped property as it took significant effort over the ten years or so for him to redevelop his other blocks after purchase. This new block had 15 paddocks that were already set up and very easy to irrigate. The property was also a very good price because the owners were getting divorced.

The groundwater wasn't actually on the 80-acre block; it was on the 30-acre property across the road which had been sold at the same time by the divorcing couple. Edward had an agreement with the 30-acre block purchaser to set up an easement that allowed access to the groundwater. The two blocks were already set up to have water access, to pipe water under

the road from the 30 acres to the 80 acres. They put in an easement on an old G-MW spur channel and Edward took over the responsibility of looking after the channel. Edward used the channel to transport the groundwater to his 80-acre block.

Since that time the 30-acre property has been sold again and Edward no longer has access to the groundwater. Therefore, Edward hasn't been actively maintaining the spur channel lately, as its purpose was to access the groundwater bore.

The 80-acre block does have an irrigation outlet and, with the easement, he can access the G-MW irrigation system, which is on the backbone, to irrigate the block. Edward could see when he bought the newly subdivided block that 'ultimately it would be smart to have an easement to get back to the channel and that's proven the case now'. With the groundwater gone he can, if he chooses to, still access water for the block.

Once-a-day milking

Edward and Ellen had a family tragedy in December 2008 that impacted on their capacity to manage the farm for a few months. Their three children were involved in an automobile accident and one daughter died. The other two children were also injured. Edward broke his leg at the scene of the accident and Ellen had broken her arm in the dairy a week earlier. It was obviously quite traumatic for the family; Ellen said, 'If it wasn't so sad, it was hilarious'.

Edward and Ellen faced a dilemma in that they couldn't manage the farm on their own for a while and yet with a drop in milk prices that occurred in November and the prolonged drought, they were under pressure already. They ended up having someone look after the farm for three months.

They were concerned about having someone come in to help because they had cows that they were milking and dry stock that they were looking after. This meant there were two management needs, which 'was going to be too complex' with Edward and Ellen 'completely out of action'. They reduced their cow numbers by selling off the dry stock, which is what 'most people did at that stage' because of the drought and the drop of milk prices at that time. They also dropped back to milking once a day. With the once-a-day milking and removal of dry stock, this meant that there was only one group of animals to look after, labour was cheaper and they saved a little bit on the electricity. It was 'a much better workable system'.

Edward and Ellen stepped back from absolutely everything at that time. There was no irrigation taking place and all the feed was bought in. 'It was just ring the bloke and send another load.' After three months they went back to twice-a-day without any problem.

Changing to autumn calving and winter active annuals

By 2009 there was virtually no groundwater available. This was 'a learning curve' for Edward who said he would 'have backed groundwater over the dam in the hills any day'. Edward and all of his neighbours discovered that groundwater could be pumped dry.

Edward didn't want to buy any water and wanted to be able to spread the water over more of his pasture, when he would get the best water use efficiency out of the feed itself. Edward decided to swing the farm over to autumn calving and did an extended lactation to make the shift.

He made the change based on the concept that 'you get your best bang for your buck for water' in the spring and autumn. This meant shifting to predominantly annual pastures, though he kept some summer-active perennial pasture 'because of the shoulders', periods when the annuals are not producing enough grass before and after the cows were dry. When the cows were dry during the height of summer, Edward found that he could feed them sufficiently on the farm's dry country.

The plan was to 'give the paddocks two drinks' (i.e. water the newly sown pasture twice) to feed through the autumn. Grass that is grown in the autumn will 'sit there forever and a day, it doesn't deteriorate'. So having more of it meant there was grass there through the winter and into spring. The change did mean that there was 'a bit of a mad panic in spring, with silage and stuff'. However, Edward and Ellen then had a bit of a break because they dried off the cows over the summer period.

Shifting to more annuals had some challenges. Putting in annuals requires sowing them and given that Edward had increased the area of his annuals significantly, that was a big job. One of the dilemmas Edward faced was how to get enough sown quickly enough, given he needed at least two drinks to get the annuals to grow. There was 'no doubt' that one watering was not enough and Edward needed to have the seed out in the paddock by mid-April so he could get two waterings on. If he didn't get the timing right the seed would strike but wouldn't get enough feed going and would 'take forever to grow'. That's the 'downside' with annuals.

Edward had a hard time getting contractors to commit to coming and sowing his annual pasture. Therefore, even though he is 'not a big fan' of sowing pasture, in that first year after changing Edward bought a seeder so that he could get out and sow it himself. A cog on his seeder broke and led to a 'two week ordeal, which really absolutely whacked' him.

Two years ago he was able to get a contractor to help him sow his pasture. Edward put all of his seed in the contractor's 'you beaut big machine' and it rained so it was too wet to sow. The contractor then 'disappeared out the gateway' and Edward never saw the contractor nor the seed again. While Edward didn't get a bill for what the contractor had done, about \$5,000 worth of work, the seed that was lost was worth \$15,000. Edward thinks he learned a good lesson, as he had bought expensive seed. Even if the contractor had come back at a later date, Edward would never have been able to tell if it was his seed without serious testing. Last year Edward did some sowing himself and used two contractors, which worked pretty well.

Due to the issue with sowing time and his annuals, Edward has recently decided to change some of the annuals he has been using. He is going to stop 'messing around with shaftels' and stick with 'good old sub'. Sub-clover is a self-seeding plant that he can start in March. He can go and drill it with rye afterwards, but by that point the sub-clover is already up and running. This reduces the need to sow everything in such a small period of time.

Recent farm development

Edward was looking for ways to produce more feed with less water. However, he couldn't do the development work he wanted done on the home block to help achieve this. The ageing infrastructure really needed upgrading but the layout meant that the work needed to be done in 'serious chunks' which would have taken too much of the farm out of production at a time. Because of this barrier to making changes to his existing land Edward could 'see some advantages with buying' other blocks, so that he could then start redeveloping the home block.

In 2009-2010 Edward and Ellen bought a nearby 127-acre block with a 258-ML shallow groundwater licence. The property was set up for irrigation but did not have a surface water entitlement. On-farm irrigation efficiency grants were becoming available. Edward and Ellen then bought two more neighbouring properties in February 2010, knowing that they could apply for the grant to do any development that was needed. They were 127 and 110 acres and

were very rundown: 'absolute disasters'. Neither block had surface water but they both came with shallow groundwater licences: 258 ML and 190 ML respectively.

While the new 127-acre block was 'laid out and developed', it was covered in fat hen, a weed. He had to get rid of the fat hen and also fix up the fences. Prior to him buying it, the block had been leased out to a silage producer who had cut all of the fencing to get the machinery on the farm. Edward put a brand new channel system into this block and at the time of the interview had 80 acres 'pretty much up and going'.

Most of Edward and Ellen's farm is on the backbone of the modernised irrigation system. Some smaller areas are not on the backbone but very close to it. With the modernisation, Edward is in the process of taking out a spur channel that runs through his property and will then get connected to the backbone for the part of his property that was on that spur. He is just waiting for G-MW to 'get their act together' so he can do it.

At the time of the interview Edward was in the process of doing some irrigation development work that was funded through Round Two of the Catchment Management Authority's on-farm irrigation efficiency program. The opportunity offered by the grant came along and Edward 'grabbed it with both hands'. The work will cost Edward and Ellen a proportion of their surface water entitlement. This development work includes irrigation outlet rationalisation, laser grading, automating his irrigation system and a centre pivot.

Rationalising some irrigation outlets wasn't a big deal for Edward because he had already been connecting his channels from outlet points so that he could achieve high flow irrigation. Edward has been into high flow irrigation for a long time. He used to just use two Dethridge wheels to get the flow he wanted. Now he can achieve it with one outlet.

Edward was in the process of automating the farm. Half of it had been completed. He was keen to automate to make his job easier. Edward still has some 'bits and pieces' of the farm that need to be laser graded, including about 50% of the original home block and 60% of the block next door. These will all be completed in the current development project.

Edward was in the process of putting a centre pivot on his newest 110-acre block at the time of the interview. It was due to be installed within weeks. Deciding on the centre pivot didn't take Edward long. He had seen a lot of centre pivots and knows that 'it's about soil type, it's about automation and also about the country that you're going to put it on'. Edward decided to put in the centre pivot over a 38-hectare (93-acre) area. The soil isn't too heavy and the

land is 'a bit up hill and down dale', making it suited to a centre pivot. As well, while that block could be flood irrigated, it would end up as long strips of short bays and would be very expensive to automate.

While the centre pivot is supposed to save water, Edward is viewing it as a development opportunity. He is going to put perennial pasture under the centre pivot as it is within a kilometre of the dairy, close enough for the dairy cows to graze it.

Edward hadn't received any benefit from the changes at the time of the interview, as the irrigation season had just started for him. He expects the changes to lead to increased production of grass. Whether from there Edward can 'turn it all into money is a whole different story'.

Overall, Edward has been quite happy to give up some surface water entitlement for the irrigation development work. Edward will 'give them as much as they like at \$2,700 a ML because it's well above value.' He has no problem with selling water: 'it's just a market' and 'water's not worth owning at the moment'.

Edward said that he isn't currently relying on groundwater. It has recharged since the drought, with recent flooding. However, Edward has noticed that the EC levels have started to rise in the area. While the area has a groundwater management plan, G-MW is 'miles behind' actually enacting any sort of plan. He is also a bit concerned by what some of his neighbours are doing with groundwater. Edward said that this is a part of the reason he has been buying some of these properties.

Edward wants to 'take control of the groundwater in the region'. Increased salt levels will always be an issue if an area's groundwater is 'essentially over-pumped; it's as simple as that'. 'The pumping pretty much has to match the recharge.' Edward has pulled up his pumps for a while so that he does not end up dragging in salt from everywhere. He'd like to 'just keep this being nice good water, thank you very much'.

In addition to the irrigation upgrade Edward is focusing on putting a 'bank of feed' away for the future. He has put 1,000 ML of water into carryover so that he knows he has enough water. With the combination of the surety of water in carryover and the added 93 acres of perennial pasture under the centre pivot, Edward has decided to shift back to spring calving. Edward is back into an extended lactation to do so. When he has water, spring calving is the easiest way he can run his farm.

Edward is 'convinced that the cows can do these extended lactations' and that research has supported this. Edward is 'not scared of change' and is very comfortable with changing his calving according to how much water he has. One thing he has learned is that 'the good stuff comes when you break the rules'.

Edward acknowledged that his business exists within a volatile world market that is not very high paying. This means that for the business to survive it needs to have 'very simple systems'. If he can feed the cows by walking them to grass, that's the way he will do it. At the time of the interview the cows were on no supplements; just grass in the paddock. 'Grass is pretty easy to grow and manage' and that is how Edward prefers to feed his cows if he can.

Edward is a bit concerned about potential changes to the carryover rules that may limit how much water an irrigator can carry over. Edward said that carryover water is important to him because it 'enables me to manage my own risk in water'. He thinks that new limitations from potential changes are 'absolute madness'. However, he also acknowledges that he no longer has the time to keep arguing it. Edward said that he is 'pretty much now at that horizon point of saying, you just tell me what the rules are going to be and I'll work around them. That's what I'll be doing.' He is going to sit back and watch how a potential change to the rules affects the water market to see what this may mean for him and his farm.

Planning to step back

When Edward and Ellen first bought the farm they had 20 per cent equity in the business. Today, Edward describes the business as worth about \$3 million, with \$1 million of debt. Even through the drought he could generally always see the equity levels going up. Edward can 'keep an eye on it on a daily basis'. There was really only one year when Edward and Ellen lost money; after their children had been in the automobile accident and they had to step back production for a few months. The problem there was not the drought, but family circumstances.

Edward and Ellen are now talking about 'stepping back' from the dairy farm a bit more. Ellen wants to get out of working in the dairy. Edward and Ellen's children are not interested in the farm. Edward is not worried about that because he bought the farm himself. Edward has seen relations struggle with selling a farm because they have inherited it.

Edward and Ellen are working on a plan to back off the dairy component of the business for them and may actually end up putting someone in the dairy for the short term until they

decide what to do. They are in the process of subdividing and selling a house on one of the properties. They are dealing with some 'hiccups with the shire' which Edward expects to successfully manage in the near future. As well, there is uncertainty because of potential changes to the carryover rules. Once the house is dealt with, and carryover rules worked out, Edward is thinking about making some changes.

Edward and Ellen have built up the farm in recent times to be about 750 acres, including two outblocks, so that it could be subdivided. He is not sure what the business structure will look like but he is thinking about putting on a share farmer or two. Edward is considering turning the dairy farm into two dairy farms.

They will likely start with one share farmer, as Edward is certain that there will be a learning curve with it. He also wants to ensure that he has the farm developed and 'ready to go' before putting a share farmer on it. The share farmer will need a decent place to live and Edward knows that, for a share farmer to meet the production objectives, the farm needs to be well set up.

Farm Narrative 6: Frank

Frank manages an 897-acre dairy business with a 669-ML surface water entitlement and a 420- ML groundwater licence (though only 200 ML of the groundwater licence is useable). Frank now supplies milk to Fontera, the new owners of Bonlac Foods. Frank currently has 200 cows and at peak these days he milks 220-230 cows. Frank's father and his father's uncle bought a 150-acre property with a 170-ML water entitlement in 1967. The property was acquired by the previous owners in the soldier settlement scheme in the 1950s. At the time, Frank's father and great-uncle were share farming on a tobacco property in the broader Myrtleford area. After the dairy farm was purchased Frank's great-uncle moved to run the dairy farm for the first two years on his own and Frank's father ran the tobacco farm. However, Frank's great-uncle did not have a driver's licence which created some challenges with getting around. While the great-uncle relied on neighbours to help get around for the first two years, eventually Frank's father, along with his wife and children, moved to the farm in 1969. After this, Frank's great-uncle went back to run the tobacco farm.

Frank was three when his family moved to the dairy farm and he has lived on the farm ever since. In 1975, when Frank was nine, his father bought out the great-uncle's share of the farm. In 1977 Frank's father had a heart attack which required open heart surgery. While it was very invasive surgery, Frank's father recovered and continued to manage the farm.

The 150-acre home farm was set up as predominantly annual-based pasture with 'a bit of perennial' pasture. Frank's father had to buy in supplementary hay. Frank thinks that they were milking, at peak, about 120 cows on those 150 acres.

There was a dry period in around 1974-75 and Frank's father started looking for more water for the farm. He was able to find shallow groundwater and put in a spear point bore. The bore water is 'not the best water' with salt at about 2300 parts per million and is meant to be shandied. Even so, during that drought year they didn't shandy it. Frank has a 200-ML groundwater entitlement with the bore and continues to use it. In the 1970s, Frank's father also put in a recycle dam to conserve any runoff to be reused on the farm.

As children, Frank and his two siblings worked on the farm. Frank's older brother used to help during the school holidays but when he turned 18 he went to university and, while he does come to visit, he hasn't been back to work on the farm. Frank's younger brother left school when he was 17 or 18 and came to work on the farm. He was on the farm until four

years ago. Frank left school at the end of 1981 and has worked on the farm ever since. It is the only job Frank has ever had. For a number of years Frank's parents, as well as Frank and his younger brother, all had input into running the dairy business.

Expanding and modernising in the 1980s

In 1982 the 110-acre block next door came up for sale, including 171 ML of water. As Frank had just left school to work on the farm, Frank's father decided to purchase the block so that they could increase the farm size and milk more cows. Frank's family bought the block from the bank, as the previous owner had gone bankrupt. They bought the block for \$115,000 and, when borrowing the money from the bank, they borrowed \$5,000 to \$10,000 more than the purchase price because the block needed considerable work.

As the new block was configured Frank and his father 'couldn't milk cows on it'. The previous owner had ploughed up most of the block for crops. There was very limited fencing and there were 'only three or four paddocks up the top that were still so-called pasture'. This meant when Frank's family took over the block it was very run down: 'there was nothing there'.

Frank and his father immediately got to work redeveloping the new block so that it better suited their needs. Laser grading was 'starting to get popular' so they started the redevelopment by laser grading 55 acres, half of the new block, in late 1982 to early 1983. They set up these 55 acres as more pasture for the cows, with 'mostly perennials' and 'a little bit of annuals'.

Frank and his father had actually already started laser grading the home block (original farm) just prior to purchasing the new block. They laser graded the first paddock on the home block in 1981. By 1991, about 90 per cent of the farm had been laser graded and at the time of the interview all of it had been done.

It was all a part of a plan to 'modernise' the farm with wider bays that would enable easier management of irrigation and use less water. For example, on one 13-acre part of the farm Frank and his father were able to change the bays so that there are now 10 where there used to be about 50. After laser grading irrigation 'has definitely been faster and easier'.

Through the 1980s the farm increased to 200 acres of perennial pasture. The farm business regularly got 200 per cent of their water right and could ask for more from the water bailiff if

they ran out. Even so, they were concerned about wasting water on the new 110-acre property and put in another recycle dam so that 'instead of sending it down the drain you'd pick it up and use it again'.

When Frank's father and uncle bought the farm in 1967 it had a six unit walk-through dairy. In 1977, after Frank's father had a heart attack, he made an eight double-up herringbone. In 1986 Frank and his father were milking more cows and thought 'we've got to do something'. 'Bigger dairies and faster milking'; it was what others were doing so Frank and his father decided to put in an 18-a-side swingover. Today they still use this 18-a side- dairy.

With the addition of the block next door the farm was 260 acres with entitlements for 341 ML of surface water and 200 ML of groundwater. Buying the second property 'made a huge difference' for the farm business. While Frank and his father still had to purchase feed, they did not have to buy in as much. As well, having the second block meant their need to agist young stock was reduced.

Reducing agistment was important for Frank and his family. One benefit of reducing the need to agist stock for Frank is that 'you're adding value to yourself so to speak; you're not paying anybody else'.

Sometimes it could be hard to find agistment when it was needed and 'you've got to be lucky and find a decent bloke'. Frank's family did occasionally have problems with agistment. It was sometimes hard for Frank or his father to get over to have a look at the stock on agistment. They have had circumstances where the farmer didn't look after the agisted stock as well as expected and the stock ended up 'skinny' because the farmer would just 'lock them in a paddock and forget about them'. To prevent problems Frank agists locally so that he can monitor the stock. Frank had his calves and two-year-olds on agistment this year because the farm had been flooded. Even so, while he knew the person he was agisting with, he still ended up 'very disappointed' because the stock condition had declined.

The outlook

In 1991 Frank's younger brother finished school and returned to work on the farm. Frank and his father were milking around 200 cows at the time. Given there were to be three people working on the farm they decided to buy another property to continue to increase the size of the business.

They bought a 637-acre outblock, 20 kilometres away, with a 405-ML surface water entitlement. The outblock was a cropping/sheep farm and was run down, requiring some work. The price was 'cheap' because of the farm's condition. Frank's family had to redevelop the outblock so that they could use it for fodder production and running dry/young stock. Being able to run stock on the outblock helped reduce the need for agistment even further, which was useful to Frank and his family.

One of the first tasks in redeveloping the outblock was to put up fencing as the outblock was actually just split in two with a road dividing the property. There were about 460 acres on one side of the road and 180 acres on the other. Before putting the fencing up, getting around the property was very easy. Once he set the block up into paddocks it meant he had to go in and out of paddocks to move around the block. Even so, putting in the fencing was important for stock management.

The 180-acre section of the outblock was a 'forest' of tussocks and rushes. There was a depression that ran through that section of the property and the previous owner had 'opened up the wheel' on the irrigation system so that the area was full of marsh grasses. Frank had to call in the fire brigade to burn it all before they could redevelop that section.

In the first year after buying the outblock Frank and his family laser graded 100 acres. Today two-thirds or more is laser graded. Frank and his family have invested considerable resources over the recent farm history on improving the outblock.

When the outblock was first developed in 1991 and onward, Frank and his family put in 50 acres of perennial pasture for the heifers they planned to run on the property. They used to have 70-90 beef cattle on the outblock as well, because they had enough land to carry the extra stock at the time. Frank 'would never' get into beef seriously, however, as he doesn't think it's 'financially worth getting rid of the cows and going to beef in this area'.

Much of the outblock has been used for fodder production. At the time of the interview Frank had 400 acres of hay 'ready to cut'. Frank has also grown oats and wheat. Frank brings the fodder from the outblock home to the dairy farm to feed to his cows.

About 150 acres of the outblock are unable to be irrigated. While there is still more that Frank hasn't developed on the outblock overall, that 150 acres he 'definitely won't touch because it's undulating and very sandy loam'. He used to use the 150 acres for cropping. At the time of the interview it was 'just whatever's there': 'natural grass'. He now uses that land for stock

over the winter. That land is good in the wet, doesn't get bogged, and Frank can feed out hay to the stock in those paddocks.

Adding the extra labour unit (with Frank's brother's return) and the purchase of the outblock enabled Frank and his family to increase the herd size so that they were milking upward to 260 cows.

Cows: calving, breeding and fertility

In the 1980s Frank and his father spring calved, though the cows didn't all calve in one month. As the calving was stretched out, Frank and his father preferred to keep milking each cow until the cow was ready to be dried off prior to calving. While this approach was preferable for Frank and his father, when the weather over winter was really wet it didn't work as well.

Frank's farm didn't cope very well with really wet winters. Frank remembers in the 1980s putting cows into paddocks during wet winters in order to feed them out hay. The cows would end up pushing all of the hay down into the mud underfoot: 'in a day or two the paddock is brown' and in the spring they would end up with no pasture. As well, the wet winters were not good for the cows. The cows would get mastitis because they would be 'lying in the wet all the time'.

The 260-acre dairy block is a pretty consistent 'loamy type' soil. Frank wouldn't describe it as heavy; nor would he describe it as sandy. Frank thinks that part of the issue with wet winters was that they had predominately perennial pasture. This meant that, after watering all through the summer, it didn't take much for the paddocks to become saturated in the winter.

When the paddocks got wet on the farm Frank and his father would have to move the cows to a check bank and feed them hay. This meant that they had to walk the cows on the road to get them to a drainage channel. They then had to drive on the drainage channel to put hay up against a fence or on the channel bank.

In the past, some winters would be very wet and in the late 1980s it was 'shocking' it was so wet. In those really wet years Frank and his father would dry off all of the cows at one time and take a month off.

Once they bought the outblock they had another option for the wet winters. The outblock has some dry blocks, where they run the dry stock, which are the parts of the outblock that cannot be irrigated either. The 'very sandy and slopey land' of the dry blocks is ideal for wet weather. The cows can go in there, don't bog up the pasture and 'live comfortably' through the wet.

Frank hasn't had as many problems with the wet weather in recent times. There was recently a wet week and he kept the cows on an old channel bank for a week where it was drier. As well, Frank has changed his pasture mix in recent times so that the dairy farm is mostly annuals and can handle a lot more water over the winter.

When Frank and his family bought the outblock in 1991 they started split calving. They did it to increase cash flow over the winter to help with their loan repayments for the new property. The winter milk that comes with split calving helps with the cash flow because the factories pay more per litre in the winter. Since then they have practiced split calving 'on and off' over the years.

Frank is a bit uncertain about the split calving, as he doesn't really like having a lot of fresh cows over the winter. Frank imagines that 'there'd be some blokes that had never been here in the '80s when it was wet' who are autumn calving. Over the last three or four years Frank has been split calving again. He is doing it because of fertility issues. If wet winters start to become a problem again for Frank, he may have to look again at his split calving.

When Frank came to work full-time on the farm the herd consisted of some cross-breeds but mainly Friesians. Frank completed his AI certificate in 1984 and has generally focused on maintaining a Friesian herd since then. Even so, he does get the odd 'black and cross-bred looking cow' in the herd.

According to Frank, dairy farmers started converting to Friesians when the factories started paying for protein. He is not sure when that was, exactly. The factories told dairy farmers that Friesians are the 'best for protein'. When that happened farmers got out of using Jerseys. Frank hasn't ever used Jersey semen on the farm. However, Frank's fiancée used to work at a Jersey stud and has been given a couple of calves. This means that Frank now has two Jerseys on the farm.

Frank had an increasing problem getting his Friesian cows in calf. He remembers when 'you had one or two empty cows and you used to think "shit, that's no good"'. Now you get 30 per

cent and you think "not too bad".' Because he was ending up with so many empty cows he would end up trying to get them in calf in the autumn and sometimes again the next spring. 'Some cows you end up cutting their heads off.'

Three or four years ago Frank decided to try a different breed because of the farm's fertility problems. He got five Swedish Red heifers. However, Frank was a bit concerned by the idea of going 'down that path of cross-breeds' as it would drop the value of his herd. The Friesian cow is worth more than any other breed.

The person that Frank bought the Swedish Reds from also had Scandinavian Friesians that have good records and are 'bred for health and fertility'. Frank decided to start using the Scandinavian Friesian semen to help improve fertility while maintaining a Friesian herd. He didn't have to change anything else about his farm system to change his herd genetics, only his semen supplier. The first Scandinavian Friesian heifers had recently started in the dairy at the time of the interview.

Installing a spear point bore

When Frank and his family first bought the outblock they amalgamated the water entitlement with the 260-acre dairy property. They used more of the water on the dairy block at that time, because there was 'just nothing' on the outblock and it wasn't laid out to irrigate.

Since then they have developed the outblock so that now the 405 ML of water that came with it is not enough to irrigate it fully. They put in a recycle dam to capture any excess water for reuse on the outblock. Also, in 2001-2002 Frank and his family put in a spear point groundwater bore to provide more irrigation water for the outblock.

The spear point bore was put in through a government scheme and cost Frank about \$20,000 at the time. Frank had a pump licence for 220 ML a year with the bore. When it was put in Frank was told that he could expect 'nearly rain quality' water at a rate of about 4.5 ML a day for three days continuous pumping before the shallow groundwater should need to recharge. It turned out that the groundwater was recharged by the farm across the road and when that farm stopped irrigating the bore went dry. That farm has since shut down completely. Now the bore is only really good for filling the dam. This is because it does not pump a high volume of water and, therefore, the pumping costs for what he gets are high.

Drought

Up until the mid-2000s, Frank and his family got up to milking 250-60 cows. That was the right number for the farm business given the farm's number of labour units. The next door neighbour wanted to sell Frank and his family some land but Frank and his family turned it down. They did occasionally hire help, but only when they were going away or, in more recent times, if they were busy with hay making.

There was a drought over a number of years which really started affecting Frank's farm in 2007. There were at least three years that were 'definitely bugged', from 2007 through 2009. Frank recalls looking at the weather forecast while he was overseas in 2007. There was no water in the dams, it was very dry and he came back to Australia to find there was 'nothing there': no feed. 'August was just shocking' and Frank sold 110 head of stock in a week. That meant his overall stock numbers dropped from around 400 to 290.

He sold the steers and yearling beef cattle that he was carrying on the outblock. The steers 'weren't good enough' and the yearlings weren't ready but he sent them to the cattle sales anyway. Frank sold empty cows. As well, in May Frank had bought 50 cows in calf. He thought that 'everybody's going to sell their cows soon and the price is going to drop' so he sold 42 young cows. It was hard and he pulled out eight or ten that he 'just couldn't sell'. After selling the cows the milking herd dropped down to 220 from about 260.

The decision to sell the 110 head of stock ended up working well for Frank and his family. Afterwards, Frank's brother was pushing to sell more cows but Frank decided to wait and see what would happen. They started buying more hay and found that the cows 'milked unbelievably on cereal hay'. The cows continued to milk well through the drought.

In 2008 Frank's younger brother decided to leave the farm. This turned the farm into a predominantly one-man operation as their father was elderly. Frank was able to keep the farm going only because the drought meant that there was less to do. 'The drought was lucky' from that perspective, otherwise it would have been 'impossible' to manage the farm on his own. Frank's mother helped a little, Frank was able to hire someone to help for a couple of months and Frank had someone come and help milk for a little while.

One of the things Frank did after his brother left was spend \$40,000 to put in new cattle yards on the outblock. Frank uses the cattle yards for loading/unloading cattle and when he rounds

up and treats the stock. The old cattle yards could be easily pushed over if the cattle became restive and it became more difficult to manage for Frank with his brother gone.

During the drought Frank made significant changes to the feeding system so he could get by with less water. On the dairy farm Frank dried off pasture. He ended up with about 25 acres of perennial pasture where he focused the watering. The cows would get a 'strip of grass' and some hay during the day and at night they would only have hay.

The irrigated portion of the outblock was predominately annual pasture, such as clover, with some cropping prior to the drought. During the drought years Frank put crops back into the entire irrigated block because they could grow more with less water. He had to feed out hay to his stock.

The drought coincided with changes in milk prices, which affected what Frank paid for hay. In 2007 milk prices went up by 30 to 40 per cent. Because the price for milk was good the demand for hay sent prices up to \$330 a tonne for cereal hay. Frank pre-bought hay for 2008 from a supplier and then the milk price dropped back by 30 to 40 per cent. Frank was 'stuck' as the price for hay dropped when the milk price dropped. The person Frank pre-purchased the hay from treated him fairly and, while he didn't drop the price Frank had committed to for the hay, he did allow Frank to pay for the hay when he could.

While the drought was very difficult, Frank acknowledges that they financially came out of it as they went into it, with no farm debt. Frank also pointed out, that 'no wages were taken out' through the drought. Frank's farm did get through the drought, which was better than 'a lot of people'. To this day Frank still has no farm debt.

Post drought

Since the drought Frank has a more annual-based feeding system. Much of the irrigated portion of the outblock is back into annuals and he still only has 25 acres of perennial pasture on the dairy property. Most of the dairy farm is now annuals, with a small amount of millet.

While access to water has improved, Frank has seen that he can make a similar amount of milk from an annuals-based feeding system as he did previously from a perennial pasture-based system. As well, Frank finds the way his feeding system is set up now to be easier. He used to have to water 200 acres of perennial pasture every seven days through the summer.

This is now unnecessary. He now makes silage and hay in the spring to feed to the cows later. He then starts up again in the autumn for a new season of fodder production.

Frank's father was unwell for a long time. A second heart attack in 1988 followed the one he had in 1977. The 1988 heart attack damaged the heart muscle and while he 'wasn't too bad' he very slowly declined through the years. Frank didn't want to seem as though he was pushing his father aside as Frank took on more management of the farm business over the years. Frank and his brother still included their father in the farm as much as possible. Frank thinks that probably kept their father alive an extra 10 years. Frank's father passed away in 2010.

With the death of Frank's father there was not any major conflict over the farm. In the 1990s Frank's eldest brother was helped financially to set up a business and Frank's father had already talked to the brother about the farm going to Frank and his other brother, who were working on the farm. Frank said that they were going to sell the farm but he has now decided that he is going to stay. He is in the process of working out 'what everything's worth' so that he can see what he may have to do to pay his younger brother out.

Frank is engaged to a European woman with the wedding planned for eight months' time. He met his fiancée when she came to Australia to work on a neighbouring farm as a part of an international exchange. After travelling back and forth to Europe to work and study to become a veterinarian, Frank's fiancée has been living locally for two-and-a-half years. Travel to Europe to visit with his fiancée's family has become a regular part of Frank's life. Frank has spent three weeks each winter over the past three years in Europe. The hardest thing for Frank is to get someone to look after the farm for several weeks. While it is hard, Frank knows it is one of those 'things you've got to do'.

Frank's and his fiancée's focus now is finding ways to make running the farm easier. For example, Frank bought a new baler two weeks before the interview. Frank was able to do 90 bales of silage in just over two hours, 'and stress-free'. With the old baler it would have taken him 'most of the day with a lot of stress'.

During the drought Frank dropped milking cow numbers to about 220. He thinks that he will stick to that as it is enough at the moment. Frank and his fiancée spend about six to seven hours a day in the dairy at the moment, which is too long. Frank needs to build a new dairy so that they can reduce milking time. Frank had talked to someone about a 16-a-side rapid exit

dairy in which one person can milk 200-220 cows in an hour-and-a-half. It will cost \$400,000 – 500,000. When Frank can afford it, that is the next thing he will be getting. He would have to get a loan. Until then, having 220 cows is enough.

Changing irrigation

Frank's farm is entirely channel-based flood irrigated. The original 150-acre home block is on the backbone. The other 110-acre portion of the dairy property is on a spur. However, a neighbour is 'being real friendly' and allowing Frank to go through his property to connect to the backbone.

NVIRP wants to get rid of the spurs on the irrigation system as a part of an irrigation modernisation program. As well, there are government incentives (round two) for water-use efficiency upgrades. Frank has put these two things together to redevelop his dairy property.

Frank is going to remove four waterwheels, pipe the water to his property and convert the whole dairy property to a pipes and risers irrigation system. Frank has decided to convert to pipes and risers because it will be more water-use efficient and it will make irrigating easier. An important part of the upgrade for Frank is to automate his irrigation system. This will enable Frank to irrigate his dairy farm via a computer in his house.

With pipes and risers there will be costs associated with pumping that he does not have to worry about at the moment. However, he thinks that the benefits are going to 'far outweigh the costs'. Overall, the farm will be set up and run better. Also, 'what price do you put on sleeping instead of running around in the middle of the night'? Frank doesn't think that he will change his feeding system once he gets the automated pipes and risers system installed.

Frank is expecting that the pipes and risers should start going in the ground in a couple of months. The project needs to be complete by March 2014. The overall costs will be over \$500,000 and Frank is anticipating that most of the costs will be covered by the incentive and modernisation programs. In exchange Frank has to give up some of the water that is expected to be saved.

Frank is 'quite happily giving them water to get what we're getting'. He is getting \$500,000 worth of work done for an amount of water that is currently worth under \$100,000. If Frank runs out of water he can buy temporary water and, if the price of permanent water drops, he

could look at buying some permanent water. While in the drought it was useful to Frank to have a bigger water entitlement, the reality was 'you didn't get all your water anyway'.

When going through the planning process to set up his dairy farm for pipes and risers it was recommended that Frank make changes to the farm layout to reduce the amount of piping he would have to install. This included about \$150,000 worth of laser grading and meant that he was going to have to plough up the whole farm. Frank decided that he could buy a lot of plastic piping for \$150,000. He then told the surveyor to draw the farm as it was with the exception of a small area next to the dairy, the bull paddock, which needed cleaning up and laser grading anyway. It ended up 'cheap' in comparison.

Frank is in the process of putting in an application for round three of the on-farm efficiency incentive program to enable him to redevelop the outblock. He wants to do something similar to what he has done with the dairy property in combining the funding from the incentive and modernisation programs to install pipes and risers and automation. Frank doesn't think it makes a difference if a farmer is on the backbone or not. G-MW wants to connect everyone to the backbone and they are going to have to negotiate with each farmer to come up with agreements.

The outblock has two irrigation outlets on the backbone and two irrigation outlets on a spur. He is going to remove a couple of the outlets and pipe the 300-400 metres back to connect to the backbone. As well, a neighbour has said that he will let Frank put a pumping station on the neighbour's property because that will be cheaper for Frank than having to bring the power lines onto his property.

The redevelopment work for the outblock would be to put in pipes and risers and automate the system. It would mean that he could sit at his home, 20 kilometres away and irrigate his property. When Frank heard that, he thought 'Sweet. Mate, let's do it'. Frank will have to give up more water with that project because it is a bigger property with about 400 acres of irrigation.

Frank has asked the surveyors to leave the outblock configuration as it is as two separate blocks (460 and 180 acres), which would be set up with two pumps. Frank learned from the design experience on the dairy block. He told the surveyors to design it so that the pipes are just put where the channels are currently. If the application for the round three incentive

doesn't get accepted then Frank plans on trying again. He has heard that very few miss out and 'you're fairly certain of getting it at some stage'.

Farm Narrative 7: Geoff

Geoff manages an irrigated cropping farm on 500 acres of owned and share-cropped or leased land. He has 322 ML of irrigation water. He recently converted from dairy farming. In the mid-1960s Geoff's parents bought an 80-acre dairy farm with 150 ML of irrigation water. Geoff's father milked 75 cows on the 80 acres and carried about 30 young stock (i.e. 12 months old or 18 months old).

When Geoff's parents first moved to the farm they had two young children. In the years following the move they had two more children. Overall, Geoff's parents had two boys and two girls with Geoff as the youngest son. Geoff and his brother Gary, who had been working off-farm, came home to work on the farm in the early 1980s. At that time the family set up the farm business as a partnership involving the two sons and the parents with each son running a portion of the farm. Some aspects of the business were shared.

When the partnership was set up the family 'wanted to go medium large'. They bought a 122-acre dairy farm with 150 ML of water several kilometres away. It was identified as Gary's block. The original 80-acre farm was identified as Geoff's block.

Gary's farm was 'very run down' when it was purchased. Geoff thinks that the previous owner 'hadn't done any work on it' for 20 years or more. This meant that there was a considerable amount of maintenance that needed to be done. Over about ten years the partnership re-fenced, gravelled laneways, put in pipes and new irrigation outlets and built up the channel banks to 'catch the farm up'.

Feeding system

Both Gary's and Geoff's blocks were set up as perennial pasture for grazing. The previous owner of Gary's block had been leasing 120 acres nearby with 115 ML of water. Geoff and Gary had an option to continue leasing it. The previous owner said that 'it would pay to lease it because then you can milk, push the farm to its limits'. Geoff and Gary ended up leasing the block. On the leased block, Geoff and Gary grew annual rye grass and clovers that they predominantly cut for hay. The leased block was also used for young stock and occasionally for grazing dairy cows.

All three properties were irrigated. Geoff and Gary were able to amalgamate the water entitlement on the 122 and 80-acre properties so that they could use the water wherever it was

needed across the two properties. The leased block was on a separate title and could not be amalgamated. Having enough irrigation water wasn't an issue 'because at that time there was plenty of water around'.

Early on Geoff and Gary were baling their own hay 'rather than pay hay carters'. After a couple of years they'd 'had enough of it'. They didn't enjoy putting together the square bales. As well, feeding it out to the cows was difficult. It required two people to feed it out safely as doing it by yourself 'was a bit dangerous' (i.e. it required jumping in and out of a slow moving tractor).

They decided to convert from square to round bales. They bought their own round baler and a bigger tractor and have 'probably done about a thousand bales a year or close to it' since. They were able to make the round bales more easily. A major benefit of round bales is that a single person can feed them out in the paddock, they are 'a lot easier to handle'. The downside of round bales is that Geoff and Gary found that they were using more hay. This is because they could measure out the amount being fed to the cows more exactly with the square bales as compared to the round bales.

Geoff and Gary used only hay for their supplementary feeding. They were not 'feeding in the bale', which meant they were not feeding pellets or grain in the dairy. To supplement what they produced on the farm and leased block, Geoff and Gary bought hay from a 60-acre paddock across the road from Geoff's block. Supplementary feed was shared across both Geoff's and Gary's farms and shifted around to where it was needed. Geoff thinks that most of the time they had 'plenty of hay'. He remembers two occasions where they had bought hay from a neighbour of Gary's; other than this, their typical sources were sufficient. Over all during the 1980s Geoff thinks that they bought in about 20 per cent of their hay. When looking back, Geoff thinks that they probably could have grown more grass themselves if they had used urea to make the grass grow quicker.

In the late 1980s the partnership bought a 110-acre block 'down the road' from Geoff's farm. They bought it for use as an outblock. Three quarters of it was perennial pasture and the rest was in annual rye grasses and cereals that were grown as winter crops.

A few years after buying the 110 acres, the partnership bought the 130-acre farm next door to Geoff's farm, with a 120-ML water entitlement. They bought it to increase the farm size. Geoff thinks he 'was still young and silly and wanted to enlarge'. They used it for a mix of

permanent and annual pasture. The new block needed a bit of laser grading. Geoff did this as well as laser grading about 30 acres 'down the back' of the 80-acre block.

Cows

When they bought Gary's block the farm was milking 90 cows. Geoff and Gary got up to a peak of milking 130 cows on that property. Geoff and Gary also got up to milking 130 cows on the home block. This meant that the business was milking 260 altogether.

Each property had its own dairy, enabling Geoff and Gary to milk separately. Gary had just recently married so they decided that Geoff's dairy would be used for the more challenging cows. The family used to 'break in' the younger heifers in Geoff's dairy. Breaking in the young heifers (i.e. getting them used to the process of milking) was a challenge because it required two people to do it. Geoff and his father did this while Gary milked the older cows on his block. As well, if Gary had a cow that was 'hard to handle' it was sent to Geoff's farm. Having two dairies made it 'easier' in this regard.

Gary's dairy was 'pretty basic' and when the partnership was dissolved Gary built a new dairy on his farm. The dairy on Geoff's farm was structurally in good condition and had been altered four times. They extended the yard out so that it could hold close to 200 cows so that they could milk a lot of cows. Geoff found that he 'wasn't really driven to milk a lot of cows'.

Breeding

When the partnership was established the home farm was milking Jerseys. Gary's farm was milking Friesians at the time of purchase. Geoff's father had a look at the records and said that the Jerseys, while higher in protein, were 'way behind the Friesians' in milk volume. Geoff didn't like Jerseys because he found them to be temperamental. Within a year of starting the partnership, they 'decided to go Friesian'.

To convert the Jersey herd to Friesians they started putting Friesian bulls over the Jersey cows. The first cross went well, as it was a good mixture. After that they did have some calving problems because they started getting little Jersey cows having big Friesian calves. When a cow's calf was too big it could sometimes lead to nerve damage in the hips and paralysis. If this happened then the cow would have to be put down. Geoff and Gary were losing anywhere from four to ten cows a year because of this.

To manage that problem Geoff and Gary bought Friesian bulls with smaller frames ‘just to try and eliminate paralysis and calving problems’. Gary had also started using AI and was selecting for smaller frames there as well. This led to the cows on both Gary and Geoff’s farms being smaller-framed Friesians. This was so all the way up until Geoff sold the cows last year.

Geoff and Gary ran their breeding programs separately. Gary went to an AI course in the early 1980s and developed an interest in using the practice. According to Geoff, Gary ‘enjoyed mucking around, catching cows’ for AI. Gary kept records of his AI breeding.

Geoff was not interested in AI. He ‘thought it was too time-consuming and costly’. Geoff used bulls. His priority was to ensure that he was ‘buying good bulls off purebred breeders’. Geoff didn’t keep any records of his breeding, he wasn’t interested in that side of the business.

As they were running separate breeding programs, Geoff and Gary had different coloured ear tags. Geoff’s farm had yellow ear tags and Gary’s had orange (the colour the previous owner used). Keeping track of the cows in such a way was important for Gary’s AI program. For example, if a cow calved an AI heifer then Gary would put an orange ear tag on the heifer. As well, it was important for managing drying off.

In the mid-to-late 1980s Geoff and Gary changed to freeze-branding. They were finding identification of cows difficult because ear tags were dropping out. A couple of times Geoff and Gary retagged the whole herd but the tags still broke because the cows stick their heads through fences. Changing to freeze-branding was good because it enabled Geoff and Gary to keep better track of their cows for joining and calving.

Geoff also freeze-branded his bulls with a code that included the year he bought them. This was because he found that he was losing track of how old his bulls were. Once the bulls reached two years old they used to lose their ear tags. Freeze-branding the bulls in this way has worked well for Geoff and is the only way that he tracks the breeding.

Partnership ended 1996

In 1996 the partnership was dissolved. Geoff and his wife Gini took over the home farm as their farm business. Gary and his wife took over the other farm as a separate business. Their parents retired. Geoff's parents wanted the partnership 'to just last and last and last', to keep going after they retired. However, it 'wasn't planned as such'. Geoff thinks that it would have been better to have a clear plan with deadlines for when the partnership would be discussed again. While Geoff's parents kept saying that they were going to retire and travel, they kept postponing it.

Geoff and Gini wanted to get out on their own and run their farm as they wanted to. While it 'went a little bit sour' when they dissolved the partnership, Geoff thinks his brother is happy with how things turned out.

Geoff's father had a view that 'there's no off-the-farm time'. Even during the winter, when they dried off the cows and cut back to one dairy Geoff found they were not getting the time off that he wanted. They had a roster for milking, as they were only milking 40-50 cows over that season which meant that they only needed one person to milk. This meant that they could have a sleep in for a week or have a weekend off. But often 'that didn't happen'. When the partnership was dissolved, Geoff put a lot of effort in setting up his farm so that he could get more time away from the farm as he has 'never had a lot of time off'. Since he left school he had worked on the farm seven days a week.

After the partnership dissolved Geoff ended up with the 80-acre home block plus the 130-acre block next door. He had a total of 322 ML of irrigation water. The home block was all perennial pasture. The 130-acre block had about 80-acres of permanent pasture and the balance in annuals and cereals for supplementary feeding. Overall, he had 160 acres of perennial pasture and 50 acres of annuals/crops.

Geoff and his brother split the cows in half. At the time they had been milking around 120 cows each, so they ended up with 120 cows each. Geoff thought that he would like to increase his herd so he could milk 150 cows. However, he got to 145 and found that it was too hard by himself. He was spending too much time in the dairy. As well, he was 'always behind'. If he was a day late in watering then he would be behind in feed. He found that he was just 'pushing it too hard'. He decided that milking 130 cows by himself was enough.

Geoff's view on farming was 'keep it basic and simple and you'll keep doing it'. He 'didn't have a big interest in cows': he didn't name them and keeping track of them just wasn't his thing. Geoff stuck to using bulls in his breeding. He started pregnancy testing his cows. He would write the date down that he put the bull in and write down when he took the bull out. About eight to ten weeks later he would pregnancy test the whole herd. Ending up with a heifer calf 'was a bonus'.

Geoff said that he would rather find a dead cow in the paddock than a sick cow which was going to require hours of his time looking after it. It was time wasting. When he'd find a cow on the ground with paralysis he 'couldn't tolerate it' and would have it shot. Geoff did leave a cow once that went down with paralysis because she was crawling round on her knees to eat and drink. Three weeks later she got up, 'basically fixed herself up just with time'. Generally, however, Geoff 'didn't have time for' paralysis cows.

Split calving

The first year that Geoff and Gini took over the farm on their own Geoff pregnancy tested his cows and discovered that 24 (20 per cent) of his 120 cows were not in calf. This was unusual as over the years, regardless of what he did, the fertility rate for Geoff's cows was 11.5-12 per cent. Normally, he would have sold them, but he couldn't sell 24 cows as it would have been 'a bit of a hole' in his herd and the cows were milking well. Geoff put a bull in with them and 22 got in calf. From that point on Geoff followed a split calving pattern when empty cows would be calved for autumn.

Geoff found that the number of cows that calved in the autumn increased by one to two cows a year so that by the time he sold his herd in 2011 he was calving about 35 cows in the autumn. This wasn't ideal, as the only reason he was calving in the autumn was to give the cows 'a second chance to stay in the herd'. Geoff found autumn calving 'draining and tiring' because 'there was no end; you're constantly on the go and milking cows - you've got to be there every day'.

Feeding in the bail (2006)

In 2006 the drought 'sort of pushed' Geoff into feeding in the bail. Gary had started doing it a couple of years earlier on his farm. Geoff thinks that it is cheaper to grow feed in the paddocks and prefers to grow feed for his cows. However, the drought made it 'harder to

grow feed' and Geoff found that with feeding in the bail the cows 'stayed full and they'd milk a bit better, but it was extra cost'.

Geoff was having problems with his 'cows not cleaning properly and not cycling'. A nutritionist advised Geoff to start lead feeding his cows (feeding as the cow approaches calving) at an estimated cost of \$2 extra per day per cow. After a couple of years Geoff decided to give it a try.

When lead feeding, about two weeks before calving Geoff put the cows in a one-acre calving paddock and gave them pellets that get 'the enzymes in their guts going and also helps with retention, cleaning' out the cows after calving. Geoff was hoping that the lead feeding would 'give them energy so there's less chance of them going down with milk fever' and reduce the lag time in milk production after calving.

Geoff 'had a really good year that year' when calving 110 cows. His cows cleaned really well and the typical two-week lag to pick up milk production was reduced. He was really excited and thought 'this is great, I'm going down the right track'. However, when he later pregnancy tested his cows he still had 15 cows that were not in calf. He had expected that he would only have four or five empty cows.

The next year Geoff followed lead feeding again, however he didn't use the lead feed product. Geoff thinks that the extra cost of the lead feed product wasn't worth it. He 'just used pellets out of the silo'. It did help on the feed side in getting the cows' bellies ready for the dairy. It was less of a shock than going straight from 'just a straight hay diet to green feed pellets diet, which is a big change'. Geoff kept feeding pellets in the lead up to calving up until he sold off the cows in 2011.

Lucerne

In the past Geoff always had plenty of water for his farm. He used to get 100 per cent of his water right plus 100 per cent in sales water. That meant irrigators could start the irrigation season earlier to 'try and get the growing'. The first dry year for Geoff was around 1997, when G-MW cut back on sales water so that he could only get 50 per cent in sales. 'After that it just slowly got drier and drier.'

Leading into the drought in the 2000s Geoff had mostly perennial pasture and about 50 acres of annuals. He also regularly bought in supplementary feed. His first response to the drought

was to dry off 30 acres of perennial pasture that were the farthest from the dairy. After 12 months Geoff's father-in-law brought him four bags of lucerne saying 'I got those cheap, chuck them in, see whether it grows'. Geoff sowed 15 acres of lucerne in a dry paddock and it grew; 'it was fantastic'.

The only problem that Geoff had with that paddock was that it wasn't gravity irrigated and he had to use a pump to water it. After growing lucerne on the 15 acres for 12 months Geoff decided to plant more. The lucerne 'wasn't demanding' when it came to water. Geoff found that once it was established he could leave it for two to three weeks without water and it wouldn't die. He could just water it again and it would start to grow again. This meant that if Geoff was short of water he could water it through the spring, let it dry off over the summer and then start watering it again in the autumn.

Geoff ploughed up 30 acres that he was using for growing winter crops and put in more lucerne. Eventually, Geoff got up to having 80 acres of lucerne overall on his farm. He got into a pattern of planting 20 acres a year and by the time he got up to 80 acres the original 30-acre block was ready to come out. He was getting about five years out of a paddock of lucerne, and that was 'pushing it pretty hard'. Geoff used the lucerne for grazing and cutting for hay. Grazing was fairly hard on the lucerne itself, but he was able to get a lot of feed from it for a minimal amount of water.

Geoff found the lucerne to be especially useful when he was trying to manage the very small water allocations irrigators were getting from G-MW (e.g. two - four per cent). Geoff found these very small allocations 'very frustrating'. However, with his lucerne he would lose production but could still get a crop.

The low allocations made it very hard to plan with ryegrass, because it needs watering without delay. Once the decision was made that was it. For example, G-MW gave Geoff a two per cent allocation once and it wasn't enough water to irrigate the area that he wanted for hay. Geoff ended up deciding to water half of it and graze the other half. The next week G-MW gave him another five per cent of his allocation and he could have watered the whole area after all, but at that point it was too late. 'It was very hard to manage your business that way' but the lucerne gave him an 'easy managing tool, feed-wise'.

The only downside with lucerne for Geoff was that he 'lost a lot of cows to bloat' when he was grazing it. In the spring lucerne is toxic to the cows. When grazing on lucerne he had to

spray bloat oil on the crop before the cows went into the paddock to stop the cows from getting bloat. If Geoff missed a bit of the lucerne when spraying the oil, even a three metre square area, a cow could die if it 'gutsed out on that spot'.

Over the five to six year period when Geoff grazed lucerne he lost 15 cows in total to bloat. Geoff lost the most cows during the first year, when he was still learning about how much bloat oil spray he needed; 'learning the right rate to put out and then how to put it out'. He learned that he had to be sure to wet the whole plant.

As well, there were a couple of times when he had sprayed the evening before and then it rained. He put the cows on thinking it would be all right and 'there'd be two dead'. When it was raining or if it had just rained then he had to spray the oil just as the cows were going in to graze the lucerne. If it was constantly raining then he just didn't put them in the lucerne because the oil would wash off straight away.

Geoff later discovered that the pellets used for feeding in the bail have an additive that helps prevent bloat. If he had known this when he was having a problem with bloat he could have started feeding pellets in the bail earlier in the season to help manage the problem. As it was, while he wasn't against feeding in the bail, he just saw it as an extra cost and didn't do it during the spring.

Even though Geoff lost some cows, he doesn't regret grazing the lucerne. At the time there was little water and Geoff was 'utilising ground to its maximum'. In the autumn Geoff found that he could go through the lucerne and direct drill cereals. If he sowed early enough in the autumn, the cows could graze twice on the lucerne with the cereals through it. The lucerne wasn't toxic in the autumn. As well, by the spring the first cut of hay had bulk with the cereals and lucerne for 'quality'.

Geoff learned a lot about what he could grow, what he could do with his farm, from growing lucerne and all from a few bags of lucerne given to him by his father-in-law. Geoff thinks it is a fantastic crop and 'the best crop to watch grow' through the summer.

Geoff started to slowly get out of lucerne from about 2007 onward. He was getting less water, about 50 per cent, and 'it wasn't enough to do anything with'. So Geoff decided to grow annuals because he could sow cheap annuals and cereals, cut it for hay and silage and store feed for use as he needed it. This worked well for him given he was lot feeding.

By the time the rains returned in 2009-2010, Geoff had about 40 acres of lucerne left and the rest of his farm was sown to annual rye grass. Geoff had started share-cropping on a neighbouring 80-acre block in 2008. He sowed the 80 acres entirely to cereals. He has since built up the acreage that he is share-cropping to 200 acres at the time of the interview.

Lot feeding

Throughout the drought Geoff shifted to 'lot feeding' the cows. Geoff designated two paddocks for the cows, a night paddock and a day paddock. Geoff bought two hay rings for his day and night paddocks. The hay rings were constantly kept full of hay. Geoff found this 'easy; anyone could do it'. Geoff could still go away when he wanted to and his relief milker could easily feed the cows for him.

Geoff had a feed-out machine but found using hay rings to be easier. He only really used the feed-out machine at 'the end of the season', in the spring. Sometimes in the spring, as Geoff was cleaning up paddocks that he would cut for hay, there would be 'a bit of green feed'. When that was the case he would use the feed-out machine on those paddocks and put the cows in to finish off the green feed. Once everything dried off he would put the cows back in the day and night paddocks.

Lot feeding worked well for Geoff. He changed which paddocks he sacrificed each year. Sometimes he would swap the paddocks around a couple of times in the year. Having to change paddocks didn't worry Geoff because he could just go in and regenerate the paddock. He 'found it good for regenerating paddocks because there's that much crap and mud and hay and everything'. Geoff would rip up and laser grade the paddock which spread the cow manure around. The following year those paddocks 'grew great feed because there was fertiliser'.

While the drought was bad, it was good for Geoff in that it made him think about how he was farming. He tried things he wouldn't have considered 10 years ago, such as growing lucerne and wheat for hay. 'It was a real step forward' that the mix of hays which can be used by dairy farmers has expanded.

Geoff continued to lot feed his cows, even when he had access to more water. Geoff remembered that in 2010 he had to change his day and night paddocks three or four times because the cows kept bogging the paddocks in the wet.

Geoff stuck with lot feeding because he didn't know 'what was going to happen with water'. As well, Geoff 'found it easier to manage and anyone could do it'. Geoff was really focused on trying to 'keep things basic and simple and low maintenance'. When Geoff was using the feed-out machine, 'as soon as you go away something would break'. 'It was bad enough in the dairy, you'd go away and you'd get a phone call saying the milk pump's not working and all that.'

With the conversion to lot feeding Geoff struggled to produce the feed he needed on-farm. He aimed to produce a thousand bales of hay and he needed around 1500 bales of hay. Geoff decided to start making silage to increase quality feed for his cows. From about 2006 to 2010 he cut the cereals he was producing earlier, when the protein level was high, when the seed was just starting to come out. He wrapped about 800 rolls of silage a year over that time.

When the rains returned in 2010 Geoff ended up having a big crop. He still had 100 acres of cereal to harvest when he had harvested the 800 rolls of silage and 1600 bales of hay that he needed to feed his cows. Given it was surplus, Geoff decided to strip the grain rather than cut it for hay. This was the first time that Geoff sold grain.

Geoff sees the decision to sell grain in 2010 as 'one of those stepping stones'. He was still planning on milking at that stage and wasn't sure what to do with the cereal. Geoff's father-in-law encouraged him to sell the cereal because at least he would get some money out of it. While it was a wet year and everything was wet, the price for grain 'was still reasonably good' and Geoff ended up getting \$220 a tonne for it. This experience gave him 'the taste of it' and increased his confidence for cropping.

Finances

After the partnership dissolved in 1996, Geoff and Gini had some farm debt. They had a plan to be out of debt within three years. In reality it took around four years to pay off the debt because they had to borrow money to buy a tractor (the old one had died). In 1999 or 2000, Geoff and Gini received some money as compensation for deregulation of the dairy industry. That compensation paid off the last of their farm debt.

This meant that, by the time the drought came, Geoff and Gini were debt-free. The costs during the drought were considerable. Throughout the drought, Geoff and Gini were either 'breaking even every year or just making a little bit'. In the middle of the drought, they sold a property (not related to the farm) for about \$100,000 which was used to cover some of the

costs. That money got them through two years or more; the cows 'chewed up that house money, turned it into crap'.

In 2009 Geoff was thinking that they were going to have to borrow money to keep going. However, Geoff was unwilling 'to borrow any more money than what the cows are worth'. With low milk prices and no water, Geoff thought 'if we're going to go out, I want to go out with money in my pocket'. It ended up raining and Geoff and Gini had 'heaps of feed'.

Getting out of dairying

The last four or five years that Geoff and Gini ran the farm as a dairy they really focused on keeping a 'great life balance'. They had a relief milker who would milk Friday through Sunday. That left Monday through Thursday for Geoff to milk. There was an 18-month period, 'when the drought really hit and things got tough', where they had to lay off the milker. However, when things picked back up they were able to hire another one, who worked for Geoff for three years.

Fifteen months ago Geoff's relief milker quit on a Sunday. On Monday Geoff tried to ring a few people to see if he could get another relief milker but had no luck. On Tuesday Geoff rang a stock agent and sold some of the cows on Wednesday.

It wasn't a sudden decision as Geoff had been thinking about getting out of dairy for five years. It was a part of Geoff's life plan that by the time he was 40 he 'wanted to be slowing down from milking cows or out of cows'. He had always imagined that he would go into cropping. In the middle of the drought Geoff was 40 and he thought about getting out. The timing wasn't right though. At that time the cows were going for \$500 a cow, which wasn't high enough for Geoff as he thought that his herd was 'worth more than that'. He ended up sticking with it for a while longer. They had a good relief milker at that point and 'sort of said "life's good, we're cruising along, we're sort of just making enough money but we're going along quite well"'.

When the relief milker left last year Geoff found out that the price of cows was 'paying well' and he'd 'basically had enough of milking cows' anyway. Geoff sold the cows over the last twelve months and still has about 12 to sell. The final 12 are the 'tail enders' that are currently in calf. They were empty cows that Geoff decided to try and get in calf. His plan was to pregnancy test them in a couple of weeks to see whether they were in calf and sell those that were not. Those that were in calf would be kept and sold off when they did calve

the following March. Geoff also kept some Friesian steers to 'clean up laneways and crappy paddocks'.

Changing to cropping

Geoff and Gini decided to go into cropping. Geoff likes sitting on a tractor, would happily do it all day, and machinery is his 'weak spot'. As well, Geoff enjoys 'watching crops grow'. He loves it when he sows a crop and a couple of weeks later he can see all the lines. Geoff gets enjoyment out of watching the crops as he and his wife drive around the countryside. One of the frustrations that Geoff used to have with cows was that he would grow a paddock of 'good green lush grass' and the cows would tread all over it and eat it.

At the time that they sold the cows Geoff and Gini put most of the money aside to help them get established. They used money from the last 40 to 50 cows that they sold to buy silos, 'a few old trucks' and a header. Geoff said that he didn't really need the header as he had a neighbour who did the contract work for him. However, he bought a 40-year-old header that was 'cheap' at \$11,000. It was in 'immaculate condition'. Geoff used it for the first time last year and it paid for itself.

With the change to cropping Geoff cut back some of the fences. He plans to pull out every second fence. Of the fences that he cut back he was careful to cut the ends and tie them back neatly as 'it's still a dairy farm'. He figured that if something were to happen to him then Gini could still sell the property as a dairy farm. Geoff is going to leave all of the laneways and stock troughs as they are. As well, if Geoff leaves the fencing he could think about taking some cows on agistment or buying cattle. He is not sure about these ideas, but if grain drops down to something like \$100 a tonne he needs to have other ways to make some income.

Geoff thinks that he needs to have other options available to him. Someone told Geoff that if he was going into cropping then he was going to have to sell the farm and move north to the bigger farms. Geoff has found that he is 'very central to everything' so he can grow grain and sell it quite close. There is a big pool for selling grain nearby and he can always sell hay to farmers. If he were to move further north he would have to cart the grain further and he would be more limited in the options of what he could produce.

Over the last few months things have 'tightened up a little bit' and Geoff is 'being careful' with money. It is a bit challenging for Geoff and Gini because 'now there's nothing coming in' so they have to rely on savings to carry on. At harvest Geoff thinks that he will 'probably

sell a bit of grain off the header'. This means that the price he will get is lower; however, it will 'get a bit of cash flow going'. As well, Geoff had sold 25 tonnes of soy beans recently, which he hadn't been paid for yet. He expected payment for them in the following month, which would 'help for the cash flow'. Geoff is planning on sowing some summer crops. He wants to make sure that he is 'not totally relying on the winter crop harvest'.

Geoff acknowledged that he is 'in uncharted waters' because he doesn't know what his expenses are with the changing enterprise type. He has to be careful not to spend too much money and also careful not to lock too much money away but to have it readily available. Geoff and Gini are planning to sit down in the coming year and work out a budget. Geoff didn't do budgets with dairy farming because he always had the monthly dairy cheque.

People have been saying to Geoff that he would miss the monthly cheque. However, Geoff and Gini had been finding in the 12 months before selling the cows that the milk cheque wasn't covering the bills. Geoff thinks that financially they are 'no worse off'. Geoff knows though that he may have 'bumper crops now', but it may rain at harvest and 'it could all go'. Also, Geoff thinks that 'lifestyle-wise it's better'. He sows, the crops grow, he puts on some spray, he harvests and then it is finished. He has to 'go like a cut cat at the end of November, December, maybe January' during harvest and then he has a break until April.

One thing that Geoff has worked out with grain is the importance of storage so that he can hold on to grain until he gets a good price. He can currently store 180 tonnes. Last year Geoff had to sell some grain and was able to lock in a price of \$170 a tonne, which was good at the time. He kept 30 tonnes and two months prior to the interview had sold it for \$240 a tonne. Geoff figures that 'farming's a gamble whichever way you go'. America has had a bad year and the price has gone up to \$300 a tonne.

Increasing storage capacity is one of Geoff's main aims for the farm now. This should enable him to 'ride the good with the bad'. Geoff has bought several secondhand silos so that he can hold onto his grain. When he first shifted to cropping he already had the dairy silo. He then bought three 40 tonne silos. One of the properties that he share crops on has a 40 tonne silo as well that Geoff uses. He recently bought another four secondhand silos that haven't arrived on-farm yet.

When Geoff decided to shift from dairy to cropping he had to make some changes to existing crops. On 100 to 150 acres Geoff had sown cereals and rye grass, which he used to produce

hay for feeding his dairy cows. When he changed enterprises he wanted to grow the cereals for grain. This meant that, after paying to put rye grass into his paddocks, he then had to spray the rye grass out of the cereals. It 'wasn't hugely successful' as the rye grass was too mature to spray out, but it did 'slow some of the rye grass down'. It ended up affecting his yield the first year of harvest. Geoff thinks this year is 'completely different'. The grain crops are looking very good and the weeds have been kept out. Even so, Geoff said that 'it's still a long way off from getting in the silo'.

At the time of the interview, Geoff had 500 acres of two different types of wheat, Wrangler and Gregory. The Wrangler is a soft feed wheat and the Gregory is a hard wheat. If the Gregory's 'protein is all right' then Geoff planned on selling it as APW (Australian Premium White), because it will get a better price. Geoff sowed these varieties because he already had them.

Geoff has to work out a plan of rotation on the farm as he only has two to three years that he can grow wheat in the same spot before he will start having 'real issues' that can affect yield. Some croppers grow canola as a break crop, so they can grow wheat, canola and then wheat again in the same paddock. Geoff has not yet grown canola. However, Geoff has heard that it is expensive to grow and he would have to make sure that he was going to get \$500 a tonne for the crop. As well, it requires windrowing prior to harvest. Windrowing is when a machine is used to cut the plants just prior to harvesting so that the seeds can dry out better. Then at harvest a header is used to beat rather than strip the plants. Geoff doesn't have a windrower. Also, while he thinks that his header might be able to do the job at harvest he thinks it may have too many holes so that the seed would leak out and be 'a bit of a pain'. Finally, Geoff still has small paddocks. Canola is just 'not an option'.

Last year Geoff had 100 acres of lupins, which is his rotation crop for his wheat. He plans on continuing with lupins. There are also a few other crops that Geoff wants to try as well. He had recently been to a field day in which they were talking about fava beans, another break crop. It also needs windrowing, but it has a bigger seed, which Geoff thinks his header would handle better. He is considering trying fava beans.

Given Geoff has got some water, he is putting in some summer crops. Last year he grew 37 acres of soy beans. 'They went OK.' In the forthcoming summer Geoff was planning on growing close to 100 acres of soy beans. At the time of the interview he had the ground

prepared and was 'ready to go'. Having a summer crop helps bring in money at a different time of the year.

Irrigation

Geoff now crops on 500 acres with a 322-ML irrigation water entitlement. He owns 210 acres and leases or share crops 290 acres. Of this, 250 of the leased/share cropped area and 50 acres of his farm are dryland blocks, which cannot be irrigated. Geoff could laser grade the 50-acre block on his farm so that he could gravity irrigate it. He was thinking about possibly doing it in the following year, given there was now irrigation water available. Geoff can see a difference when he compares his dryland and irrigated blocks, even with only one irrigation. On irrigated land 'you can control your moisture level whereas on the dry land you are in the hands of the gods'.

Geoff's farm is 1.5 to 2 kilometres from the backbone on a spur channel. At the time of the interview he was 'in the middle of discussions' regarding his farm's access to irrigation water. G-MW suggested piping water to Geoff's outlet. That didn't make sense to Geoff as it would mean G-MW would have to build up that channel 30 centimetres and provide the pipe. As well, it would require going through a neighbour's farm, crossing a road and going under a drainage channel. Geoff thinks that it will cost G-MW 'a fortune'. He thinks that if they just maintained the old channel, which was only remodelled 10-15 years ago, it would make a lot more sense. Geoff thinks it is 'absolutely ludicrous' that they are talking about individual pipes for everyone rather than a shared pipe with neighbours.

From Geoff's perspective, G-MW will 'bear the cost' to getting Geoff access to the irrigation water and once it gets to Geoff's farm it is his cost. This means that, if there is any damage or something needs to be done to the irrigation system on his farm, he will have to pay for it. As well, Geoff will be paying for water from the time it leaves his meter point, rather than at the outlet. This means he would be paying for all the water in the pipe.

Geoff looked at applying for an on-farm water-use efficiency grant about six months prior to the interview. He wanted to put in pipes and risers and give up some water to do the work. He was advised that most farmers still had to contribute some money; that the grant wouldn't cover all of the costs. Geoff lost interest when he heard that. He had changed to cropping, which meant that he was only watering four or five times a year. He didn't think it was really worth it.

Geoff has spoken to a water agent and is considering selling most of his permanent water. He has put a price on it. He would like to keep 22 ML and still have his low reliability water. This would allow him to buy temporary water and carry over water, so that he could carry over 150 ML. Being able to carry over water would mean that at the end of the season, if water is cheap and he needs it, he could buy temporary water and carry it over to start off the next season.

If he only had to pay for the water he used then Geoff would be keeping his permanent water. Over the last ten years Geoff has had a water right for 322 ML that he has had to pay for. However, G-MW hasn't given him the water. His bill was consistently \$15,000 a year even when he only got a small percentage of his entitlement. For example, Geoff only got 29 per cent one year. That 'annoyed' Geoff.

As well, Geoff doesn't need all of the water. Last year he had 400 ML of water towards the end of the season. He didn't need it all and sold 200 ML for \$10 per ML 'just to get rid of it'. This meant that he carried over 200 ML. When allocations came out for the current season and Geoff was given 100 per cent he was back up to 400 ML and has 'struggled to use it all'.

This is very different than when Geoff was dairy farming. With dairying he was using all 322 ML, 'plus more'. Currently Geoff needs around 200 ML of water for his cropping. If he were to plant more next year, like 150 acres of soy beans, he may be able to get it 'close to 300 ML'. That would be based on him watering his winter crops at the end and all of his summer crops. While there is a lot of water now, this may not always be the case. If water were to become scarcer again, Geoff wouldn't plant the summer crop.

Farm Narrative 8: Harry

Harry owns a 345-acre dairy farm with an 85-ML water entitlement and 470-ML deep lead groundwater bore licence. Harry's son owns an adjacent 188-acre block with a 100 ML-shallow groundwater licence. Historically, the land and water have been used together within a dairy farm business. Harry's son currently milks 400 cows in a 50/50 share farm arrangement.

Harry left school when he was 15 and joined the National Service (conscripted for the Korean War), when he was 18. When he got out of the National Service he came home to his father's 40-acre farm. They grew tomatoes on the property and also had fruit trees. This meant that Harry 'knew a bit about fruit'.

In 1956 Harry was thinking about getting married and knew that he needed to find somewhere to live and 'get a job or do something'. He ended up buying a 25-acre orchard with a 58-ML water entitlement that came up for sale near his father's farm. Harry was married to Helen in 1957.

Harry's parents helped him buy the property as the bank wouldn't loan Harry the money. Harry's father mortgaged his 40-acre farm, Harry's mother loaned him £1,000 and Harry had £1,200 that he had saved up from the National Service. There was no equipment with the orchard and over time he bought trucks and spray pumps. Harry paid off the orchard in about five years.

While the orchard was profitable, Harry couldn't simply increase its size because of the land. 'It's got to be good land to grow fruit.' The orchard block he had was on a high bit of ground and good country for growing fruit.

Harry had a growing family and was looking to expand his farm business so that he could support his wife and children. The problem with the orchard was that 'if you get a hailstorm on your fruit you've got no income'. There were times that 'things were tough to get through' because of this. Harry wanted to look for a 'more consistent' business and decided to buy a dairy farm to achieve this.

Bought 60-acre dairy farm

In 1966 Harry bought a 60-acre dairy farm that was about one mile away from the orchard. The property had a 65-ML irrigation water entitlement and 60-ML drainage pump licence. He mortgaged his orchard for £4,500 and borrowed £10,000 from the bank to enable the purchase. There were no cows or equipment included in the purchase. The property had a new home which 'wasn't quite finished', a six unit herringbone dairy and fenced paddocks for the stock. Harry already had equipment from the orchard, including a tractor and trailer that he was able to use on the dairy farm.

As there were no cows on the dairy property, Harry bought 45 Jersey calves. It took him two years to rear the calves and start milking. He decided to breed a herd of Jerseys because Jerseys were high in butter fat. Jerseys 'were the thing at the time' because the money dairy farms made from the milk was based on butter fat.

Harry and Helen ran both the dairy and orchard enterprises, which was 'pretty tough going'. They would both get up in the morning and milk the cows before having to get their children off to school. Harry then went to work on the orchard. They used to employ six Italians to do all of the pruning on the orchard and Harry did all of the spraying and irrigating.

The orchard 'was a back-up' for Harry over a number of years. He 'didn't have only one iron in the fire'. He grew apricots, pears, peaches, apples and oranges which he sold for fresh fruit and canning. The orchard made more than 30 per cent of the farm income when the dairy was not so profitable.

Getting bigger

By 1970 Harry had increased the dairy farm's cow numbers to about 150. He then leased a 100-acre block about one and a half miles from the dairy to enable him to continue to build stock numbers. While the leased block was set out with irrigation and fencing, Harry and Helen improved and maintained it while they leased it. Harry ran young stock on the block and milked off of it as well. Milking off of the leased block meant that Harry had to walk the cows on the road and time it to avoid school traffic (buses and children on foot).

Harry had the 60-acre home block and 100-acre leased block all sown to perennial pasture. Harry found that the perennial pasture didn't grow over the winter. Therefore, in addition to using the pasture for grazing, Harry cut it for hay to feed out over the winter time.

Between 1970 and 1974 Harry bought some more land. He bought a 20-acre corner block with 25 ML of irrigation water that was near the 60 acre home block. He also bought 120 acres between the home block and the 100-acre leased block.

In June or July of 1974 Harry bought a 32-acre block that was the same distance to the home farm as the leased block. He didn't have any money but had an increasing number of cows. He thought that he would be better off buying the 32 acres and giving up the lease on the 100 acres. He ended up borrowing half of the money he needed to buy the land and the vendor left half of the money in the land. After these last couple of land purchases Harry's debt load increased to about 50% of his farm business asset value.

The blocks of land that Harry purchased in the early 1970s were already reasonably developed with fencing and irrigation and were sown to perennial pasture. This meant that he could very quickly start using the blocks for his stock. He could also milk off of the blocks as they were all within walking distance to the dairy.

Export market crash

Harry was continuing to build his herd and it was up to around 200 head of cattle, though he was still milking about 150 in 1974. In doing so he ran cows and calves on his new 32-acre block and the 100-acre leased block. However, the money that Harry was getting for his milk decreased as price for butter fat dropped. He was 'broke'. Harry got a letter from the bank that told him to stop writing cheques from the farm account until he came up with some money.

Harry had shares in Murray Goulburn Cooperative (a processing plant) and was able to borrow some money against these. As well, he sold the stock he had just set up on the 32- and 100-acre blocks for \$65 a head. This was a bit under what he was thinking that the calves would have been worth (\$100 a head) after giving them a bit more time to grow. He was able to come up with enough money to give the bank 'a bit of a softener'. After selling the stock he was still milking about 150 cows.

The bank manager actually did Harry 'a favour' as the letter made Harry sell some stock just before a crash in the market for stock. If he hadn't sold when he did he 'would have been shooting them and putting them in the pit'. It was in about October that 'the rot set in' and there was an unexpected export market crash. This meant that farmers couldn't sell their stock. For the dairy industry this was bad because dairy farmers couldn't sell their 'chopper

cows', calves and excess stock. Also, if a farmer wanted to get out of dairy they couldn't sell their herd. If a farmer didn't have enough feed for their cows they had to shoot stock and bury them in pits. Harry described how the 'cows all swelled up and grew out of the ground again'.

Harry told a story about when he couldn't sell some calves and was driving back to his farm with them. He stopped at a hotel on the way home to have a couple of beers. When he returned to his vehicle there were another three calves in the trailer that someone else didn't want to take home.

Early 1980s

By the early 1980s Harry owned 232 acres of land for his dairy and still ran the 25-acre orchard. Harry and Helen have two sons. One son started working on the farm in the 1970s, during the crash in the market for stock. Harry said that he 'got educated when the cattle went in the pit' and chose a different career path. Harry and Helen's other son came back to work on the farm in the early 1980s and has been on the farm ever since.

A neighbour who owned property between some of Harry's blocks sold 120 acres to Harry in the late 1980s for \$95,000. Harry had to sell his 32-acre block and borrow \$50,000 to buy the 120 acres. He was able to find another neighbour willing to buy the 32-acre block. The trio managed to organise the purchases through one solicitor, which saved them all money on the exchange.

The purchase of the 120 acres took Harry's dairy farm to 320 connected acres. The 120 acres had a house and some fencing, but it was a sheep and cattle property. Harry had to lay out the block for dairy. This included installing bridges over the drainage and irrigation channels, fencing and installing troughs in paddocks.

Harry also laser graded the 120 acres. Harry had already laser graded some of his other land which he started doing in the 1970s and continued laser-grading portions of the farm over the years. At the time of the interview Harry's entire farm, except for 20 acres, was laser graded.

On the 60-acre home block Harry had a 65-ML irrigation water right and a 60-ML drainage diversion licence. With the diversion licence he could pump water that had run off farms into the drainage channel. He generally had 'just enough' water to get by, and this was in the days when he used to get 200 per cent of his entitlement. It was a 'battle', however, and wasn't

helped by the fact that water wasn't transferable and he couldn't buy water. In those days 'the water was allocated to the land'.

In the early 1980s there was a drought and Harry 'was out of water'. He felt that he 'was short of water' on that property which limited what he could do with the land. Harry received permission from the Department of Minerals and Energy to drill for a deep lead bore on the property. It took two attempts, but Harry successfully installed a 120 metre deep lead bore on his property. The water is 'good water; not salty'.

He got the bore capped and running in February during the middle of the drought year and pumped off of it for 'six weeks, non-stop'. All he had to do was change the oil and fuel. Harry was able to grow millet through the two years of that early 1980s' drought. Millet was a 'quick feed' and the 25 acres he sowed with that in those years helped him get by. Harry concluded that 'putting the deep lead bore down was the best decision I ever made'.

There were no restrictions at that point. Eventually he had to apply for an allocation and asked for 1000 ML. He was given an allocation of 470 ML. Eventually there were rigs all over the area drilling bores. Even so, it didn't affect the amount of water he was able to get out of the ground with his bore.

The dairy shed (1992)

When Harry first bought the dairy farm in 1966 it had a six unit herringbone dairy. As he started building up a herd he doubled the units to 12. When he bought the 120 acres and leased 100 acres in the early 1970s he increased it again to a 20 unit herringbone.

Buying the 120 acres in the late 1980s enabled Harry to continue increasing the number of cows he was milking to about 300 by the early 1990s. As well, Harry had been converting the herd over to Friesians, which were bigger cows. With the increased number of larger cows it was taking too long to milk.

Harry knew that converting to a Friesian herd meant bigger cows and that they would have to make provision for them. Harry considered 'knocking a hole in the side of the wall, like the cows come in and their heads could stick out of the side'. He also started looking at other options. Everyone was putting in rotary dairies but Harry was only milking 300 cows and they were significantly more expensive.

Harry knocked down the 20 unit dairy and built a new 32 swing-over dairy in 1992. It was the largest swing-over dairy in the district. The new dairy held 64 cows in the shed at the one time. This is the same dairy that they use on the farm today.

Harry set up the new dairy so that he could start feeding the cows grain and pellets in the dairy shed (ie. feeding in the bail). He decided to start feeding in the bail so that if he got short of pasture he could 'push the feed into the cows and get more milk', make more money. Feeding in the bail also helped keep the cows healthy.

When building the new 32 swing-over dairy Harry kept the existing vat area because that allowed him to classify the changes as a renovation. If he had knocked everything down then council regulations would have required that he move his dairy further back from the road. As well, Harry bought materials over two to three years so that he didn't have to 'hand out all this money' at the time he was building it.

While the new dairy was built in the early 1990s, the conversion to Friesians began on Harry's farm in the mid-1980s. Harry decided to go with Friesians because the milk payments changed. Previously he was paid based on butter fat and a proportion of 'city milk' (fresh milk). These payments changed to focus on protein, which meant that increasing the amount of milk became more important than butter fat. Friesians were better cows for volume.

Split calving

After putting in the new dairy Harry started split calving. While he had traditionally calved in the spring he decided to start calving some cows in the autumn so that he could get the better pay that comes with winter milk. 'It pays you to milk all the year round.' While the cow numbers have increased, the proportion of cows that calve in the spring and autumn has not changed.

As a part of the split calving, Harry pregnancy tested cows to see which cows were empty and joined them later for autumn calving. Pregnancy testing was something that Harry did not do before he went to split calving. While Harry had used AI 'for years', he generally would then use bulls to 'mop up' after six weeks with AI. Any cows that went back into season again after the bulls were pulled out were sold. This was the practice for the Jerseys and later with the Friesians.

With the split calving, Harry monitored the cows more carefully to ensure that he had the right proportion of cows calving in the spring and autumn. He used pregnancy testing to help with this. Harry has never had a problem with fertility with his cows. 'As long as they're well fed and looked after' there was no difference with fertility between his Friesians and Jerseys.

Harry and Helen always kept cows that were close to calving near the house, which had a number of windows. This enabled them to easily keep an eye on the cows in case they needed help during calving. Harry found that his Jerseys were 'better calvers' than the Friesians. With the Friesians, 'you've got to be there; you've got to help them'.

Bought 188 acres for son

In 1998 Harry bought 188 acres just across the road from his farm and very close to Harry's dairy. The block had a nice three-bedroom brick home on it. While it had been a part of a neighbouring dairy farm, the portion that Harry bought did not include the dairy shed. Harry paid \$352,000 for the 188 acres which he thinks was at market value, because the land had a limited amount of water. There was really only enough water to irrigate about 100 acres of the 188 acres. Harry was comfortable with buying the 188 acres knowing it had less water because he knew that he had a deep lead bore just across the road that he could use.

The 188 acres was bought in Harry's son's name. While Harry's son had been working on the farm for 16 years at that time, all of the land was in Harry's name. There were also some family circumstances at the time which meant that it made the most sense to buy that property separately from the farm.

Harry then leased the block back from his son and paid all of the expenses to improve it and manage it. The block was 'very run down'. Harry put in recycle dams and set up the paddocks, which included laser grading and new fencing.

Harry pulled out the fruit trees on his orchard in 1999. The birds were eating the fruit and he 'couldn't get labour to pick it'. As well, the local fruit processing factories shut down and Harry had to cart his fruit a 'blood long way' to the nearest factory. He converted the 25 acres to pasture and started running calves on it. By that point Harry's cow numbers were getting pretty high and it was not financially difficult to get out of the orchard.

With the addition of the 188 acres and the conversion of the 25-acre orchard to pasture, the dairy farm increased in land size to 533 acres.

Drought

In the almost 10 years of drought starting in the early 2000s Harry relied heavily on his deep lead bore water to keep the farm going. Harry and his son had even connected the bore to the 188-acre block to keep that block productive during the drought. Early on in the drought the farm business was 'getting by'. At the time Harry had a 320-ML surface water entitlement and 470-ML groundwater entitlement. The use of bore water was more restricted during the drought than it used to be. He might get '50 per cent or 70 per cent, the same as your water out the wheel'. He bought a lot of bore water and pumped it because it was 'cheaper to buy and pump bore water than to buy wheel water'. 'The amount of water that's been pumped out of the ground is in incredible' in the region.

Up until the drought, Harry had a perennial pasture based feeding system. Over the years Harry had oversown his paspalum and clover pasture with rye. Through time there were improved varieties of rye to choose from. Harry liked oversowing with rye because he could sow it in the autumn and it would 'grow like blazes' and continue growing right through the year. With the oversowing, the paspalum 'has nearly all gone'.

Early on in the drought, around 2002, Harry started planting lucerne. At the time of the interview at least a third of the 188-acre block was under lucerne. Harry had set up and laser graded the paddocks so that one paddock was one irrigation bay. This enabled him to set up a pasture rotation that included lucerne, as they could selectively water each paddock separately. When the lucerne died off they planted rye and clover.

Harry decided to grow lucerne 'because of the prolific growth' of lucerne. He had more cows and bigger cows which he needed to feed. As well, during the drought the cost of buying feed increased. Lucerne gave him another option for feed which didn't take much water.

Harry managed some of his stock feed needs by agisting his calves and his dry cows. He had been agisting his calves with the same person for 30 to 35 years. As well, he agisted his dry cows for six weeks over the winter, when his pasture slowed down. During the drought agistment of his calves did not change, however Harry agisted more of his cows. He trucked the cows wherever they could get agistment.

In 2007 Harry paid \$200,000 to put in a shallow groundwater bore on the 188-acre property to provide supplementary irrigation water. The shallow groundwater bore had a licence to

pump 100 ML of water. Harry said that, following the drought, his son generally pumped about 50 ML from the bore.

Finances

Harry and Helen received about \$300,000 compensation when the dairy industry was deregulated at about the same time that the drought emerged. He used some of that money through time to pay for some of the farm costs. He also put some of the money aside to pay to build a house in town so that he and Helen could move off the farm.

The farm debt increased through the drought. This added pressure to Harry and Helen and meant that they had to work harder on the farm. The year 2009 was 'the really bad year' for Harry. His property was mortgaged and he was 'battling to keep going'. Murray Goulburn dropped the milk price which put Harry and Helen under so much financial pressure that they considered getting completely out of dairy. However, their son wanted to keep the farm going so Harry and Helen decided to carry the debt and pay what they could. Some of the deregulation money was used to pay the debt. As well, Harry had to sell 200 ML of permanent water, taking his entitlement to 120 ML.

Harry was able to clear all of the farm debt and buy a unit in Melbourne, to diversify the income. Harry was comfortable with the farm having a small surface water entitlement. He still had bore water. As well, surface and bore water are tradable. He knew he could 'buy wheel water now probably for \$10, \$12 a ML'.

Change to irrigation system

The entire farm was irrigated through flood irrigation. After the drought Harry's son used an irrigation modernisation program and a water efficiency grant to help fund converting the 188-acre block over from flood irrigation to pipes and risers. The cost of setting up that block with pipes and risers was about \$330,000. This cost included having to shift pump locations and piping under a drainage channel along a neighbour's fence. There was a fair bit of work needed to ensure the whole block could be irrigated.

In the infrastructure changes they rationalised six irrigation outlets down to one outlet. They also put plastic pipes into all of the channels to stop loss of water through seepage. Harry thought that a lot of the water savings came from piping these channels given the block had

very sandy soils. They were able to get the work done because the property was already fully laser graded and able to be laid out with the pipes and risers within the existing farm layout.

To get the funding for the pipes and risers Harry's son needed to give half of the water saved through increased water-use efficiency to the government for environmental flows. Harry gave his son 35 ML of permanent water to ensure that there was enough water to qualify for the grant.

After giving his son 35 ML of water, this left Harry with 85 ML for his farm. Most of Harry's farm was on the backbone of the irrigation system. He had one irrigation outlet that was not on the backbone, which NVIRP was 'trying to shift'. At the time of the interview Harry was planning on putting in an application for the next round of funding for water efficiency grants to get pipes and risers installed on the 345 acres of land that he owned. The next round of funding was due to open in about six months.

The soil on much of his land was not as sandy as that on the 188-acre block. He was interested in going to pipes and risers because it took him an hour to fill an irrigation channel. With pipes and risers, he could expect to just 'turn the pump on here, and the water comes out'. Harry thinks that even if he were successful in getting some funding, it will probably cost him some money.

The farm today and into the future

When Harry turned 70 he decided that he was going to stop milking cows as he thought he had 'done enough'. At that time he had already bought a block of land in town so he could build a house for himself and Helen. Helen wasn't very interested in moving into town so Harry said to the builders 'whatever she wants she gets.' It took a long time, but they have transitioned to living comfortably and happily in town.

In the 12 to 18 months prior to the interview they had changed to a share farm arrangement in which Harry and Helen's son managed the farm and they split the profits 50/50. Their son owned half of the cows and the 188-acre block and house. Their son was also in the process of buying his own equipment. While he was building up his own equipment he was using some of Harry's as well.

The farm had recently increased stock numbers at the time of the interview. There were about 600 head, including 100 heifers on agistment and 100 calves. They were milking around 400

cows. Given the size of the farm business, Harry and Helen's son had two full-time staff working for him.

Harry was two months shy of turning 79 and laughingly said 'I've only got a bit over 11 years to 90'. The plan with the farm business was to focus on utilising the infrastructure that was there to expand the existing business rather than dividing the farm into two. They were financially better off keeping the farm together because of incentives that were paid to farmers with higher volumes of milk. Harry had 'backed right off' actively managing the farm.

Farm Narrative 9: Isaac

Isaac manages a 300-acre dairy farm with a 450-ML water entitlement. The property is fully irrigated and is roughly two-thirds perennial pasture and one-third annuals (clover and rye 'sub-based pastures'). He also leases approximately 50 acres 'virtually across the road' from his farm and runs it as a dryland block for his dry stock. Isaac is currently milking about 170 to 180 cows and wants to build this up by another 10 to 20 cows.

Isaac's father and uncle bought the original 240-acre flood irrigated farm in about 1960. Isaac was one year old at the time. The property had been a sheep property prior to the purchase. While the sheep yards are gone, the old shearing shed was converted to a hay storage shed and is still on the property. The two brothers set the property up as a dairy business, beginning with building a dairy shed. Isaac thinks there were only two other farmers who were milking cows in the district at that time. While Isaac was still a child, his father bought out his brother and took on sole management of the dairy farm.

Isaac is not certain how much irrigation water came with the property in 1960. His father successfully applied 'some years ago' to get the water right increased. With the increase the water right was about 350 ML. Isaac thinks that the water right is 'probably not too bad here'.

Isaac had always helped out on the farm as a youth. When he left school in 1976, at nearly 18 years of age, he came back to work on the farm as a part of a farm apprenticeship. The farm apprenticeship required that he go to college one day a week and work on the farm the rest of the time.

When Isaac arrived to work on the farm his father was milking about 150 to 160 cows. They were able to feed the cows with what was produced on-farm other than buying 'the odd paddock of hay now and again'. The pasture mix was about the same at that time as it was when they bought the farm in 1960 and is the same today with two-thirds perennial pasture and one-third annuals.

The soil across the farm is consistently 'fine sandy loam' and was not a determinant of where different pasture types were sown. Isaac recalled that the pasture mix was the same as it was when his father bought the farm. As well, the perennial pasture and the annuals have always been put on the same parts of the farm. The perennial pasture has always been put where it has been easier to water, 'closer to the main channels'. The annuals have always been sown in paddocks that are further away from the main channels, where 'it takes a bit of water to fill

drains' when irrigating those paddocks. Isaac said that 'because it was a sheep place beforehand, we had the sub-based pastures there'. They took advantage of that as it gave them 'early growth, early feed'.

Getting bigger

Isaac got married in 1987. The first of his three children was born a year later. At the same time that Isaac's family was growing, Isaac and his father were increasing the size of their herd. From the mid-1980s to the early-2000s they increased from about 150 or 160 milking cows to 220 milking cows. Isaac described it as 'a natural progression' as 'everybody was starting to get bigger'. As well, there were two of them working on the farm and they thought the 'farm could handle' increasing cow numbers, getting bigger.

Once they were milking more cows, they found that they needed somewhere for dry stock; for the yearlings and heifers. In 1987 they leased a 100-acre block across the road. The lease agreement was verbal as the owners were distant relations and included access to the irrigation allocation for the 100 acres. In addition to running dry stock on the block, they cut hay off it and there was 'a little bit of water in those days' that they could transfer to their farm. Like the home block, the leased block was a mix of perennial and annual pastures. Throughout the lease, Isaac and his father maintained the block, including existing pasture mix, as it was.

In the early 1990s, Isaac and his father bought a 60-acre block that was just 'over the channel' from the farm with about 100 ML of irrigation water. The block was set up as paddocks of perennial pasture at the time of purchase. While the block has been completely laser graded, the setup has been predominantly maintained over the years.

Natural depression

Isaac described how the farm had a 'natural flow' with a low spot in the centre. The farm irrigation infrastructure was built to take advantage of this natural flow. In the past 30 years the depression had been turned into a recycle dam and then made bigger over time so that the whole farm now drains into it. In doing so, a channel has been installed across the farm to drain the water into the recycle dam. Laser grading has helped with this.

The farm was laid out but it wasn't laser graded when Isaac's family purchased the property. Over the past 15-20 years, Isaac has laser graded 'virtually the whole farm'. When laser

grading, Isaac was able to keep the existing farm structure. The focus was mainly on consolidating irrigation bays (i.e. turning four or five bays into one). Given the farm layout and natural landfall, Isaac didn't have to move a lot of soil. He was 'lucky in that respect'.

Feeding system

Isaac and his father have historically focused on producing their own feed for their cows. While they had to 'buy the odd paddock of hay' if they 'were a little bit short', overall they grew it themselves. As well, Isaac started making silage in the late 1990s or early 2000s. Cow numbers had almost reached their peak at that time. While it was new to him, he remembers his father making silage early on and then stopping. Isaac was able to use an old forage harvester from the shed which is what his father used.

Isaac has always carried enough supplementary feed to get through 12 to 18 months. He said that they 'were always lucky enough' to have the shed space and produce extra hay to 'have that little bit up our sleeve'.

Calving

With the amount of winter pasture growth from the annuals on the farm Isaac and his father calved earlier than is typical with spring calving. They would calve around the first of July which gave them 'that extra start' at the beginning of the season. When Isaac's children were 'getting a little bit older' and they all wanted to go away during school holidays Isaac brought the spring calving back to around July 20th. This change was 'because of a lifestyle thing more than a pasture mix thing' but has worked well with the farm.

Isaac and his father 'always milked virtually 12 months of the year' because they had some cows that calved in the autumn. Early on, 90 per cent of the cows calved in the spring. The other 10 per cent were cows that they couldn't get into calf and carried through to join for the autumn.

In more recent times Isaac preferred 75 per cent spring- and 25 per cent autumn-calving cows. With this proportion, Isaac and his family could go away on holiday for three or four weeks before they start spring calving and leave the relief milker with only 50 or 60 cows to milk.

Cows (breeding)

When Isaac's father and uncle set up the dairy farm they started with a herd of Jersey cows. By the time Isaac started working on the farm the cows were Friesian/Jersey crosses, which were 'supposed to be the better milking cow'. Since Isaac has been working on the farm, they have continued to breed for Friesians which means the Jersey is 'slowly being bred out'. Isaac thinks they are 'nearly 100 per cent Friesian' now. While it may be that the Friesian/Jersey crosses were better milkers 'in those days', with today's genetics Isaac thinks his herd is better with purebred Friesians.

When Isaac did his farm apprenticeship he was 'probably one of the first ones doing an AI course' in the local area. They have used AI on the farm ever since. Isaac's approach with breeding has consistently been to go through two cycles with AI and then use bulls. In the last 10 to 15 years Isaac has been using pregnancy testing. He has found that it helps him to keep track of which cows are in calf so that he can budget for the next year. Before he used pregnancy testing it was a 'gamble until nearly before they would calve'. Even with the pregnancy testing 'it doesn't always work out'.

Dairy

Isaac's father and uncle built a 10-a-side zigzag herringbone dairy with a walk-up platform just after buying the farm in 1960. Shortly after Isaac returned to work on the farm in 1976 they did a major renovation and turned it into a 12-a-side zigzag herringbone. In around 1986 they significantly changed the dairy again to a straight rail 18-a-side, which they were still using at the time of the interview.

A major reason for changing the dairy in 1976 and 1986 related to cow numbers. As Isaac and his father increased their herd size they wanted to be able to milk quicker; therefore, they increased the number of cows they could milk at a time.

The dairy was set up from 1960 to 1986 with zigzag rails. The change from a zigzag rail to a straight rail in the 1986 renovation had to do with cow size. As they converted from Jerseys to Friesians the cows increased in size. Straight rails meant they could 'squeeze more cows in' the dairy at a time given their larger size. At the time of the interview Isaac was still having a problem with his cows fitting in his dairy shed. The Friesian cows have become bigger over the years, especially since he imports 'the American-style semen, which is a bigger cow'.

Father retires

While Isaac has worked on the farm since 1976, Isaac's father made the majority of the farm financial and business decisions. Isaac's father tried to get Isaac involved but Isaac would say 'no, you do that and I'll do the work'. Isaac preferred to work on the farm.

Isaac thinks that there would have been some farm debt early on, but doesn't know anything about it. Isaac recalled that they had to borrow some money when they purchased the 60-acre block in the early 1990s.

The farm has always supplied milk to Tatura Milk, now called Bega. While Isaac remembers deregulation of the dairy industry in the early 2000s, 'it didn't seem real big' to him.

Isaac's father retired in about 2001-2002, just prior to the drought. At that time there was 'not much debt' in the farm. In order to buy Isaac's father out of the business Isaac and his wife borrowed about 40 per cent of the farm asset value from a bank.

Isaac then took on his father's business management tasks and his wife took over the book work. Isaac and his wife were still trying to work out management of the farm business on their own when prolonged drought arrived. This meant that when the drought arrived it was 'stressful' and 'a traumatic time' for Isaac.

Drought

Prior to the drought, Isaac 'never really had to worry about water'. In his time working on the farm his father 'might have run a little bit short' but Isaac cannot remember his father buying any water. Once they leased the 100 acres, they had a bit of extra water. While generally 90 per cent of the water associated with the leased block was used there, anything that was left would be used on Isaac's home block, if it was a bit short. That meant there was always enough.

During the drought in the 2000s this changed. 'Water became so dear' that the owners of the 100 acres of leased land decided that they could make more money selling that water on the temporary water market than including it in the lease to Isaac. 'The water went, so then that block dropped back in production a fair bit.' Isaac continued to lease the block, at a reduced price, and maintained it as a dry block. At the time of the interview the land still had the

irrigation infrastructure and the owners had water that they continued to sell on the temporary market.

In addition to the loss of water on the leased land, water scarcity was an issue across the farm because of its impact on feed production for the cows. Isaac's main feed source, grass, greatly decreased in production due to lack of water. However, he did have enough water to pick a few of his best perennial pasture paddocks for watering through the season, while other farmers ran out.

Isaac looked into groundwater as an option for increasing his access to irrigation water in the middle of the drought. G-MW came and tested his property for a minimum fee to identify whether there was suitable water (quantity and quality) to put in a bore. If they found suitable water then Isaac could have received a subsidy to install the bore. The testing didn't reveal suitable water.

Irrigation modernisation

Isaac has a flood irrigated system that is connected to the backbone of the public irrigation infrastructure. In the middle of the drought Isaac's outlets to the public irrigation system were automated as a part of an irrigation modernisation program through G-MW. This included changing some bay outlets.

Isaac was uncertain whether the automated system is any better. While it allowed him to start and stop irrigating overnight without having to go and open a wheel, there was a risk that an outlet gate might not open or close as it was supposed to. 'There's always the chance - and it's happened here before', which he saw as a sign that the automated gates are 'not quite as good as what they say they are.'

For Isaac, if a gate didn't open then he had to apply to get the water back from G-MW, which was a problem. However, the biggest risk was if a gate didn't shut in the middle of the night. When a gate didn't shut then the pasture got overwatered and when the recycle dam was already full the water ended up 'everywhere'. Due to his concern over gates not opening or shutting properly, Isaac only very rarely had a gate switch off in the middle of the night and when he did he would go out and check it. He tended to prefer to start them at night and finish in the morning.

Isaac seemed 'to be using more water to irrigate the same amount of land and, in some cases, taking longer' than what he used to find with the old water wheel. This was even more confusing because the new gates were 'supposedly using a higher flow'. He was not convinced by his water use figures that G-MW sent him because G-MW could change the figures regarding what was coming out of the system onto his land. When Isaac questioned G-MW about the difference between what he got with the old wheel and the new gates they argued that, with the wheel, 'the water bill wasn't accurate in the first place'. Isaac's argument was that G-MW's 'system's not accurate now, and they can't prove it and they won't prove it'.

While there have been some on-farm water-use efficiency grants available Isaac 'hemmed and hawed' over them and decided to 'just wait to see what happens first'. He didn't want to apply for a grant that required him to give up some water and then find out that the government has decided to take 10 to 20 per cent of his water off him. He'd rather 'sit and wait'.

Feeding during drought

In the first year of the drought Isaac installed feeders in the dairy so that he could start feeding some grain to the cows during milking, though he has never fed pellets in the bail. This gave him a 'third feed source' (in addition to pasture and hay/silage).

Isaac's stock of hay and silage was 'pretty full before the drought'. During the first year of the drought Isaac used a lot of the farm's on-farm supply of supplementary feed. By the second year of the drought the 'home stocks of hay and fodder were starting to matter'.

While Isaac did buy 'a little bit of hay' during the drought he found that it was very expensive and 'there wasn't very much of it around'. Some of the hay that he bought was 'rubbish', the sort that he used to burn rather than feed to cows. He paid something like \$240-250 a tonne for it. Given the poor quality and high cost he could see that it wasn't going to work.

In the second year of the drought Isaac's stock of hay ran down. He 'just cut everything back' and didn't fertilise, slash or oversow his pasture. 'The tractor stayed in the shed.' He found that the annual pastures were 'fairly good': 'they'd just come back and were all right'.

Isaac entered the drought milking 220 cows. That was ‘daunting’ for Isaac. When water went down to about 30 percent of his entitlement, Isaac wondered ‘how in the hell are we going to feed these cows?’ Isaac and his father had always relied on irrigated pasture to feed the cows and they ‘weren't big supplement feeders’. Isaac decided that he needed to reduce his stock numbers on-farm.

To reduce stock numbers Isaac’s original plan was to dry off and agist some of his cows. However, he couldn’t find suitable land. ‘Time was creeping by and it was getting drier and drier’, leading Isaac to becoming increasingly concerned. Isaac decided to park stock to get his numbers down to what he thought he could carry based on the water he had available. He had never parked cows before, so Isaac said that he ‘had to drag the old man out of his retirement and said, “You’re coming for a ride with me because I don't really know what I'm doing”’. Isaac and his father met the people who ‘were really good’. He ended up parking 80 cows in Gippsland. Isaac also culled 30 head. In total, this brought his numbers down to about 110 cows in the first year.

Isaac’s son left school at about the same time that Isaac had cut back his herd size. Isaac thinks he ‘probably would have come home on the farm’ if the timing had been different. Isaac thinks his son ‘loves the farm but was not overly rapt in milking the cows’. Given that his son had moved on to other work, Isaac didn’t think he was likely to want to quit and milk cows for less money and no weekends off.

Isaac found that every year was ‘a little bit different’ as the drought progressed. Overall, Isaac ‘didn't chase production’ through the drought. He fed the cows what he could ‘without going over the top’. Some years he would ‘get rain at the right time’ and produce a bit of fodder. For example, if Isaac ‘got a half early break’, he occasionally put in a paddock of cereal in one of his paddocks, as part of pasture rotation.

He was always ‘a little bit short of water’ over the drought years and tried to work out roughly how much water he would have for the year and ‘irrigate to suit’. With the pasture that Isaac did grow as the drought progressed, he focused on trying to ‘make it produce a little bit more’; ‘where otherwise it would just get plonked in beforehand and what grew, grew.’ Isaac fertilised more, focused on picking the ‘right paddock’ and chose different varieties that were ‘going to grow a little bit better; better food value’.

Throughout the drought the amount of stock he carried changed based on available water through his entitlement. Overall, Isaac had three different lots of 40 to 50 cows at a time parked in Gippsland. He ended up selling the last lot of cows to the people he had parked them with. 'About six months later, down come the rain.' That left Isaac 'a little bit short on numbers' and at the time of the interview he was 'slowly trying to pick up again'.

Cup removers

The farm had always been a two person operation. Just prior to Isaac's father retiring they employed someone to help out. 'It was really good probably for the first 12 or 18 months.' Isaac was able to catch up on a lot of 'odd jobs' that he had been putting aside. After a while he found that he was 'spending money to create jobs' and 'it was starting to cost on both sides' as he was paying for the employee to do things that didn't really need to be done. When Isaac's father retired the employee helped with the milking and Isaac did the rest of the farm work himself.

With the reduced stock numbers Isaac 'didn't produce a real lot of milk for a couple of years'. One year a high milk price helped, but 'the next year it was shocking'. With the increased pressure caused by the drought Isaac laid off the employee and had cup removers installed in the dairy. The installation of the cup removers turned milking into 'a one-man operation'. Isaac borrowed the full \$25,000 needed for the purchase and installation of the cup removers. While it seemed small, 'probably putting the cup removers in the dairy was one of the biggest things' for Isaac. In a way, the drought was the excuse to say, 'well, look, we just need to cut the whole job back so we've just gone back to doing it by ourselves'.

Isaac thinks that he and his wife have 'been pretty lucky during the drought in a way' because they 'never missed a payment' to the bank for their loan. They had to refinance once, but have paid a lot of the debt' which 'was better than most people' were able to do. As well, Isaac and his wife had to stop paying into their superannuation fund during the drought, though they have started building it up again since the drought ended. There was some drought relief funding and subsidies that also helped get them through.

Recently Tatura Milk was bought by Bega and paid a dollar value for shares that Isaac and his wife had in the company. That was 'a little bit of luck' and helped them to put some money away. The value of the farm, the water and the cows have all gone up as well. That has reduced the percentage of debt to equity, which is now sitting at about 20 per cent.

The biggest impact of the drought for Isaac was 'stress-related'. There was stress associated with taking on ownership and full management of the farm. There were stresses related to the direct impacts of the drought on the farm. On top of this, Isaac's wife 'was very unwell right in the middle of it', which was 'the hardest bit' for Isaac.

Isaac identified himself as 'a pretty conservative sort of a person' who likes to have something in reserve; 'something up my sleeve'. Looking back, Isaac thinks that he 'would probably be milking 300 cows 'if the drought hadn't come along and changed the way' he looks at things. He imagines that he would have bought some more land and his son or someone else would be working for him. The drought came along and he went a different direction than that. Whether he had 'gone the right way or the wrong way, who knows and who can tell'. There are a lot of those whom Isaac classifies as 'good farmers' 'that are gone' or 'getting out' of farming now. Isaac does know that he 'actually got through the drought reasonably well' with the path he chose.

Cows: fertility problem

Isaac had a bit of difficulty getting some of his cows in calf at the right time. This led to an increasing problem of cows calving late. Overall Isaac didn't think that his fertility issue was any worse than for anyone else. Isaac 'never had a real lot of cows calve early' anyway. However, last year he had an especially bad year with it. He got the cows in calf but 'they just seemed to be one or two cycles behind what the pregnancy test showed' (i.e. 20 to 40 days). Isaac was surprised that even the veterinarian didn't pick it up during pregnancy testing.

To prevent the problem in the current year Isaac had been administering Prostaglandin to all of the cows that calved late last year. The Prostaglandin is supposed to help cows cycle more quickly and Isaac hoped it would help bring forward the conception date for those cows. At the time of the interview he was about to administer a second dose and then would do it again in 12 days for cows who hadn't joined. 'Prostaglandin is pretty cheap' at about \$2 a dose.

Initially, Isaac looked at going on a 'synchronising program' which would have cost him about \$10 per cow. The synchronising program is different than Prostaglandin because it requires four injections over a 20 day period, after which every cow is joined on the same day. That means about 80 per cent of those cows will all calve in a day. Isaac didn't think he could handle that many cows calving in the one day. After talking to his veterinarian and

others he decided that Prostaglandin was better for him as it 'sort of does the same thing, but doesn't give you quite the numbers'. As well, Isaac had used Prostaglandin once before, on some 'tail-enders', but this was the first time he started the breeding season with it.

Isaac saw the Prostaglandin and a synchronising program as his only two real options to deal with the late calving problem. Other than this, Isaac had been focusing on trying to improve on the 'ten or a dozen' little things that influence fertility including AI practices, visual assessment, and nutrition.

On the nutrition side, Isaac has been trying to feed the cows a bit better. He was told by his veterinarian that more mature grasses, which may make him lose a bit in milk production, are actually better for reproduction. 'There's a balance' that Isaac is trying to work out for his cows, though he admits that he is 'not quite into it like some of the other blokes are'.

Post drought and future

Two years ago there was a 'really wet summer' that gave Isaac the chance to build up his fodder reserves again. At the time of the interview he had nearly 12 months' worth of reserves in his sheds.

Isaac sowed a paddock of lucerne on the 60-acre block he bought in the early 1990s. During the wet summer he didn't have to water it at all. While this year he did have to water the lucerne, the water requirements were much lower than for perennial pasture. He started growing the lucerne to increase the amount of 'good quality feed' he was producing on farm.

Isaac thinks that, historically, the pasture production on the farm probably wasn't as high as on some other farms. However, he had improved - 'crept up a little bit'. Isaac fertilises and oversows his pasture as a part of his routine pasture management. He generally fertilises on a yearly basis. He does this on the farm as well as on the leased block.

However, he thinks 'it's a little bit different' now. He currently soil tests so that he can 'pick and choose' which paddocks to fertilise. This is 'mainly because of the expense' of fertilising. Isaac thinks that his farm has 'got probably a little better soil structure' which means that he doesn't have to fertilise quite as much. Though it may 'go against some people's beliefs', he gets 'fairly good production'.

Since the drought Isaac has 'been trying to build back up numbers a little bit'. With the current farm structure Isaac thinks they need to be milking about 170 to 180 cows to make it profitable, depending on milk price. While they can 'get through' with 150 to 160 cows, this limits their ability to upgrade machinery. As well, Isaac thinks, 'you need to be making a little bit up your sleeve somewhere'. The drought limited Isaac's ability to upgrade the machinery that 'should have been normally rotated somewhere along the line'. This has put Isaac and his wife in a situation where there are a number of things that need changing all at once.

Isaac thinks that he should build up to 180 or 190 cows which he could milk by himself. He doesn't want to employ anyone as the costs associated with having an employee 'add up these days'. If he was going to employ someone he would need to milk an extra 50 cows, which would take the farm up to 230 to 240 cows. Getting that big 'creates a problem' as the block isn't big enough.

In the last 12 to 18 months half of the leased block was sold. Isaac continues to lease the remaining 50 acres as a dryland block. Looking back at it, Isaac thinks that that he 'should have bought the lot, but that's the way it goes'. Isaac thinks that he will continue to work on the farm for a while longer, to build it up a bit more and 'put a little bit away'. He then plans on retiring. The drought set them back in that regard.

Farm Narrative 10: John and Jacqui

John's family has a long history with his farm. John's great grandfather and grandfather (his son) were the original selectors on three connected blocks in 1872. The 80, 80 and 60 acres were combined and run as one farm of 220 acres. They acquired another 112 acres two miles away but John is unsure whether that was selected at the same time as the 220 acres.

John's family has milked cows on the farm since first acquiring the land. In the early days the dairy cows were a part of a mixed farming business as 'they had a bit of everything in those days'.

By the time John was born in 1944, his mother and father ran the farm. John's earliest memory on the farm was sitting on a channel bank and watching his father plough the paddocks with horses in about 1948. The farm was still a mixed enterprise business. John's parents had about 40 dairy cows as well as pigs, steers and sheep (120 ewes). They produced crops and pasture to feed the different livestock. They had the pigs and dairy cows on the 220-acre home block and used the 112-acre outblock for other stock (heifers, steers, ewes) and to grow barley for the pigs. The outblock was too far away for walking the dairy cows to the dairy shed.

At that time the local factories bought cream, rather than fresh milk, from dairy farms. John's parents used a separator to separate the cream and skim milk. The skim milk was fed to the pigs.

The farm was set up for irrigation and, while the farm historically had irrigation water, prior to 1959 the water right was about 40 to 50 acre-feet (49.33 ML – 62 ML). This meant the farm had very little water. John's parents grew about 60 acres of summer-active lucerne on the 220-acre home block for the cows, because it didn't have to be watered nearly as much as other pasture. They also fed the cows chaff in bales.

In around 1959 the rules regarding water changed so that water rights were determined by titles rather than acreage. This was good for John's family as they had four titles and 'finished up with quite a substantial water right' of about 350 acre-feet (430 ML).

Conversion to summer pasture from lucerne

The sevenfold increase in water right meant that John's family 'had plenty of water' and decided to convert the lucerne over to summer pasture, a mix of summer-active clover and

rye. There was a paddock of summer pasture near the house. To convert all of the lucerne over to summer pasture they let the cows graze on that pasture and carry the seeds over to the lucerne paddocks. They just 'had to keep watering it'. Eventually the lucerne was converted to summer pasture.

At about the same time a 15-year-old John came back to work on the farm full-time. John had three sisters none of whom were interested in working on the farm. While he was working full-time on the farm he was not paid. 'That was the thing in those days: you worked for nothing.' To earn some money John also worked off-farm picking fruit, driving a tractor and as a rouseabout in local shearing sheds.

After John started working on the farm the family started to increase the dairy herd size from 40 cows up to 120 cows. They increased the dairy herd size to make more money from the dairy itself, not to increase skim milk production for the pigs. They continued to rear the pigs and some steers, though they got out of sheep at about that time.

John got married to Jacqui in 1963. A year later the factories started taking whole milk rather than just cream. This meant that there was no longer excess skim milk for the pigs. The family installed a milk vat at that time for milk storage. John's family kept pigs until 1967 or 1968. His parents had moved off the farm and into town. John's father used to transport whey from the milk factory back to the farm for the pigs. The milk factories 'used to give it away in those days'.

When John's family put in the milk vat they also put in a herringbone dairy that 'was big for its time'. When they were first putting it in it was going to be six-a-side dairy, but before it was finished they made it a seven-a-side dairy. Two years later they ended up expanding it so that they could fit in an eighth cow with its head out sticking out the front 'just to get another one in'. They were milking around 120 cows at that point.

Cows

When John's family were milking 40 cows they 'used mainly Dairy Shorthorns'. Dairy Shorthorns are 'nice roan cows' that are good for meat as well as dairy. John's father used to keep the bull calves to rear as steers because they could 'make a living out of about 120 ewes, 10 steers and 40 cows in those days - a good living.'

In the period from 1959 to 1964 John's family tripled their cow numbers, going from 40 to 120 cows. To increase their numbers they 'bought in a heap of heifers'. When the factories started taking fresh milk John's family started gradually converting from Dairy Shorthorn to Jersey-Friesian crosses, which are better milking cows. Since the family was 'shifting to more dairy,' they 'needed a more dairy type of cow'.

John described how he 'had an odd fling' with another breed: Ayrshires. But the 'fad died out a bit' with the Ayrshires, even though 'they were all right'. John has continued with Jersey-Friesian crosses ever since.

When changing over from Dairy Shorthorns to Jersey-Friesian crosses, John's family did not have any problems with the cows fitting in the dairy as the Dairy Shorthorns were already 'a good-sized cow'. As well, the dairy had adjustable breast rails which helped with any variation in cow sizes.

The family used a combination of AI and bulls in their breeding program. They started with AI when John came back to work on the farm, as AI wasn't available before this time. In their breeding program they would start with the AI and then use bulls for the empty cows.

Pasture

After converting the lucerne to summer pasture the 220-acre home block had about 120 acres of summer pasture and 100 acres of annual pasture (subclover and rye). The annual pasture only had to be watered in the autumn and spring.

This meant that they had some pasture for grazing the cows in the summer and some for in the winter. John's family also shut up some of the paddocks for hay production. This was because they always had to feed out some hay over the winter. John thinks that one of the reasons they had to feed out was because they 'probably never went out hard enough', never really pushed the pasture production.

Ever since laser grading emerged as an irrigation management practice in Australia John has been doing it. The whole farm has been laser graded and was done, a little bit each year, to improve irrigation efficiency.

Growing tomatoes

There was a downturn in the dairy industry starting around 1972-1973. At that time other farmers were 'shooting all the cows'. 'The cows were worth nothing. The milk was worth nothing.' Luckily John and Jacqui didn't have to shoot any of their cows though they did sell 'a few for nothing, just to get rid of them'.

John and Jacqui started growing irrigated tomatoes on the farm. They ended up growing them for about five years. They started off with about an acre-and-a-half and got up to about 15 acres of tomatoes. While they were growing tomatoes they continued to milk all 120 cows. The cows became second priority to the tomatoes. The income from the tomatoes kept the farm going.

It was hard work for John and Jacqui during that time managing the tomatoes on top of what was already fulltime work managing the cows. John recalled, 'one thing about it, you slept well, for the few hours you got'. John and Jacqui's three children used to help with the tomatoes. Their son was 14 by the time they were finishing up with tomatoes and shortly afterwards he decided to do an apprenticeship rather than stay on the farm.

After the tomatoes John and Jacqui grew cabbages, but 'so did everyone else'. They ended up selling the cabbages at the market and out of the 'back of the ute' for \$0.20 each.

After a few poor years dairying 'came good' and became the focal point of the business again. Milk prices went up and 'chopper cows' were starting to make some money. Things were a bit more stable through the late 1970s and John and Jacqui were able to just focus on dairying for a while.

Changing farm ownership

Up until the late 1970s John and Jacqui were share farmers on the family farm. This meant they earned a portion of the profits but John's parents still owned the farm. John's father used to come out on the farm to help with things, such as baling hay, but had 'just lost interest' in the farm in the mid-1960s after the tragic death of one of John's sisters. Since that time John made the farm management decisions.

In the late 1970s John and Jacqui bought the 112-acre outblock from John's parents. Four years later they bought another 77 acres at the back of the 112 acres. John recalled that shortly after this, in the early 1980s, there was a drought. It didn't impact the farm much, though they did agist (with government subsidy) some of the young stock.

In 1982, John was looking for help with some of the farm work. A 17 year-old nephew came and worked full-time on the farm. The work arrangements were set up so that the nephew received a percentage of the profits from the farm rather than a wage, as John thought that receiving a percentage of the profits motivated workers to get the most milk out of the cows. From 1982 up until 1995 John and Jacqui had a farm labourer. The nephew was there off-and-on, as was another worker.

In 1983 John and Jacqui bought the 220-acre farm from John's parents. John's parents financed the farm for a couple of years with no interest and then John and Jacqui put the loan through a bank to pay John's parents out. John and Jacqui had to take on a bit of debt to buy the farm.

In 1990, John and Jacqui sold the 189-acre outblock and bought a 90-acre block adjacent to the home block. This meant that the farm was essentially one connected block with 456 ML of water. The extra money they made in the sale of the 189 acres enabled John and Jacqui to put some money aside.

John and Jacqui bought the 90 acres because it enabled them to graze more cows on the dairy farm and they wanted to be able to milk more cows. They were trying to increase cow numbers for financial reasons. With costs increasing John knew that he had to do more: 'get bigger or get out'. At around the same time John started feeding pellets to the cows in the dairy to boost production.

By the mid-1990s, the farm business was milking 200 cows. They were spending four hours in the morning doing the milking, which was too much time in the dairy. John and Jacqui decided to build a bigger dairy. They used some of the money they had put aside from the land sale. They built a 24-a-side swing-over herringbone. The new dairy is actually equipped for 25 cows, as there is a spare set of taps, however they have never milked 25.

Calving pattern

John always calved in the spring on his farm. Then in the mid-to-late 1990s he started having problems getting cows in calf. While there were always some that didn't get in calf, the number started increasing. John described it as something that 'creeps up on you'. At first he noticed more cows were calving later. Then he started having an increasing number of empty cows. In the late 1990s John started split calving. He carried the empty cows forward and put a bull in with them later, so that they would calve in the autumn.

John thought that the increased fertility problem was a result of cows being better producers these days. His cows could produce well for two years without calving. Since going over to split calving, John got into a fairly consistent balance of 200 cows calving in the spring and 60 cows calving in the winter.

Share farmers

A year after the new dairy was installed, John and Jacqui decided to take on a share farmer who moved to Australia from overseas. Having a share farmer meant that the farm could continue to increase cow numbers. They set up an arrangement where the share farmer didn't have to pay costs and received a percentage of the profits. While acknowledging that it was probably a pretty good deal for the share farmer, John figured that 'if you pay them well they do a blooming good job'.

Wearing all of the costs could be a bit tricky for John and Jacqui so the relationship between them and the share farmer was important. John described it as 'all on trust'. It helped that John and Jacqui still lived on the farm. They could see day-to-day what was happening on the farm. John also worked full-time on the farm doing tractor work: making hay.

As it turned out, the share farmer 'was probably one of the best things that happened to the farm'. They got along really well and learned a lot from each other. The share farmer took on all of the herd management decisions and John worked with him to make decisions about the farm infrastructure.

John and Jacqui built a new house closer to the dairy for the share farmer. The house they had originally thought would be used by the share farmer was further away. John and Jacqui were concerned about the share farmers having to leave their children while milking and wanted the share farmers to be able to live closer to the dairy.

Bridge

John kept a fairly consistent approximately 50/50 mix of annuals and summer pasture over time. The only cropping done on farm was when he was renovating pasture. When the share farmer came to work on the farm, this mix did not change. John didn't have all summer pasture because 'when you get to the really hot weather you can't be watering everything or you'll just evaporate your water'.

One 40-acre block on the farm was over a drainage channel that did not have a bridge. This made it difficult to graze the cows. The cows had to be walked a long way around to get to it; it was 'just a hassle'. John's family had it set up with annual pasture and watered it in the spring and autumn. They only occasionally put the cows on it and used it predominantly for hay.

Shortly after the share farmer arrived John put a bridge over the drainage channel to improve access to the 40 acres. This meant they could include the paddock in the regular pasture rotation. Putting in the bridge allowed them to increase their numbers by 40 cows.

At around this same time John recalled that 'it must have been pretty tough times' producing enough feed for the cows because they had to park 50 cows in southwest Victoria. Previously, John had mainly bought in hay for his cows. John and the share farmer decided to try producing and feeding pit silage. They put in a feed pad next to the new dairy to enable this. They decided on pit silage because it was a cheaper option to wrapped silage for good quality feed.

This share farmer stayed on John and Jacqui's farm for eight years. He bought his own farm and left in about 2006. When the share farmer left he bought the silage cart and tractor from John.

John and Jacqui took on a second share farmer who only stayed with them for two years. Things didn't work very well with this share farmer and 'he was the worst thing that probably happened' to them. The share farmer wanted to lease the farm rather than share farm but they 'couldn't come to an agreement'. John described himself as 'easy to get along with - probably too easy', but he had 'had enough' with the problems regarding the share farmer and ended up telling him 'to get out by the end of the month'. It didn't end well.

The second share farmer had his own feed cart for the pit silage. When he left he asked for too much money for the feed cart and John just told him to take it with him. John decided at that point to stop producing pit silage. He went back to doing wrapped silage so that he didn't have to buy 'all the big equipment again' that came with doing pit silage.

Drought

John described how the farm generally needed about 550 ML of water in an average year to irrigate the pasture. John used to get sales water in addition to his 456-ML allocation, which

meant they 'had plenty of water'. Then government 'messed up the water' by making it transferable, separating it from the land. 'They emptied Lake Eildon in two years or something.'

Just as the second share farmer left, the drought started to worsen. John ran the farm himself for about a year and a half, 'right during the low allocation years'. John and Jacqui learned 'a whole new way of farming' because of the drought. They learned not to rely so much on pasture-based feed and decided to purchase hay to feed the cows rather than watering. 'It was a cost' but John found he could 'get away with it'. John didn't have to change anything about the farm to start feeding out to the cows. They already had a feed pad that they had put in for the pit silage.

Given the feed prices in the drought, the reality was that John and Jacqui 'weren't making any money' but 'were just bumbling along'. There were a couple of things relating to water that worked in their favour and helped them get through the drought.

Given they were buying-in their feed, this freed up some of their irrigation water. One year they only got 27 per cent of their allocation. That irrigation season John sold the water on the temporary water market to someone in Mildura for \$1,170 per ML. John doesn't 'know how the poor guy' could afford to do it as 'you'd have to go broke doing things like that'. After Christmas in that same year John bought temporary water back for about \$300, or even \$150, per ML.

Another thing that helped John and Jacqui in the drought was the NVIRP program which included reconfiguring the area's irrigation infrastructure. John's farm is on the backbone of the public irrigation system. NVIRP gave John money in around 2008 to rationalise two Dethridge wheels and carry out associated on-farm work. NVIRP took the Dethridge wheels out before the agreed date so John got some compensation money for that as well. The NVIRP money helped get John and Jacqui through the drought.

John and Jacqui managed to get through the worst of the drought still milking all of their cows. They did not have to agist or park cows to manage feed constraints due to lack of water. They didn't make any money through the drought but they got through it without owing anything either. After the drought, John oversowed his pasture back to a similar balance of summer and winter active pastures.

Towards the tail end of the drought, in 2008, they took on a couple as share farmers. The new share farmers were very good and the farm was going well. They had built the milking cow numbers up to about 260 at the time of the interview. As well, John was managing another person's block four to five kilometres away. John was agisting the young stock from his farm on this other block, which meant they only had to carry milking cows on the dairy farm.

In the past few years there had not been many significant changes to the farm. John looked into an on-farm irrigation efficiency program, in which he would have had to give up some water in exchange for a negotiated irrigation infrastructure upgrade on-farm. He thought about his age and then decided the program wasn't for him.

Overall, John and Jacqui were not 'looking too far ahead' given their ages and were 'making decisions based on tomorrow'. They planned on staying on the farm as 'dairying has been good' to them. They were going to stay on the farm as long as they could and John was still doing improvements, just not 'grand scale ones'.

John and Jacqui thought that their daughter and son-in-law were interested in the farm for the future. The younger couple were already dairy farmers and had three sons. Even if they only used it as an outblock for a while, John didn't doubt that at least one of the sons would end up a farmer. The reality with the farm was 'if you sell it they can't ever get it back'.

Farm Narrative 11: Karl and Keith

Keith currently manages a 393-acre dairy farm with a 449-ML water entitlement on which he milks 180 dairy cows. He leases the farm from his father, Karl. The interview was conducted with both Keith and Karl.

Karl's father purchased the original 138-acre farm, with 138 acre-feet (170 ML) of irrigation water, in 1944. The farm already had a house and was set up as an irrigated grazing enterprise. Karl was 20 years old when his father bought the farm. The farm was a family farm, so Karl, his father and Karl's sister all worked on the farm. Individual family members were not paid a wage for contributing to the farm. The family converted part of the farm over to market gardening. They planted vegetables such as potatoes, tomatoes and peas on about 30 acres of the property. They used the rest of the farm for irrigated pasture production for grazing cattle.

'Things started to change' on the farm when Karl got married to Katherine in 1949. Karl and his father bought another 138-acre farm with 138 acre-feet (170 ML) of water about 15 km away. At that time Karl's father put the original farm over into Karl's name and Karl took over exclusive management of the farm. Karl's father moved to the new farm and managed it as a separate business.

Changing farm enterprises

Karl made some significant changes to the farm once he took over management. He decided to reduce the vegetable production to a focus on 10 acres of potatoes. He also started new enterprises in dairying and pigs. The wider family thought Karl was 'nuts for starting up dairying because the family was traditional market gardening'. He decided on these three enterprises because the combination would provide him with more income.

In 1950, when he went into dairy production Karl put in a six cow walk-through dairy shed. He also sowed about 100 acres of pasture for the dairy cows. At that time the factories only took cream, not milk. Karl would separate the cream from the milk for the factory and feed the skim milk to the pigs. In the first year of running the dairy enterprise Karl milked 27 cows. The second year he milked 48 cows and then he 'increased year by year' to where in 1976 he was milking nearly 240 cows. At the time he 'was the biggest dairy farmer around the district'.

When Karl went into pig production he started with about 100 pigs. He built pigsties, feed and water troughs (including the installation of a windmill). The pigsties were connected to the dairy shed via a milk line in which skim milk could be pumped into the feeding troughs. As he increased his dairy herd size Karl also increased his pig numbers. Including his 100 sows and their piglets, Karl got up to carrying over 1000 pigs by the early 1960s.

Karl and Katherine had five children, two boys and three girls, between 1952 and 1964. Keith, the current manager of the family farm, was the youngest. This was right through the period during which they were establishing the mixed farming business. Undoubtedly, this was a busy time for Karl and Katherine in terms of the family and the farm business. As Karl increased farm production he had problems with getting labour. Karl described how they 'were working 24 hours a day' with the pigs and cows, and he was still producing potatoes.

Getting bigger

In around 1956 Karl bought a 105-acre block with 136 acre-feet (168 ML) of water that was right next door to his farm. The block was set up as an irrigated dairy farm, with paddocks for grazing and a dairy shed. However, 'it was just run down' and the dairy 'wasn't any good'. Karl used the block in pasture production for his dairy cows. He also cropped it for grain. Some of the grain was fed to his pigs and some was sold.

Within a few years of buying the 105-acre block next door, Karl bought a 150-acre block across the road from the original farm. This new block was set up as one block and had been used for wheat production and dryland grazing prior to Karl purchasing it. When Karl bought it he had to divide it into paddocks and install irrigation infrastructure.

The 150-acre block had 90 acre-feet (111 ML) of water. This block had less water because the block was part of a larger property that had been split up. When Karl bought the block it was with an understanding that there was supposed to be a caveat on one of the other blocks being sold giving water to Karl. This didn't end up happening.

Karl borrowed about £10,000 to buy and renovate the 150-acre block. Prior to buying the block Karl did not have any debt on the farm. Karl thinks that he paid about £50 per acre for the land. He bought the block because he saw an opportunity to 'get bigger'. With the added blocks Karl increased the farm to 393 acres with 364 acre-feet (449 ML) of water.

Dairy herd breed

Karl started off with a herd of Jersey cows in 1950. After several years of Jerseys, Karl decided to convert the herd to Friesians. While Jersey cows produce more cream as a percentage of the milk volume, the Friesians produced a greater volume of milk. For Karl, a greater volume of milk meant more cream for the factory and more skim milk for the pigs.

Karl used bulls in his breeding practices up until artificial insemination (AI) was available, which was around the same time that Karl started converting to Friesians. Karl converted the herd over to Friesians through breeding. He used Friesian semen in his AI breeding practices and transitioned his cows over to Friesian over time. This meant that his cows ‘gradually got bigger and bigger’.

Through the 1950s and 1960s, Karl increased the size of his cows and the size of his herd. This led Karl to make significant changes to his dairy. The original six cow walk-through dairy was replaced by a six-a-side double-up herringbone. This was extended to an 11-a-side double-up herringbone in about 1968, when Karl had 240 cows that were predominantly Friesian. The 11-a-side dairy meant that Karl could milk 22 cows at a time.

Karl managed the change in cow size as he transitioned the herd from Jersey to Friesian by setting up the dairy with moveable breast rails. While the original walk-through dairy for the Jerseys had what Karl described as a ‘conventional rail’, the moveable breast rails in the herringbone dairy enabled Karl to accommodate the cows that were increasing in size.

Feeding cows

Self-sufficiency with regard to feed production was important to Karl. On Karl’s 393 acres he had about 40 per cent in annual pasture, which was productive over the autumn, winter and spring periods. The rest of the farm was in summer-active perennial pasture. Having a combination of annual and perennial pastures was important as it provided ‘a good balance’ of feed for the cows.

The entire 150-acre block across the road was sown to a subclover-based annual pasture. A percentage of the home block was in annuals as well. He used the annual pastures for grazing and for hay production. Every year Karl made hay. Some years he had surplus hay and was able to sell it. However, Karl never bought any hay as he was always able to produce what he needed on-farm.

The location of the annual versus perennial pasture on the farm was determined by soil type and drainage (land slope). The heavier clay soils on flat country with poor drainage grew better subclover. This described the land on the 150-acre block across the road. The perennial pasture was put on the country with better landfall and drainage.

However, if the soil and drainage differences were not so pronounced, Karl would still have had a similar proportion of annual and perennial pasture. For example, if the entire farm was free-draining sandy soil it would not all be sown to perennial pasture as subclover 'makes better hay'. Karl needed the balance of annuals and perennials to enable him to maintain self-sufficiency in feed production.

For Karl, water was not a constraining factor in what pastures he grew. About a year after Karl took over the family farm Lake Eildon was enlarged to enable a greater regional storage capacity for water. Karl, and other irrigators were offered the chance to double their water use through 'sales' water. Karl 'never ran out of water'. When his irrigation allocation ran out he would use his sales water.

Tough times

In 1968 Karl bought a 217-acre block with 300 acre-feet (370 ML) of water. The block was about a mile away 'as the crow flies', but closer to two miles away via the road, from the family farm. Karl bought the block to run a beef cattle enterprise as a part of the farm business.

In the late 1970s and through the early 1980s things got 'really tough' for Karl and his farm. Karl already had problems getting enough labour to help him on the farm. When he bought the 217-acre block this problem worsened. He continued to have a hard time finding workers. When he did find them he 'had headaches all the time' because the workers wanted to tell Karl what to do rather than taking on the tasks that needed completing. Fairly quickly Karl worked out that the extra block 'was too much' for him given the labour problems. He decided to give the block to his eldest son (who was in his mid-20s at the time) to run as a separate farm.

At around the same time that Karl bought the 217-acre block he started getting out of pigs. The factories started taking whole milk rather than just cream. This meant that there was no surplus skim milk available to feed the pigs. As well, 'pig prices dropped'. 'Everything was

going wrong' for Karl as the milk and cattle prices also fell with a downturn in the market. Karl recalled other farmers having to shoot their stock.

Karl described how he had a dispute with the milk factory and the union, which increased the pressure on his business. At that time, Karl was milking 240 cows and the factory had to send a truck twice-a-day to pick up his milk because of the volume he was producing. Karl started having problems with the factory because tests were indicating that his 'milk wasn't up to standard'.

Karl observed the driver taking samples of his milk and noticed some problems with how the samples were being taken that were causing the poor test results of his milk. The driver was collecting milk samples from the hose on the side of his truck when he arrived, rather than from Karl's milk vat. This meant that the samples were from the milk in the hose left over from the previous farmer, not Karl's milk vat.

Karl saw the driver testing his milk in this manner at 2:00 am one morning and said to him 'Look, it takes me 24 hours to get that milk in there; it only takes a minute to bugger it up'. After Karl tried to talk to the driver about how he was collecting samples the driver complained to the union. 'The union was strong' at that time and the very same day Karl was faced with three union representatives who told him that they were putting a ban on his farm. Karl was accused of using a shovel to threaten the driver taking the sample. Karl said 'I wasn't holding a shovel'.

The union went to the factory and told the factory manager not to pick up milk from Karl's farm. The manager said that Karl was one of the factory's 'best customers' and that he didn't have a history of threatening people. The manager negotiated a compromise where a different driver was assigned to pick up Karl's milk.

Karl 'got discouraged'. He had stopped producing pigs; he then ended up getting out of vegetables completely and reducing his dairy herd size from 240 down to 150 cows. He 'got rid of all labour' as, with 150 cows, Karl and Katherine could milk on their own.

In around 1978, Karl decided to get out of dairy completely and converted the farm to beef cattle. Karl transitioned to beef cattle by putting beef bulls over the dairy cows over two years. He kept the bull calves as steers and the Friesian-cross heifers as breeding stock for the beef herd. In 1980 Karl got the Friesians in calf using AI Friesian semen, at which point he

sold his 120 dairy cows. Karl didn't have to make any changes to the farm when he went into beef cattle. He simply ran the cattle on the existing irrigated pasture.

At the time he converted Karl had no farm debt. In the decade he was in beef cattle Karl was able to 'make a living out of it', though he did go 'backwards'. As Karl was making less income, he 'wasn't making enough to put back onto the land'.

Change in farm management

Keith, Karl and Katherine's youngest child, came back to manage the farm in August 1991. Keith was 27 at the time. He had gone to university and worked in Melbourne for a number of years. Over those years he was living in Melbourne, Keith travelled home 'most weekends' and helped his father. Keith was married in 1990. He and his wife decided to move back to the farm because of 'a growing disinterest in the city'.

Karl was 'tiring', so managing the farm was 'getting hard'. He was 67 at the time. Karl leased 243 acres of the farm to Keith, enabling Karl to still get an income from the land. Karl decided to continue to run steers on the 150-acre block across the road. Karl and Katherine moved into a nearby town. However, Karl 'didn't really retire' because he continued to help Keith on the farm.

Keith made all of the decisions relating to the part of the farm he leased. Even so, he sought his father's input. In the first year Keith continued managing the farm as a beef cattle enterprise. He realised that they 'were going backwards fast staying in beef'. They couldn't 'sustain a decent income on beef'. The lack of income from beef meant they couldn't put fertiliser back on the pasture and that meant Keith couldn't grow enough grass.

Keith decided to convert the 243 acres to dairying. He bought 100 Friesians cows and 35 two-year-old Friesians heifers from a farmer who was getting out of dairying. Keith wanted Friesians because they produce a good volume of milk. Keith didn't have to make any major infrastructure changes to enable him to go into dairy. He was able to use the same milking shed, though it hadn't been used in 12 years. He only needed to replace the rubber parts. There was also an existing 2100 litre vat.

Over the first few years of running the dairy Keith increased the milking herd size from 100 to 150 cows. It did not take Keith long to discover that his milk vat was too small. He decided

to put in a 7600 litre milk vat. For the number of cows that he had at the time it was a large vat; 'nowadays it's not'.

Calving

Keith has always calved in the spring. Karl did the same when he had a dairy enterprise on the farm. Keith had tried 'a little bit' of autumn calving but found that the farm was 'too flat to run dairying through the winter'. By drying off the cows through the winter he can avoid the problems with pugging and water logging that the cows get with milking over the winter.

If Keith were to convert to autumn calving it would require more infrastructure changes. He would have to set up feeding pads and a shed to house the cattle. That would all be extra costs.

Keith described how fertility issues just 'come with the job'. Since he bought the herd in 1992 Keith has always had around a 15 per cent empty rate.

Farm planning

For the first couple of years that Keith was managing the farm he maintained the pasture as it was. He then realised that he 'just wasn't able to feed the cows properly' with the existing set up. With his increasing cow numbers, he needed to also increase his pasture productivity.

With an aim to increase his farm productivity, Keith had a WFP developed for the 243-acre block. As well, the farm had salinity issues and Keith wanted to get the water table down and plant trees to reduce the problem. The WFP included infrastructure changes to increase irrigation efficiencies, such as laser grading and bigger irrigation bays with bigger bay outlets. The WFP also included a lot of changes to the layout of paddocks. The farm was originally laid out with a smaller number of large paddocks. These large paddocks would have been hard for Keith to divide in their existing layout. Dividing the paddocks was important so that Keith could set up a rotation in his grazing pattern.

In the mid-1990s Karl decided to get out of steers. Keith started leasing the 150 acres that Karl had been using for steers. Keith couldn't use the block for his dairy cows as the cows would have to cross a main road to get to the dairy shed, which 'was just too dangerous'. He used the 150-acre block for his young stock and for making hay. The whole block was sown to annual pasture.

Water started to become scarcer in 1997, which is what Keith identified as the first year of the drought. It was the same year that Keith's second of three children was born. The drought pushed Keith into implementing the WFP faster than he expected. In fact, Keith completed in five years (1997-2002) what he had planned to complete in 10.

As water became scarcer Keith started 'taking more and more land out of commission'. He focused on irrigating his smaller areas of fertile pasture and produced a lot more pasture than if he had tried to spread the water across more land. He focused on renovating the pasture that he had taken out of commission. When other farmers asked Keith why he was renovating pasture in the drought he said, 'it's not growing anything now so what am I missing by working it up?'

Keith had a water entitlement of 423 ML of water. When Keith first took over the farm he used all of his entitlement and all of his sales water. When the drought first hit there was water in Lake Eildon and Keith used all of his entitlement as well as at least 80 per cent of his sales water. Keith thinks he was 'using a lot of water' for a while because he was renovating pasture.

During this period of renovation Keith continued to increase his herd size to where he had around 180 cows and was producing around 6000 litres a day. Keith and Karl both thought the difference in cow size and production were 'amazing'. Karl had a 'really good herd' in his day, but the difference in breeding as compared to 15 years ago was evident.

Early 2000s

Through the 1990s and into the early 2000s Keith managed to keep 'everything in-house'. However, once the drought reached a peak in 2002, Keith ended up parking 40 to 50 cows for one season. It worked well for him as he 'found a good guy' to park the cows with. This was the only time Keith had to park cows.

After 2002, Keith 'had a couple of fairly good years' and then the drought worsened again. Keith decided at that time to sell his worst-producing cows and reduced the herd down to around 130 cows. For the next few years he maintained a seasonal pattern where he would milk 150 cows through the spring, when there was plenty of feed. When the grass dried up and Keith had to pay for supplementary feeding, he would reduce his herd size down to between 120 and 130 cows. He was 'still trying to be as self-sufficient as possible'. It was

only in the last three years, starting at around the 2009-2010 season, that things improved. Keith had 'starting picking the herd number up' again since then.

Other than reducing cow numbers, Keith managed through the drought by feeding the cows as much hay, silage and grass as he could produce on the farm. Throughout the drought Keith thinks that he got about 50 per cent of his irrigation entitlement on average. As water allocations started going down, Keith started drying off the new perennial pasture that he had established. The pasture was 'growing really, really well' too.

Keith didn't buy or sell any water during the drought. Keith thought that the prices for water were very high during the drought. It wasn't worth the cost to his business. He has never bought water on the temporary water market.

During this period Keith had to buy in some hay and reduce grazing time. He focused on growing enough pasture to graze once a day and then fed out hay and silage to the cows on the dry paddocks. To supplement the feed Keith also bought a silo and started feeding pellets in the dairy.

Throughout the drought Keith grew most of his own hay but also had to buy in some hay because he just couldn't produce enough on the farm. Keith bought about 200 tonnes of hay over all, which was 'not a huge proportion'. Keith produced all of his own wrapped silage, which he starting doing in around 1997.

Having a combination of both silage and hay was important to Keith as they have different benefits at different times of the year. He Rocky fed silage in the hotter months and hay in the colder months. In the hotter months silage takes less energy to digest, which prevents the cows overheating. In the colder months the cows need to eat hay, which makes them produce more heat and warm their bodies.

At times, Keith found that the cows were not getting quite as much feed as they needed. When that happened they didn't 'make as much milk'. Keith had a business strategy to keep his overheads down. During the drought he couldn't see the point in spending too much money buying in feed and water. He focused on keeping his costs down and reducing stock numbers. This worked for him, especially since he 'wasn't getting a return on the milk prices' at the time.

Through the drought Keith did not have to take on any farm debt. His accountant and bank manager would ask him how he was doing it, given ‘a lot of people were going backwards real fast’. Keith said ‘it’s not rocket science, you just keep your overheads down’.

Keith and Karl both think it is challenging these days in dairying as the input costs keep going up, such as those of labour and machinery, but the income doesn’t go with them. For example, the sale price that Keith recently received for his Friesian bull calves was the same that Karl received when he was milking back in the 1970s. This meant that ‘farming is going backwards’. Karl questioned whether ‘it’s worth slogging it out’ with farming at all.

Irrigation infrastructure

The farm is near the end of a five to six kilometre long irrigation spur. There are five irrigators on the spur, including a government-owned facility. Keith didn’t think that G-MW was planning to rationalise the spur and that the spur will continue to be managed by G-MW. Having the government facility there ‘probably helps’. As well, G-MW recently remodelled a section of Keith’s channel bank. He didn’t think they would spend that money if they were going to rationalise the spur.

The public irrigation infrastructure had been upgraded and Keith thought that the new system ‘works great’. He had not had any problems with his new ‘magflow’ irrigation outlets. Keith was provided \$20,000 to make some on-farm water use efficiency changes. He was later audited with regard to these changes, which entailed submitting proof of expenditure on approved on-farm works.

As a part of the upgrade Keith rationalised two of his five irrigation outlets. The two outlets only irrigated an 18-acre section of the farm near the edge of the property. Keith was paid compensation for rationalising the two irrigation outlets. It was valued at what it would cost to make some on-farm infrastructure changes to enable irrigation on the 18 acres. This was cheaper for G-MW than the cost of installing new outlets. Keith decided to use the money for other things rather than the infrastructure changes. In the future if he decides to start irrigating the 18 acres he is going to have to find the money from somewhere else. Keith now uses the 18 acres for dryland production. He didn’t have to do anything to change its use, ‘just let it go dry’. Keith looks at the weather and decides whether to put in crops or annuals on the 18 acres.

There was an on-farm efficiency program offering infrastructure upgrades in exchange for water at around the same time that Keith's irrigation system was being upgraded. Keith didn't apply for the program because he had already improved his irrigation system when he implemented the WFP. Keith's farm is already operating at a really irrigation-efficient level.

Currently, Keith thinks that he probably needs only his entitlement in a typical year. This is because he is 'able to produce more pasture on fewer acres'. The balance of annuals and perennials has shifted so that he now has more annuals and fewer perennials. While before he had probably 60 per cent perennials and 40 per cent annuals, today he has the reverse.

Post drought

At the time of the interview Keith had close to 180 cows, which he thought was about his limit. The infrastructure 'wouldn't cope with much more'. Keith was still using the same 11-a-side dairy that his father used before he got out of dairying in 1978. As well, Keith could be self-sufficient with the farm at its current size with 180 cows. That meant he did not have to buy in anything other than the grain he fed in the dairy. The farm required about one labour unit to manage it.

Over the years Keith ran the farm on his own. Keith and his wife had three children and Keith's wife ran her own business which took her off-farm. About four years ago his wife's business was thriving and she was off the farm for an increasing amount of time. Keith took on the role of 'home dad'. This meant that he looked after the house and managed the children's needs. Keith did that over three years and it was difficult. The most challenging part was the evening milking as that same period was when he needed to be looking after the children and their needs and preparing the evening meal. Keith just couldn't be in two places at the same time and he was 'burning out'.

A year ago Keith hired someone to do the afternoon milking. While Keith managed everything else with regard to the farm, having someone do the evening milking took a bit of the pressure off him.

Future of the farm

Keith plans on continuing to maintain the farm. The cost of building the infrastructure he would need to increase production on his farm is greater than the return he would get out of it. He couldn't milk more cows and still be self-sufficient with regard to his feed inputs. As

well, if he were to change the dairy he could reduce the milking time but he wouldn't get paid more. He would only be doing that for a 'better lifestyle' and Keith already had a better lifestyle with having the evening milker.

Given the focus on maintenance, any money that came in was being invested off-farm to set Keith and his wife up for retirement. While he has three children, none had expressed interest in farming. Keith 'wouldn't encourage it either'. Keith thinks that 'it's a shame, it's sad but no, unless prices change and we get a bit of Government support like other European countries get, it's just not worth it'. Keith and Karl both think that 'agriculture is dying a very slow death'.

Farm Narrative 12: Lachlan

Lachlan managed a 160-acre dairy farm with 160 ML of irrigation water and 320 ML of groundwater. At the time of the interview he was milking approximately 170 cows.

Originally, Lachlan's grandfather owned 600 acres of land. Lachlan's grandfather ran a mixed farming business which included dairy, beef, sheep and horses. This grandfather had five sons and divided the 600 acres up into sections, giving a block to each son in the mid-1950s.

When Lachlan's father was given his 160-acre block there was no existing infrastructure, it was 'just paddocks'. Lachlan's father built a house, sheds and a seven-a-side herringbone dairy. He put in a 1400 litre milk vat and started running the 160-acre block as a dairy enterprise.

At the time Lachlan's father took over the block the farm had a 120-ML water entitlement. When setting up the dairy enterprise, Lachlan's father installed on-farm irrigation infrastructure in the mid-to-late 1950s. While the irrigation channels were already in the region, this was the first time that it was used on the block.

In the mid-to-late 1960s, Lachlan's father and mother had three children: two girls and a boy. Lachlan was the middle child and born in 1967. Over the early years on the farm, Lachlan's father started converting some of the existing annual pasture over to perennial pasture. By the mid-1970s 60 acres of the farm were perennial pasture and the balance sown to annuals. Lachlan's father didn't need a lot of perennial pasture back then because he was only milking 40 or 50 cows. With 60 acres of perennial pasture and the balance in annuals, there was sufficient pasture for grazing and Lachlan's father was able to cut 'plenty of hay' for the cows.

Lachlan thought that the average herd size in the region in the mid-1970s was probably about 80 cows. Back then, with the monthly dairy cheque 'you could buy a brand-new motorbike, a car, do all your groceries for that month and still have a little bit left over'. As well, Lachlan thought that the costs were very low at that time. Water and power bills 'were pretty much nothing'. Lachlan's father grew all of his own feed and they 'had hay coming out of their ears'. Lachlan's father could 'make a good living out of milking 50 to 80 cows'.

When Lachlan's father ran the dairy farm the herd was a mix of Friesians and crossbred cows. This didn't really change until Lachlan got involved with the farm. Lachlan's father

used bulls in the breeding and always calved in the spring. At its peak, Lachlan's father got up to milking about 80 cows.

In 1989, Lachlan's father decided to stop dairy farming. He sold all of his cows and the farm went dormant for up to a year. Lachlan's father was 'never really a farm bloke' and saw it as 'just a means of making money and a job'. Lachlan's father had always had other businesses that were profitable and 'he'd just had enough of the farm'.

Lachlan took over the farm

After selling the cows, Lachlan's father offered the farm to Lachlan, saying 'it's there if you want to do something with it'. Lachlan decided to get the farm back up and running. At first Lachlan got into hay production and beef cattle. He realised pretty quickly that he was not going to make any money out of hay and beef. Within a year, Lachlan decided to get the farm back into dairy production as he thought he was more likely to make a profit in dairy.

When Lachlan was deciding what enterprises to try on the farm, any initial financial outlay was an important consideration. With dairy, as well as hay production and beef cattle, he could use the existing farm infrastructure. If the farm hadn't had a dairy shed then Lachlan wouldn't have gone into dairying, because of the money he would have had to put into it. As well, with the dairy he could start making money right away. If he were to try something like orcharding, then he would have had to plant trees and wait five or more years before he started getting any fruit.

Another important consideration in Lachlan's decision regarding what enterprise to try on the farm was experience. Lachlan was interested in enterprises that he had some experience with. Again, in considering orcharding, for example, Lachlan hadn't seriously looked at it because he didn't have any experience with fruit trees.

In 1990, Lachlan 'started from scratch' with the dairy farm. He began by buying 40 or 50 cows. He then bought some other smaller batches of cows. Lachlan made decisions about buying in more cows as he renovated pasture. When new pasture was established, enabling him to feed more cows, he went out and bought cows. He got 'up to 120 cows pretty quickly'

The cows that Lachlan bought were predominantly Friesian. Lachlan decided to use Friesian cows because of their high volume of production as Friesians have 'a much bigger capacity

than most other breeds'. Lachlan doesn't have 'a love' for one breed of cow over the other. He is interested in what is going to make him the most money.

Lachlan started using artificial insemination and herd testing with his cows when he took over the farm. He brought in technicians to do these tasks. Lachlan took on these practices because he 'was doing pretty much everything' that he could to 'build up a good herd'. Lachlan considered that he was much better off having 55 or 60 'good cows' than having '100 average cows'. The good cows would produce the same amount of milk for about a third of the costs.

The fertility of Lachlan's cows varied from year to year. Some years fertility dropped and could be as low as 50 per cent. In a good year, fertility percentage could be in the mid-to-high 80s. Lachlan thought that 'seasonal changes' (weather/climate) and nutrition were big influences on fertility. When Lachlan had a low fertility season he carried the empty cows through and joined them again in the next calving cycle. Lachlan had two calving cycles in the year.

Lachlan has always used split calving in his breeding program. He did this because he got more money with calving in the autumn and milking through the winter. Lachlan thought that many farmers did not milk over the winters because it was so muddy. While it was muddy on Lachlan's farm, he found that the climate had changed by the late 1990s and they were not getting 'those wet, stinking winters when you're in mud up to your knees every day and they were just miserable'. It became very easy to milk over the dry winters and Lachlan found that if he irrigated right up until early May he would end up with 'beautiful feed coming out of your ears'.

Changes to infrastructure

At the time that Lachlan took over the farm he had another part-time business that was compatible with running the farm. Lachlan worked in this business from 1990 until around 1998. Lachlan used the income from the other business to cover his living expenses. This enabled him to funnel all of the profits from the farm into developing the farm. Lachlan was also 'fortunate enough' that when he first took over the farm 'the weather was good, milk prices were good - it was just the best time' for the first five or six years.

Overall, Lachlan thinks it is really important when managing the farm to 'run it as a business'. He thinks it is easy to get sentimental about things in farming. He avoids this. For example, 'if old Betsy out there is not producing enough milk, she's gone'.

Early on, Lachlan demolished the old dairy and built a new 20 double-up herringbone dairy. At the same time, Lachlan put in a 10,000 litre milk vat. The dairy and the milk vat that Lachlan put in were twice the size of what he needed. Lachlan 'always had a 10-20 year plan' that included making sure any infrastructure work was 'twice as good or twice as much' as what he currently needed. He did this so that if an opportunity to buy a neighbouring farm came up, he would not have to upgrade again.

Before Lachlan took it over, the family farm was 'an old-fashioned, old-style' farm with 'a lot of laneways and channels and little paddocks'. Lachlan redeveloped the entire farm, starting with a WFP. Lachlan drafted the WFP himself as he knew what he wanted. Growing up on the farm meant that he 'knew every inch of the place' and had a really good idea of how to reconfigure the paddocks and irrigation system.

A WFP was required for any grants that Lachlan might try to access for funding some on-farm works. Lachlan received two grants to support work on his irrigation channels and laser grading. Lachlan also received a grant for setting up power on the farm. Within five years, Lachlan had finished laser grading the property and laid out the farm into five-acre paddocks that are 'a lot easier to maintain, a lot easier to irrigate'.

Lachlan reconfigured the farm based on what he thought would work best on the land rather than following the existing channel system, fence lines and paddocks. For example, the farm had a 20-acre block that had a salinity problem due to poor drainage on low-lying country. As a part of the infrastructure upgrade Lachlan put in a recycle system to drain excess water, run it back to a dam and enable its reuse on the farm. Once Lachlan put in the recycle system the drainage issue and its associated salinity problem diminished. Over the last 20 years the soil has improved so that it is now 'back to quite productive soil'. Other than the land itself, the only constraint on how he could reconfigure the farm was the single irrigation outlet onto the farm from the public irrigation channel, as the farm irrigation system needed to flow from that outlet.

Within a couple of years of taking over the farm Lachlan realised that he needed more water if he wanted to milk more cows. This was during the time that he was 'tipping money back

into the place' so he used one of the milk cheques to buy 40 ML of permanent water at \$1,000 per ML. This brought his water entitlement up to 160 ML. Lachlan wishes that he had bought more water at the time because during the recent drought the lack of water 'pretty much ruined everything'.

As Lachlan redeveloped his farm he set it up so that it was about 60 per cent perennial pasture and 40 per cent annual pasture. The ratio of perennial to annual pasture was what Lachlan needed to be able to feed his cows. The decision regarding pasture location on the farm was predominantly determined by proximity to the dairy. The paddocks closer to the dairy were sown to perennial pasture and the paddocks 'right down the back' were sown to annuals. Soil type was less of a factor in where pasture types were sown, as the soils are consistent on the farm.

Partnership

In the mid-1990s Lachlan was milking 160 cows and running his farm as a one-person operation. He became increasingly aware that, as a one-person operation, he was working seven days a week with no time off. The farmer next door to Lachlan's farm was also milking 160 cows on a similar sized block. Lachlan thought 'we've both got a tractor each, we've got the same amount of equipment, we've got the same amount of cows, we do everything exactly the same, we've both got no time'.

Lachlan proposed to his neighbour that they join the two herds together and run it as a partnership. This meant that they could each have alternate weekends off and there would always be someone who owned half of the cows in charge, ensuring they would 'put the same amount of care' into the animals. As well, they were able to swap weeks off over holiday periods. The extra time off was 'absolutely fantastic' for Lachlan and his neighbour, who had children at the time. Lachlan's eldest child, a son, was born during the time Lachlan ran the farm in partnership, so having extra time for family was important. Lachlan and his partner could also help each other with larger tasks that took two people, such as drenching.

The partnership worked for Lachlan and his neighbour because they had 'similar production' approaches that only needed to be 'tweaked a little bit'. For example, the neighbour was also split calving and joined cows for autumn if he couldn't get them in calf. With the combined herd, Lachlan and his partner milked 330-340 cows. They decided to use Lachlan's dairy

because the neighbour's was very small. As well, the level of automation in Lachlan's dairy enabled Lachlan or his partner to milk on their own within a couple of hours.

Lachlan used the advice of a nutritionist when making his farm nutrition decisions and had done so since before the partnership arrangement. Lachlan learned a lot from the nutritionist and thought that having an 'ongoing rapport' with the advisor was important. The nutritionist came out once a month. During the partnership, one of the benefits of having the nutritionist was that he could be a sounding board and offer an alternative perspective. There were some minor differences between Lachlan and his partner, which were opportunities for Lachlan and the partner to 'learn off each other'. Lachlan described how he is a 'pretty strong-viewed person' and that his partner was more willing to follow Lachlan's lead, which helped.

The partnership only lasted two to three years because, when the drought started, Lachlan's partner 'was really struggling'. The partner was leasing the farm he was on in a 'shake-of-the-hand type' lease. When the drought came and the price of water increased, the owners of that farm sold the water on the temporary market, which put Lachlan's partner under severe pressure. In the partnership arrangement with Lachlan, they each had to put in an equal amount of resources, so if Lachlan put in 200 ML of water then the partner had to do the same. The partner could not afford to pay the high cost of buying the necessary water to stay in the partnership after the owners sold the water. The partner then took his half of the cows and moved to another farm.

Lachlan was disappointed when the partnership ended as it was a really good approach. However, he didn't have to change anything to shift the farm back to a single-operator enterprise. Essentially, Lachlan just went back to how he was running the farm before the partnership, including his cow numbers which had dropped back to 160.

Lucerne paddock

Shortly after the partnership ended Lachlan decided to convert a 16-acre paddock of his annual pasture over to lucerne. He was looking for 'some good quality feed' for his cows for over the summer months. He mainly cut it for hay to feed out to the cows. Lachlan could get six to seven cuts of hay out of the paddock. As well, he was able to produce a couple of hundred extra bales of lucerne hay that he was able to sell for \$50 a bale.

Even though Lachlan put the lucerne in at around the same time as the drought was starting, he didn't put it in because of the drought. While it had 'started becoming ordinary' he had

been expecting it to rain again in the near future as the rain always returns to his area. Lachlan had expected that the dry spell might last for a year or two 'but that's what that dam's for; we just irrigate'. Overall, Lachlan wasn't expecting the extent of the drought when he decided to put in lucerne.

Looking back at his lucerne block, Lachlan thought it was good 'but it's not a be-all and end-all'. Lucerne goes dormant in the colder months, while Lachlan found that his annuals lasted for nine to 10 months. Even so, Lachlan thought that he had a good amount of lucerne with the 16 acres and planned on planting the area to lucerne again when the current pasture declined.

Drought

When the drought started, Lachlan had a 160-ML irrigation entitlement. On average, Lachlan was typically using 200 per cent of his entitlement. He always needed 'at least 250 to 300 ML'. This meant that Lachlan regularly bought water on the temporary market to supplement his entitlement. Lachlan has never bought water for over \$100 per ML, as 'even at \$100, it's hard to make money on it'. Prior to the drought he never had a problem accessing water at a price he could afford.

Lachlan really noticed the drought when he first started getting lower irrigation allocations, in 2004 or 2005. His allocation was 50 or 60 per cent. Water was increasing in prices and got up to \$100 per ML. Lachlan recalled that the following year water increased from \$200 per ML to \$500 per ML, which was 'ridiculous' and 'a waste of time'. Lachlan didn't use carryover water during the drought. Whatever water he had in the season he 'either used it or sold it so there was nothing to carry over'.

During that first year of the drought, when he got a 50 to 60 per cent allocation, Lachlan decided to put in a shallow groundwater bore. As he lived in an area that had high salinity he was able to access a grant to help cover the cost of putting in the groundwater bore. Lachlan contributed about \$10,000 towards the bore.

He got a groundwater licence to pump 320 ML with his bore. Due to the water quality, Lachlan needed to shandy his bore water with some of his surface water and aimed for at least 50 per cent fresh water. Lachlan only used the entire 320-ML entitlement of bore water once during the drought. The need to shandy the bore water meant that using 320 ML of bore

water required 320 ML of surface water. There were points in the drought where the surface water was too expensive to buy.

Prior to the drought Lachlan had about 120 acres of perennial pasture (including the lucerne) and about 40 acres of annuals. Early on in the drought Lachlan was able to maintain this proportion of pasture as he had put in the groundwater bore. As the drought progressed Lachlan did not have enough water to continue to irrigate all of his perennial pasture. He kept about 50 to 60 acres of perennial pasture going and dried off the rest. Over the next couple of years, as the drought continued, Lachlan dried off more perennial pasture until eventually he had dried off all of his perennial pasture .

The perennial pasture that Lachlan dried off he then sowed to annual pasture. He saved up whatever water he had and used it to get the annual pasture started in the autumn. Lachlan did water his 16 acres of lucerne during the drought. It was 'good summer pasture for less water'. To water the lucerne Lachlan used his bore water and the small amount of allocation that he had available.

Generally Lachlan had to buy in feed to supplement what he produced on-farm for the cows. During the drought the amount of feed he had to buy increased considerably and the price he paid for it was much higher. Lachlan didn't have to change the way that he fed his cows however, as he already regularly fed out in the paddocks and fed grain during milking. The cows just required a lot more of each.

Lachlan found that moving the cows in a rotation around the farm from paddock to paddock was better than keeping them in the same paddock when feeding them hay. Moving them around meant that the cows were fertilising the paddocks along the way. Lachlan used to feed the cows for a longer period of time in his 'worst' paddocks so that they would get more fertiliser.

Lachlan generally agisted his young stock for 12 months on a nearby block. During the drought, agistment was harder to find, a lot more expensive and available for a much shorter period of time. Lachlan found he would get a couple of months out of an agistment, so as soon as he had them agisted on one farm he would have to start looking for the next available spot. Lachlan did not increase the number of stock that he agisted during the drought; nor did he park cows.

Financially, Lachlan thinks that he came through the drought better than many other farmers because he started the drought with less debt. The fact that he had another business when he first took over the farm meant that he had been able to pay for things as he went along rather than having to borrow a lot of money for the farm. During the drought Lachlan wasn't under the financial pressure that he saw other farmers facing, including pressure from banks.

While Lachlan had focused full-time on the farm between 1998 and 2005, in 2005 he became involved in another business off-farm that was essentially a seven-day-a-week business. This other business was not necessarily his 'passion' and he approached it the same way he did the farm. As long as the business was going well and making money he would stay in. If things were not going well, he would just move onto something else.

In Lachlan's other business, he generally worked in the early morning for several hours and then again in the late afternoon for several hours, depending on the time of year. The business has some flexibility that enabled him to go back to the farm when needed during the day.

Lachlan employed someone to manage the milking and Lachlan came home in the afternoons to do all of the other farm work. Lachlan kept the finances of his farm and the other business separate, though every now and again 'one will give the other one a hand'.

This other business was going well, which took some of the pressure off of the farm to make a profit. This meant that while Lachlan didn't make a lot during the drought, at a minimum he only needed to cover his farm expenses. The drought still had a big impact on Lachlan's income, however. Prior to the drought he was making about \$100,000 a year from the farm, but during the drought he 'probably came out square'.

'Pausing' the farm

Lachlan 'kept thinking "it's got to break, it's got to break"', but it didn't. Lachlan decided in 2009 to sell his cows. Lachlan was under a lot of stress. He was 'sick of working and not making money'. Lachlan decided that the time was right to sell the cows because things were starting to turn around and 'people started getting a bit of confidence'. Cattle prices and milk prices were improving as well. Lachlan made the decision to sell the cows with the idea that he may go back to farming again.

After selling his cows, Lachlan sold what temporary water he had, though he didn't have much that year given he had only received a 15 to 18 per cent allocation. Lachlan continued

to have costs relating to land ownership (i.e. 'rates') and water that amounted to about \$8,000 to \$10,000.

When Lachlan sold the cows he didn't do anything with the farm for over a year. After a while he could see that weather patterns were changing from El Niño to La Niña and he decided that it was a good time to get back into dairying. Lachlan knew that as things continued to improve cattle prices were going to increase considerably. He had to make the decision to either buy cows at that time for a reasonable price or wait another year to confirm that the weather had genuinely turned around. However, if he waited then 'the cattle would be two or three times the price'.

Lachlan decided to 'go 50/50' and bought 50 Friesian cows in March or April 2010. Looking back at it, Lachlan thinks his decision was a good one because he was able to start making money again very quickly at a minimum cost. At that time he had plenty of hay and it was an easy transition. He employed a milker for the 50 cows.

In around April or May 2012, Lachlan bought about another 100 Friesian cows to get his herd back up to 160 or 170 in total. He increased the hours of his milker at the same time to account for the increased milking time. Looking back on it, Lachlan sometimes wishes that he had stuck with 50 to 80 cows and 'just done it easy'. The increased number of cows was a lot more work. He found that milking three times the number of cows did not mean that he was making three times the amount of money.

Prior to buying the cows, Lachlan 'was never in debt'. He borrowed \$250,000 to buy 120 cows. Lachlan didn't think \$250,000 was a large amount of debt in a dairy enterprise and overall thought that the farm debt was only around 30 percent of the value.

At about the same time that he bought more cows (around April 2012) Lachlan spent a couple of months cleaning up his pasture. He then sowed all of it, except for the lucerne, to annuals. He used a contractor to do all of the pasture work. Lachlan brought in contractors for 'nearly everything' as he is 'not a big believer in having \$200,000 worth of equipment sitting in the shed to be used for a month at a time'. Lachlan thought that if he had 300 or 400 acres then it might be worth it, but for a small farm like his, it just 'doesn't make sense'.

Lachlan decided on annuals rather than perennial pasture because he was waiting for 'a few good years of rainfall' to show that the weather patterns have definitely changed. To Lachlan spending \$8,000-10,000 on perennial pasture was expensive. If it was all killed in another dry

spell then it was 'a waste of money'. As well, temporary water was currently costing about \$65 - \$70/ML. If Lachlan was guaranteed that water was going to be \$20/ML over the next 10 years or so, then he would sow perennial pasture.

In the past few years the public irrigation system has been upgraded. This has had little impact on Lachlan's farm. Lachlan's farm is on the main channel and he is confident that the channel will remain open into the future. His one irrigation outlet was converted from a Dethridge wheel to a 'flow meter' as a part of the upgrade with no ill-effect.

Lachlan didn't apply for any of the on-farm grants that were available at the same time as irrigation system upgrades were occurring. He had already completely reconfigured his farm and could not see any improvement that he could do. Lachlan stated with a shrug that 'the grant wasn't for nothing anyway', as farmers had to give up some water.

The future

In considering the future of the dairy farm, Lachlan thought that it would either stay as it was or he would buy a neighbouring block and double the size. Lachlan was seriously thinking about increasing the size of the farm. His monthly milk cheque was 'worth a lot less' and getting bigger was the only way to improve that. As well, Lachlan thought that he was only going to stay in his off-farm business for another 12 months or so. If he did get out of that business, then he would focus on building up his farm business.

A neighbour's property came up for sale a few years ago but Lachlan wasn't interested as it was during the drought. Lachlan's uncle owns the farm next door and was looking to sell. However, Lachlan thought that it was a bit run down and he was asking too high a price. Lachlan had spent 10 years improving his farm and didn't want to go through all of that again. Another neighbour has a farm behind Lachlan's which 'would be fantastic' from what Lachlan could see and Lachlan was thinking he might buy that property.

Lachlan didn't want to get in a situation where he was 'in million-dollar debt'. He had a friend who was looking to get into farming and Lachlan was looking at setting up a financial partnership with him. Lachlan's friend would buy the other farm and own it as a separate entity. The two farms would be run by Lachlan as a partnership.

To manage a larger farm Lachlan thought that he would need to be on the farm full-time and he would need a worker. However, Lachlan thought that milking 320 cows was not much

more work than milking 160 cows; perhaps 'an extra 45 minutes' work in the dairy'. Lachlan wanted to work it out so that he did not have to work seven days a week. Lachlan was in his mid-40s and had two children. He had worked hard. He wanted to be able to enjoy life a bit more. He and his family had 'a really good 10 years' before the drought and Lachlan wanted to get back to having more time off.

Over the previous six months it had been dry again and Lachlan was starting to wonder if he should really be farming. He had considered selling the farm and moving into town. Lachlan had friends who made \$100,000 doing factory work and they could just leave their worries at the factory gate. However, Lachlan acknowledged that he'd 'probably get bored pretty quickly'.

Lachlan had looked at other types of enterprises that he could use the farm for but fundamentally they would all be unworkable because there was no money in them; their markets were up and down. Lachlan couldn't go into cropping because his farm was 'way too small'. He would need 500 to 1000 acres to make money out of cropping. Lachlan could get agistments but then he would have the problem of waiting for people to pay him, which he had no interest in. Lachlan didn't know enough about vegetables and he didn't want to have to learn how to grow them. Also going into vegetables would require buying a lot of equipment.

Lachlan thought it was a better plan to 'stick to what you know and what you think you're good at'. For him that is dairying. As well, with dairy farming he found that his 'money was guaranteed every month'. He could plan 12 months out what income he was going to get. He could see dairying being 'pretty consistent' into the future.

Lachlan thought that the biggest thing stopping the dairy industry from making good money was the high Australian dollar. If the price were to drop back to 'where it should be', at or below 80 cents, then dairy farmers would get 30 per cent more income - assuming that other people in the supply chain 'don't keep taking, taking and taking'. Lachlan was banking on the Australian dollar dropping.

The reality for Lachlan was that he liked living on the farm. He didn't really aspire to move into town. Living on the farm was good for his children. Lachlan thought 'things are all right at the moment'. He described himself as in 'a little wait-and-see stage'. The owner of the

neighbouring property was keen to sell to Lachlan and his friend. Lachlan's friend was keen to buy the land and start a partnership.

Lachlan was holding back on the proposition because he would be the one managing it and there would be more work involved. It would require that he get out of the other business.

Lachlan had just starting to see results in the other business and he thought it was 'probably just a little bit too early to get out yet'. Within the next six to 12 months Lachlan thought he would have a good idea which way he was going with the farm and the other business.

Farm Narrative 13: Matt

Matt manages a 500-acre agistment enterprise. The 500-acre block is an outblock to a dairy farm that Matt recently sold. At the time the dairy farm was sold, Matt and his family were milking 600 cows on 400 acres.

Father bought farm

Matt's father was a World War II veteran and decided that he wanted to change from his pre-war career in the railroads to farming, as his family was from a farming background. In 1945 he started share farming while he completed an agriculture course that was required to access government soldier settlement funding. After finishing the course in 1949 Matt's father, at 30 years of age, bought a 72-acre block.

When Matt's father bought the block it was up and running as an irrigated dairy farm milking 25 to 28 Jersey cows. The block also had a small orchard with two acres of apricots and one acre of pears. While the orchard was small, the apricots in particular were important for the viability of the farm.

The land had 130 ML of water which was 'a fair bit of water for its size because it had the orchard and it was a small block'. There were about 55 acres of irrigated perennial pasture.

Income from the orchard was used to pay off the loans and enable the building of farm infrastructure. Through the first three years on the farm the apricots 'were absolutely a godsend' for Matt's father. The orchard was removed in the mid-1950s. Matt thought it was removed because the market price his father was getting for the fruit was low. As well, farm emphasis had shifted into focusing on cow numbers and the production of butter fat.

Pigs

Matt's father was married prior to World War II. Within a month of buying the dairy farm their fourth baby, Matt, was born. The family was 'financially strapped' and the farm had to support a growing family with four boys under the age of eight. By 1956, Matt's father and mother had five children, all boys.

Matt's father was seeking out ways to support his growing family. At that time, the factories only took cream from dairy farms, which meant that the skim milk was separated off. The previous owner of the 72-acre farm used to give the skim milk to a neighbour. Matt's father

decided to build a piggery so that he could use the surplus skim milk himself rather than give it away. The piggery became another source of income on the farm.

The farm had 55 acres of perennial pasture and three acres of orchard. The remaining 14 acres of the farm comprised sheds, the house, the dairy, a hay shed and about six acres of 'dead area'. The dead area was an unused low-lying part of the property into which the dairy effluent ran. One acre of the dead area was used to create a bull paddock.

Matt's father built a piggery on about two acres of this dead area. Initially, Matt's father built very simple yards with water troughs for the pigs. In the 1950s he built a big brick piggery. Matt's father kept producing pigs for over a decade. He got out of pigs when the factories started taking whole milk rather than just cream, in the early 1960s.

Dairy

When Matt's father bought the farm it had a very old two-unit walk-through dairy. Matt's father increased the dairy to a four unit walk-through shed so that he could milk more cows. It wasn't long before he increased to milking 50 cows. Over time, Matt's father continued to steadily increase his cow numbers. In his career as a dairy farmer he always focused on increasing cow numbers as a way to keep the farm profitable.

Pasture and buying land

Matt's father maintained the pasture as summer-active perennials for grazing. However, he did harvest a small amount of the pasture for hay. He also bought hay. Matt's father also relied on agistment to ensure there was enough feed to last over the winter.

Matt's father was 'never big in machinery' so when he needed hay cut he brought in contractors to do the work. He did eventually buy an old tractor in the mid-1950s and a mower in the 1960s. The five boys helped on the farm after school and on weekends. By the mid-1960s, Matt and his brothers were helping mow as a part of hay harvest.

To continue increasing production more pasture was important and when Matt's father had the opportunity he bought more land. In the 1950s, he bought an adjoining 15-acre block with 37 ML of water. This was considered 'a good amount of water'. This took the farm to 87 acres with 160 ML of water. Matt's father maintained this as perennial pasture.

In the early 1960s Matt's father bought a 58-acre block back behind the 72- and 15-acre blocks. The block came with 61 ML of water which was 'quite low'. The water right was low because the block was a section of a 155-acre farm that had been subdivided into three blocks of 58, 37, and 60 acres. When water rights were originally allocated to land, larger blocks had less water per acre of land than smaller blocks. While the farm had been subdivided into smaller parcels of land it was not possible to increase the amount of water beyond the combined total in the original allocation.

Matt's father 'was astute' as he could see the value of buying the land, even with a low amount of water. The 58 acres butted onto an irrigation spur channel along the border of the 87-acre farm. Given the proximity of the new block to the spur channel, Matt's father could see the potential of using the channel to irrigate that area of the farm.

The original farm had a drainage channel running through it. In the 1950s Matt's father successfully applied for a drainage pumping licence from G-MW. The licence enabled Matt's father to pump 86 ML of water a year from the drainage channel.

Matt's father planted the 58 acres to annual subclover pasture, as there wasn't enough water to put it into perennial pasture. Matt's father built a wooden bridge across the irrigation channel out of telephone poles and sleepers, so that the cows could access this new area of the farm. Matt's father and brother Martin, who had good skills in this regard, also set up a siphon and pump system to move water from the drainage channel over into the irrigation channel on the new block.

Once there was more irrigation water available eight acres of the 58-acre block was put into perennial pasture. There were 'dry areas' of the block that had been sown to subclover and typically not watered at all. Matt's father oversowed some perennial pasture species, phalaris and paspalum, into these dry areas and started watering it when 'there was spare water'.

In the mid-1960s Matt's father bought a second 15 acres of land with 37 ML of water. This 15-acre block was adjacent to the 15-acre block that was bought in the 1950s. This was maintained as perennial pasture.

Breeding

According to Matt, the family was ‘a bit Jersey oriented’ because the farm had Jerseys when they bought it. During the 1950s Matt’s father started the process of setting up a Jersey stud. This meant that he began keeping meticulous breeding records and had a few cows classified as purebred Jersey. Building up a purebred Jersey line could have been valuable ‘down the track’, though Matt’s father never actually had a bull sale through the Jersey stud business. In addition to keeping meticulous breeding records, Matt’s father used bulls for joining and herd tested within his breeding program.

In the 1960s, after the factories started taking bulk milk, more breeds of dairy cows became available through the use of artificial insemination (AI). Matt’s father realised that he could get semen of different breeds from different places around the world. He began to question his use of bulls and the Jersey stud. In the early 1960s he dropped the Jersey stud and switched to the use of AI in his breeding.

Matt’s father started to produce cross-bred cows ‘soon after AI started’. Matt is not sure if they had the same knowledge back then regarding the benefits of ‘hybrid vigour’. Matt knows that his father was looking for ‘slightly bigger animals’ in order to increase milk volume while avoiding producing too much butter fat.

While they were being encouraged to ‘go for Friesians’, Matt’s family kept with the crossbred cows. Matt’s father bought some Friesian cows once ‘just because they were handy and cheap and available’. Breeding those cows in turned out to be ‘absolute chaos’. Matt was ‘quite confident that the crossbreds worked beautifully’ for his family farm and he could see a real place for them in the dairy industry. This is especially true given ‘where Friesians are going with infertility’ issues.

Changes to dairy

In the early 1960s, Matt’s father was milking 80 cows and decided to put in an eight-a-side herringbone dairy with zigzag rails. He built the new dairy right next to the old walk-through shed. In the 1970s, Martin and Matt’s father extended the dairy to make it a 12-a-side herringbone with zigzag rails.

In the 1980s the dairy was altered again to accommodate the larger crossbred cows and enable them to milk more cows at a time. They converted the zigzag rails to straight rails and

were able 'to jam 16 cows' in the dairy at a time. This made the dairy a 16 double-up. In addition to changing from zigzag to straight rails, they also had to move the breast rail and knock out some posts.

'Thankfully the brick wall was wide enough' so they could make the 'infrastructure changes within the shed limits' and afterwards still be able to 'walk along their heads' to drench the cows for bloat. The farm had 'always had little bits of issues with bloats over the years like lots of farmers have'. Bloat occurs when animals 'gorge themselves' on a legume and it turns to gas in the rumen. The animal 'puffs up like a balloon', it puts pressure on their heart and they 'drop dead'. Matt had problems with bloat on his clover pastures, during pasture establishment. The worst time was when 13 cows died one night in the 1980s after feeding on shaftel clover.

The boys working on the farm

During those early years, Matt's father ran the farm as a single person operation, as the children were too young to be able to help. At that time the only help Matt's father had were high school boys from Melbourne who would come up for the summer to pick fruit. As Matt and his four brothers got older they began to help more on the farm, after school and on weekends. Though all of the boys helped on the farm, their parents stipulated that they all needed to get a trade other than farming before they could work full-time on the farm. Three of the boys, including Matt, trained to be mechanics and the other two trained to be school teachers. The three brothers who trained to be mechanics ended up coming back to work on the farm.

Matt's eldest brother, Martin came back to the farm in about 1965, after training to be a mechanic. They were milking over 100 cows at that time. Matt's father decided that they needed to milk more cows and Martin would be a share farmer. As a share farmer Martin managed the farm and was paid a percentage of the profit. Martin also paid some of the farm expenses. Martin got married and lived on the farm with his wife. The rest of the family, Matt's parents and the four remaining children, all moved into the nearby town. Matt's father still travelled out to the farm every day to help with the day-to-day operations.

Another brother, Mark, came to work on the farm in the very late 1960s, after being retrenched from his job as a mechanic. This increased the farm's labour units to three. Mark was paid a wage for his work rather than a share of profits. Things were going well on the

farm and they continued to increase the number of cows they were milking. Mark left the farm to pursue other interests overseas. When Mark left, Matt's father encouraged Matt to come work on the farm. At that time, the business was milking over 200 cows and they were still producing the vast majority of feed on-farm; the only supplement was some purchased hay. They needed Matt to come back and help with what had become a three-person operation.

Matt came to work on the farm in 1973. He had finished his apprenticeship as a motor mechanic. Matt got married to Marie in 1975. Matt's father allowed him to subdivide a half an acre of the 58-acre block, upon which he built a house for himself and his wife. As a part of subdividing and building the house, Matt had to organise connecting his subdivision to the electricity grid.

Increasing farm size

After Matt was married, Matt's father bought a 60-acre block with low water right that was on the back of the 58-acre block. 'It was pretty poorly laid out.' This block was a part of the 155-acre farm described previously. In the early 1980s Matt's father bought the last 37 acres of that previously subdivided farm. This land also had a low water right. With these land purchases the farm was 257 acres in total with 365 ML of irrigation water, 86 ML in drainage diversion and 27 ML of stock and domestic.

In the early 1980s, Matt and his family took up a lease on a 50-acre block across the road from the farm. The block was an 'ex-orchard' with 100 ML of irrigation water. The owner had pulled the trees out and left the block as it was. Matt's family set up the block as perennial pasture for the dairy cows. Matt's family maintained the lease on the 50-acre block up until 2012, when they sold the farm.

Matt's father was always willing to borrow money to buy more land for the farm and 'always owed money'. Prior to the advent of salinity loans in the 1970s, farm infrastructure and machinery were always paid for with the farm overdraft. At the time that Matt came back to work on the farm, the farm probably had about 25 to 35 per cent of its value in debt. Matt thinks that the proportion of farm debt continued to grow.

Matt and Marie had to take out a \$15,000 home loan to build their '16 to 18 square' house, in addition to using any of their existing savings. This situation was not helped by a huge drop in milk prices in 1975. The price 'dived' when Matt and Marie had loan repayments equalling

\$4000 a year; the same amount of money they were making from the farm in wages. Both Matt and Marie got off-farm work, including picking tomatoes and cleaning oil heaters. It was a difficult time for Matt and Marie and it was a difficult time on the farm. Everyone had to 'tighten their belts' if the farm was going to be able to keep going. While this 'might have caused a few issues at some stages', it kept the farm viable.

Infrastructure changes

Martin, as the share farmer, made most of the decisions about the farm, in consultation with Matt's father. In addition to being the share farmer, Martin was older and had been working on the farm a lot longer than Matt. Matt was happy with Martin and his father making most of the decisions at the time.

In the 1970s there were reduced-interest rate salinity loans available to do infrastructure upgrades. The loans were three to four per cent below the average interest rate. At around the same time laser grading was introduced, which 'absolutely transformed irrigation'. Matt's family started looking around to see what they could do to improve their farm. At that time the farm irrigation comprised little bays and 'mud stops with shovels'.

The family applied for a couple of salinity loans that enabled them to build a dam, laser grade and reconfigure some of the farm irrigation system including recycle systems. In the late 1960s there had been a drought during which the farm had relied on the 86-ML drainage diversion licence to irrigate two 15-acre blocks of perennial pasture that were close to the pumping site. They pumped 'a dribble' out of the drainage channel continuously, at about ¼ ML a day. Based on that experience, Matt suggested that they build a dam to store the drainage channel water to increase the flow when they irrigated.

Qualifying for a salinity loan required that they generate a farm plan. Matt and Martin had been thinking about building a three to four-ML dam using a bull dozer. The person developing the farm plan for them suggested that they build a 40 to 50-ML dam and connect the dam to a greater area of the farm. The farm plan was designed including other on-farm irrigation improvements that would help them 'make good value of the water' being stored in the dam.

Installing the dam had a bigger impact on the farm than expected. Matt identified the dam as 'the start of the irrigation blow up' on the farm as the dam led to the use of fast flow

irrigation and automated irrigation. Matt described how ‘everything sort of steamrolled from that dam’.

The dam took up about six acres of farm land and was built ‘right in the middle of the farm’ on a portion of the original 72-acre farm that was near the drainage channel. The dam was built three metres above ground and about two and a half meters below ground. This meant that there was ‘dead water’ because only 35 ML were available via gravity feed above ground. To enable access to the dead water, and to ensure they could get a good flow of water as the dam level dropped, they put in a 30-metre long, 600ml steel pipe that they encased in concrete. Due to the large size of the pipe, Matt and Martin had to install ‘ex-Melbourne gas works valves’ to regulate the flow.

Given the increased size of the dam, Matt and Martin could see the potential to irrigate more land than the 30 acres that initially inspired the idea. They installed the large pipe for the dam across the spur channel, over into the 58-acre block. They were able to irrigate that block and other areas of the farm with the increased volume of water from the dam.

When Matt and Martin first tried irrigating out of the dam the faster flow of water ‘just about blew out the channels’. They decided to ‘put in high channels and wider channels and bigger structures’. This enabled the irrigation system to cope with the changes in flow.

For Matt and Martin, figuring out how to irrigate with the new system was ‘mindboggling’. With the old irrigation system they could irrigate bays overnight. The faster flow because of the dam meant that they ‘were running around every two hours shutting off bays’. ‘It was just almost hopeless’ for Matt and Martin to manage and would end up with a ‘flood down the end like a lake’ because they missed shutting off a bay.

To help manage the fast-flow irrigation, Matt and Martin ‘started talking pretty quickly’ about automating the irrigation system. They were ‘right on the edge of the first ones’ to use automation. Over time they changed the type of automated system they used. They started with a simple pneumatic system and moved to a hydraulic system with a water pressure pump. In more recent times they shifted to an electronic system that Matt could manage from his iPad. The farm had been through five different types of automation systems. He thought that the current system was ‘pretty terrific’ and couldn’t see changing it again.

In addition to putting in the dam, with the aid of a salinity loan Matt and Martin reconfigured the irrigation system on the two 15-acre blocks. This collective 30-acre parcel had 110

irrigation bays with 'channels going everywhere'. They reconfigured it down to six bays. From there they reconfigured the most recently purchased 60-acre block. While this block was the farthest away from the rest of the farm, it was in poor condition. These farm works included laser grading and converting the block from annual to perennial pasture.

The reconfiguration of the blocks was a bit challenging for Matt's family as the farm had existing 'structures that made it difficult for recycling'. These structures included G-MW irrigation channels and community drainage channels, which the family couldn't alter as they were not the property of the farm. They had to set up the recycling systems within these structures.

In the 1980s the farm development flowing from the dam work 'gained momentum'. Throughout that decade much of the farm was redeveloped.

Changing pasture type

The blocks of land that Matt's family bought had different pasture mixes, depending on the irrigation allocations associated with them. The blocks that had higher allocations had perennial pasture and the blocks with lower allocations had annual pastures. Prior to the installation of the dam they maintained pastures in their existing locations on the farm.

Matt's father was 'never that keen on annuals' because it meant that he had to bring in contractors, as he didn't have the machinery to do it himself. While 'some people say perennial pasture doesn't grow in the winter', Matt's father could see that perennial pasture does grow in the winter 'if you manage it nicely'.

Once the dam was installed Matt and Martin converted the annual pasture over to perennial pasture. They converted pasture after reconfiguring and laser grading blocks. In the conversion process, Matt would first put in millet and white clover in the late spring and then drill perennial rye grass into it in the autumn. This was 'the trend' for establishing new pasture at the time. Another important part of the trend was putting 'one or two tonne of single super per hectare over a three to four year period'. While they 'had bloat problems' early on with the pasture establishment, it worked well.

Irrigation water

By the early 1980s the farm was 257 acres and had 589 ML of irrigation water, 27 ML of stock and domestic water, and an 86-ML drainage diversion licence. They also leased a 50-acre block with 100 ML of water. With the lower water entitlements on much of the land that Matt's family bought, they 'were always a bit water strapped'.

Matt's father used to buy all of the 'sales' water that he could get because 'he knew that water was the key' to having a productive farm. This would sometimes double the water allocation for the farm. It wasn't possible to buy extra permanent water for most of the farm's history, however, as that had only been possible in the last ten years.

The early 1980s 'were tough times' for the farm. There was a downturn in the industry: 'milk prices were terrible' and farmers were 'shooting cows' because 'they were worthless'. In the early 1980s there was also a drought. Martin and Matt decided to put in a groundwater bore to obtain supplementary irrigation water. They installed the bore just after the first 30 acres were laser graded. The bore had a licence to pump 100 ML. They continued to use the bore through the years, though it did slow down during the recent drought.

After watching the first bore being dug, Matt and Martin dug a second groundwater bore themselves 'by hand' using an auger and pumps. They put this second bore near the dam. This second bore delivered about half of the amount of water when compared to the first bore. They obtained a 50-ML pump licence for the bore.

Martin leaves

In the mid-1980s Martin left the farm for private reasons. It was quite sudden and Matt had to take on the day-to-day management of the farm. Mark immediately came back to work on the farm, filling the labour gap left by Martin.

After Martin left and Matt took over the farm management he had to learn how to manage the cows on the pasture. Matt's father and Martin had always made those decisions in the past. Grazing has changed significantly through the years on the farm. When Matt's father managed the farm 'all the gates were open and he didn't know from morning to morning where the cows' would be.

Matt used the knowledge he had learned from DPI discussion groups about ‘magical’ rotational grazing to develop a system for his farm. Matt’s grandfather was full of ‘pedantic persistence’ which Matt’s father picked up and was passed on to Matt. Matt thinks that this pedantic persistence comes out in him through his ‘passion for pasture and irrigation’.

Matt thought that developing a system for the farm was made easier for him because they had so many cows that they needed all of the pasture for grazing. They didn’t have capacity to lock up pasture for hay. This meant that all of the paddocks had to be put into the grazing rotation. At that point, the farm was only slightly overstocked, as they were milking over 250 cows.

When Martin left the farm in the 1980s he had to be paid out his share. This added to the farm debt, which was ‘pretty high’ already. After Martin left, Matt continued to be paid a wage, as a percentage of the milk cheque, rather than switched over to being a share farmer.

Rotary dairy

The 307-acre farm (including the 50-acre leased block) was narrow and a mile long. Matt and his family had redeveloped areas of the farm that were at the farthest point away from the dairy. This meant a longer walk for the cows to come in for milking. Walking longer distances used more energy and reduced milk production. The region was experiencing wet winters in the late 1980s. In wet weather cows were getting stuck in the mud, getting mastitis, and it was taking even longer to move them down to the dairy shed for milking. Overall, milking was taking too long.

In 1989, Matt, brother Mark and their father decided to build a new dairy in the middle of the farm, to reduce walking time for the cows and increase the speed at which they could milk the cows. They built a 50 unit rotary dairy. There were only one or two rotary dairies in the region at the time. Matt’s family had to borrow around \$250,000 for the project. At that point, Matt and his family were milking 300 cows. It was taking them ‘three-and-a-half to four hours morning and night’ to milk 300 cows. With the new dairy they were able to milk more cows in less than half that amount of time.

They decided to put the new dairy in the middle of the farm. In addition to centrality, other factors that determined where they built the new dairy were road access for tanker trucks, access to electricity, and a good water supply. The new location was near Matt and Marie’s

house, which had road access and electricity. The new location was also near the 50-ML dam, which ensured access to water.

With an aim to increase milk production Matt started feeding grain in the dairy once they built the rotary dairy. They also put in grain silos which enabled them to store 200 tonnes of grain. Feeding grain in the dairy shed freed up pasture so that they could increase cow numbers on the farm. They very quickly jumped up to milking 350 or 400 cows.

Matt was very careful, however, about making sure that he didn't feed the cows too much grain in the dairy. 'If you're feeding them grain in the shed too much they'll eat the grain and they won't eat the grass.' Keeping cows eating grass was a 'key point' to Matt.

Putting in a rotary dairy was a good decision for Matt and his family. 'It was a better environment' for the cows: they had 'less mastitis', 'less stress' overall, and a 'reduction in cell count levels' because the cows were 'happier'.

Groundwater bore for rising salt

Due to wet weather, in the late 1980s, the farm developed a 'rising salt problem' which was leading to tree deaths. To manage the problem Matt put in a third groundwater bore so that they could pump down the groundwater table and disperse the saline water in a 'fan paddock'. This bore was put in after the rotary dairy had been built and connected to electricity. Matt extended the power from the rotary dairy to the new groundwater bore with an electricity grant for salinity management.

The water from the bore was 'pretty ordinary' at 10,000EC. Even with shandyng it couldn't really be used to irrigate pasture. Hence, the bore was solely for salt disposal. In more recent times this groundwater bore was not being used as a high water table was not an issue during multiple years of drought.

Calving

Matt's farm historically supplied milk to Bonlac. Shortly after building the rotary dairy Matt and Marie changed to Tatura Milk Company. Tatura Milk had fewer than 300 suppliers and a 'waiting list at least a mile long' because they paid a 10 to 20 per cent higher rate than other milk companies. While Matt and Marie were not on the waiting list, they got into Tatura Milk because they milk a large number of cows.

Matt's family had always calved in the spring. In 1994 Matt and Marie decided to try split calving, as Tatura Milk was paying 'very high milk payments' for autumn and winter milk. They tried it for about a year but decided that it wasn't worth it. It was so 'different to the current system' that it created too much extra work. They returned to spring calving.

In the 1990s Matt and Mark were 'flat out' milking 450 to 500 cows and rearing as many calves as they could to continue building up the herd. Matt continued to be 'really pasture oriented, trying to be careful with the amount of grain' they were feeding. They focused on getting feed targets right, getting irrigation and fertiliser right.

Outblock

Matt's family bought a 500-acre mixed dryland and irrigated outblock with 200 ML of irrigation water for the farm in 1998. The outblock was about 6 kilometers from the dairy farm. They were familiar with the block and the owner as they had agisted young stock on the 500 acres over the years and had also bought hay grown on the block. The block had an established mix of annual and perennial pasture.

Matt had about 350 acres of dry paddocks on the block. Using a contractor, Matt did a bit of cropping when they were feeding grain to the dairy cows. He also put some of the dry paddocks under dryland lucerne. The lucerne was great after summer rains, when the other dryland paddocks were dormant. He thought dryland lucerne was 'marvellous'.

Approximately 150 acres of the block was already set up for irrigation, including laser grading. However, the irrigation system was set up so that the water entered the farm through the outlet into a sump, from which the water had to be pumped using a diesel pump. Matt found the irrigation system to be 'terrible'. The pump was expensive plus he had to 'go out there three and four times a night sometimes'. After using it for a couple of seasons Matt decided to find an alternative.

Government grants for \$20,000 became available for 'high flow diversions' to remove and store nutrients from the Murray River. The aim of the grant program was to reduce nutrients (such as fertilisers) from washing into the river system during high rain events. When there were high flows, and at the end of the irrigation season, gates to high flow diversion sites would be opened.

The block was right on the edge of a large low-lying depression where runoff tended to settle during high rainfall events and high river levels. This depression was maintained by G-MW. Matt could see that setting the block up to take on extra water through a high flow diversion would work well, given this natural depression. The depression was directly across the road from his block and only required a 50 metre pipe under the road to access it. Matt determined that every winter he could ‘nearly get a full dam, depending on how big it was’.

In 2000, Matt built a 220-ML dam covering about 15 acres of the block. The dam cost \$250,000, though they did receive the \$20,000 grant. With the new dam, the 500-acre block had increased in value to about a million dollars. Based on the experience of building the other farm dam, Matt ensured that the infrastructure associated with the new dam was better suited to automation. As automation came after the original dam was built, the system was not set up for it and ‘still isn’t suited to automation’.

When making changes to the irrigation infrastructure on the 500-acre block Matt had an option to expand the area of irrigated land. He decided not to do this because they only had 200 ML of irrigation water at the time. The 200 ML was not quite enough for the 150 acres of irrigated pasture. Expanding the area of irrigated land would have required that they stretch the water even further.

Though the family originally purchased the 500-acre block as an outblock for dry stock, Matt started using it for hay production and agistment while he still had the dairy farm. He ‘saw the potential and the productivity gains’ that could be made with the land, given the new infrastructure. It ended up being a profitable decision. With the agistment, Matt was paid by the weight that the animals put on while at his property and thought that he ‘probably made \$80 -100,000 each year on grazing other peoples’ stock’.

Matt and Marie take over the farm

By the late 1990s, they were milking 500 cows. The farm was getting so ‘productive and large’ that the farm accountants wanted to get all of the farm clients on computer-based systems. It was suggested that Matt’s father’s ‘shoebox’ approach to the bookkeeping may no longer be right for the farm. Matt’s father passed on managing the farm bookkeeping to Marie because of this.

Matt’s father helped all of his children in different ways over the years. He stressed early on that the boys who worked on the farm should inherit the wealth of it. Though Matt’s father

was the owner of the farm, as he bought blocks of land he put them into the names of his children who were working on the farm. Matt had always looked at the farm as a family farm that he would manage with his father, brothers and then eventually would be managed by the next generation.

Martin had been bought out in the 1980s. In 2002, Mark and his wife announced that they wanted to be bought out eventually, as their children were not interested in farming. This was 'a bit of a bombshell' for Matt and Marie who imagined having to 'take on an extra million dollars' worth of debt' in 20 to 30 years' time to pay them out. Instead, Matt and Marie suggested paying them out sooner so that they could know what direction they could go with the farm.

They then used a consultant to go back through the farm history to determine the value of the payout. Matt reflected that they were 'probably a bit fortunate' because water was 'hardly valued' at that time. They agreed to a one million dollar payout with a low interest rate and bought out Mark and his wife in 2003.

Matt and Marie were able to refinance their farm loans, borrow an extra \$400,000 and pay Mark the \$400,000 up front. They then paid him the other \$600,000 gradually over time. Matt and Marie had loans equalling two-thirds of the value of the farm. This was actually not an increase in percentage of debt as it was based on the value of the entire farm.

The deregulation of the dairy industry occurred at the same time as the negotiations about farm ownership. As the milk price was going to drop, government had worked out a payout for dairy farmers based on their previous few years' production. This worked well for the family farm as they had 'produced beautifully in the previous few years'. They received about \$350,000 in compensation which 'was shared proportionally based on the time and resource investment' each brother put into the farm. With their share of the compensation Matt and Marie were able to balance out their finances a bit after buying out Mark.

When Matt and Marie bought out Mark they changed all of the land deeds that were not already in Matt's name over to 'Miller Family' rather than individual names. They did this to avoid the large cost of changing names on titles into the future.

Mark and his wife continued to live on the farm until 2005. Mark worked on the farm as a waged employee. Even once Mark moved off the farm, he continued to work on the farm as

an employee. Matt and Marie's son Merv was also working as an apprentice on the farm. Merv got married in 2005 and moved into Mark's old house with his wife.

After the shift to Matt and Marie taking over the farm, Matt's father was on a veteran and retirement pension, as well as some income from the farm. Matt and Marie took over responsibility for supporting Matt's father through his years as a retiree.

Drought

Just as Matt and Marie were negotiating taking on full responsibility of the family farm, the region was settling into a number of years of drought. 'It was really an emotional, tough time' for the whole family.

Typically, Matt's dairy farm needed about 1000 ML a year to maintain the existing pasture. This was about 40 per cent more than his entitlement. When the farm used to get 'sales' water, this was not an issue. In the late 1990s sales water declined and disappeared as water became scarcer. Matt had amalgamated the dairy farm and the 500-acre outblock. This enabled him to transfer the water between the two properties. As water became scarcer Matt transferred the water from the outblock to the dairy farm. Making sure there was enough water for the dairy farm was the highest priority. Matt also had to rely more on bore and drainage water and on purchasing extra water on the temporary market to supplement his entitlement.

Pressure increased when the drainage channel started 'slowing down' in the late 1990s. This occurred when allocations started dropping and farmers were only getting a 100 per cent allocation with no sales water. As well, there were fewer irrigators 'upstream' from Matt's farm as a couple of farms sold and became hobby farms, which used less water. The bores also started to slow down as the dry conditions were maintained into the 2000s.

Government rules relating to water changed as drought conditions commenced. This 'made life more stressful'. Overall, with the changes in water management, 'things have absolutely turned upside down'. Matt thought some of it wasn't good and had concerns over 'water leaving the district'. However, he also thought that it offered irrigators 'versatility' which wasn't bad.

As the drought took hold and other options for water began to disappear, Matt and Marie bought more temporary water. During the first major drought year they bought 200 ML for

\$200/ML. From that point on the price of water increased to a thousand dollars. Matt and Marie continued to buy some water. The most they paid was \$600/ML one year, 'just to keep some green on the farm'. Marie described this as 'a mental health insurance policy' for Matt as 'it was awful living in this brown farm' when they were used to 'lush' green pasture.

Matt and Marie could not afford to buy in all the water they needed to get through the drought. They decided to reduce their cow numbers to reduce some of the pressure. They were milking 560 cows just prior to the drought. In 2006-2007 they culled heavily and got their numbers back to 460 cows.

Matt and Marie had to reduce the area of pasture that they irrigated through the drought. Matt identified what he thought were the best pastures and maintained them through the drought, the amount of pasture maintained depending on how much water was available

Matt fed out more hay and grain to supplement the decline in pasture. He had a good relationship with the hay and grain producers and didn't have a hard time getting hay or grain for a price that he was happy with. Matt set a rotation which included some grazing time as well as some time in a dry paddock with hay. Matt sacrificed paddocks for feeding out the hay.

Buying temporary water to maintain pasture was expensive. Doing too much of it would have been unprofitable. However, maintaining some pasture was important to Matt as it meant that when drought ended they would be ready to go, 'off and running'.

During the drought the farm debt level increased. However, Matt and Marie 'lost less than most people'. They received government interest subsidies for two to three years during that time, which helped. As well, Matt's father died in 2008 and left some money in his will to the farm.

Through the later part of the drought and into recent times, the public irrigation infrastructure was being upgraded. The majority of Matt's farm was on the backbone of the public irrigation system. There was one spur channel with three irrigation outlets that went through Matt's property and onto the neighbour's property. However, Matt hadn't used the spur outlets since he built the dam, 25 years ago. The modernisation of the public infrastructure didn't have a big impact on his farm irrigation. He didn't apply for an on-farm water-use efficiency grant because he had already improved his farm irrigation system.

Anthrax

By 2009 the drought had broken, and while things were looking a bit brighter, Matt and Marie had a couple of bad experiences with bringing outside cows onto the farm that led them to becoming a 'closed herd'. First, they took in 12 cows from a neighbour who was going away on holiday. The cows brought in a lung infection that all of Matt and Marie's heifers contracted. It was a 'huge problem' that ended up affecting the cows all the way through calving.

At about the same time, Matt took in 80 cows from another farmer who had to go in for heart surgery and was looking for a place to park his cows. At the time Matt was milking 510 cows and producing close to 280,000 kilograms of milk solids. Tatura Milk was offering a 'considerable incentive' to farmers who were producing over 300,000 kilograms of milk solids. Taking in the extra 80 cows would boost cow numbers to qualify for the incentive.

Unfortunately, one of the new cows died of anthrax within weeks of arriving. The date of the death was at the 'extremity of the incubation period' which meant that she could have contracted it on Matt and Marie's farm.

'All hell broke loose' as Matt and Marie's farm was put under quarantine for 42 or 45 days. The Department of Primary Industries (DPI) came in and vaccinated all of the animals. The cows were calving at the time, which caused further problems. While Matt would normally sell their bull calves after five days, they were not allowed to do this due to the disease risk. This meant that Matt had to slaughter all of the bull calves, which was 'mentally frustrating'.

After an investigation by DPI, it was discovered that, prior to arriving at Matt and Marie's farm, the infected cow had been grazing in a paddock in which 15 cows had died of anthrax eight years earlier.

Up until that point they often took in neighbours' cows in the winter so that people could go on holiday. Matt and Marie always milked some cows through winter anyway and would get down to 'maybe one round' of cows on the rotary dairy. 'What's two more cows or 10 more cows on a rotary system?' After the anthrax experience, based on veterinary advice, Matt and Marie decided that they were going to run a closed herd.

Recent dairy farm changes

Matt decided to sell a third of the farm's 615 ML of permanent water entitlement in 2010, approximately 205 ML. The Government was offering \$2500 per ML, which was considerably higher than what they could get on the market at \$1500 to \$1800 per ML. Marie was concerned about selling the water as she wanted Matt to have the security of having water for the farm. Marie was also concerned about production losses in the region associated with selling water out of the region. Matt knew that selling a third of the water was 'not going to affect one bit the productivity of the farm'. Matt's application to sell the water was accepted in 2011. Matt and Marie used the money to reduce their debt and refinance their loan.

In 2011 Matt was in his early 60s and didn't want to 'keep going flat out'. Merv had started taking on more management of the dairy farm and was milking 600 cows. Matt was managing the 500-acre outblock. Matt's son was motivated to continue building the business. He encouraged Matt in 2011 to buy a 150-acre block just near the farm. The block had been another farmer's outblock and was set up as pasture. That pushed the dairy farm up to 400 acres.

In that same year Matt, with his son's encouragement, made some changes to the dairy to turn it into 'a one-man shed'. They had automatic teat cup removers and sprayers, as well as an automatic feed system. They extended the yard and installed an undercover automatic drafting yard. The automatic drafting system could draft off cows that were sick (or had a high cell count) and, separately, those who were ready for AI, from the main herd. The dairy improvement cost \$100,000.

Selling the farm

Shortly after upgrading the dairy and buying the extra 150-acre block, Matt and Marie's son announced that he was leaving the farm for personal reasons. Mark was still working on the farm. However, Matt decided that continuing to run the 400-acre dairy farm and the 500-acre outblock without his son was going to be too difficult.

Matt and Marie sold the 400-acre dairy farm with 800 ML of temporary water, so that the new owner had nearly a full season of irrigation water. Mark continued to work on the dairy farm as a part-time employee for the new owners. Matt and Marie also sold off all of their permanent water, the 410 ML from the dairy and the 200 ML from the 500-acre outblock.

The decision to sell the farm was unexpected and traumatic for Matt and Marie. Matt's father had been 'so thrilled with it being in the family'. Matt had planned on continuing to run the farm with his son. After selling the farm Matt didn't miss the cows; 'to lose that history' of what the family had done on the farm was the biggest loss.

Managing the 500-acre agistment enterprise

Matt and Marie decided to keep the 500-acre outblock and continue to run it as an agistment enterprise. Matt needed about 640 ML to irrigate the 150-acre portion of his 500-acre block. After selling the 200 ML of permanent water that came with the block he relied on the dam as his main source of irrigation water. In an average winter Matt could almost fill the dam. In a dry winter he would get less water in the dam. However, even in a dry season, Matt would generally have enough water to 'kick off the season'.

Overall, on the outblock Matt had a bit more flexibility in a dry year than he did with the dairy. He could simply choose to take fewer heifers on agistment. While he typically had 250 animals on the block, at the time of the interview Matt had 400 heifers. He was 'thinking about putting on a lot of fertiliser and urea to grow more grass'.

Matt and Marie no longer had any debt after selling the farm and the water. This meant that Matt wasn't under any pressure to make the 500-acre block profitable. Making a bit of money was nice but not a necessity. Running the agistment enterprise was a way for Matt to 'slow down' at his own pace rather than just get out of farming. Selling the farm was 'traumatic' and the agistment enterprise was something Matt enjoyed.

Farm Narrative 14: Neil

Neil manages a dairy business on a 460-acre dairy block and a 320-acre outblock. The farm is an irrigated enterprise and Neil has 700 ML of surface water entitlement and 400 ML of shallow groundwater across three bores. At the time of the interview Neil was milking 340 cows.

Neil's father bought a dairy farm

Neil's father and uncle were tobacco farmers in north-eastern Victoria at the time that a quota system was being introduced for tobacco production, in the late 1950s. An individual farm quota was determined by an average of production over the previous two years. The crop on this farm was 'wiped out' during a 'freak hailstorm' in one of the years used to determine the average. This meant that the quota assigned to the farm was too small to support both Neil's father and uncle.

Neil's father decided to 'give dairying a go for a couple of years'. He bought a dairy farm in 1957 from a farmer who received the block in the Soldier Settlement Scheme. The farm was a '100-odd-acre' block and already set up as a dairy farm, with an old walkthrough dairy.

Neil's father milked 40 cows when he first started out. Over time Neil's father bought other parcels of land around the original block. This enabled him to increase pasture production and cow numbers on the farm. Neil's father and mother had three children, two boys and a girl. Neil, the youngest of the three, was born in 1972. While Neil was unsure about the details regarding the farm early on, he remembered that his father had bought '40-odd acres' when Neil was a baby.

Over the following years, Neil's father continued to buy blocks of land and eventually increased the dairy farm to '280 odd acres'. With a growing family, being able to increase productive land and cow numbers was important. Even so, there was one year in which the 'milk price was terrible' and Neil's father grew a paddock of cabbages that he sold. The cabbages ended up being 'a big help in getting through that year'.

Neil's father buys outblock

In the 1970s Neil's father bought a 100-acre farm 'up the road' which he used as an outblock, to run young stock. Then Neil's older brother came back to work on the family dairy farm. In the early 1980s Neil's father and brother bought a 400-acre outblock. The block was put into

Neil's brother's name 'to make him feel part of the farm'. The 100-acre outblock bought in the 1970s was sold to help pay for the 400-acre block.

The 400-acre outblock was 'pretty undeveloped' and had been used predominantly for cropping. Neil's father and brother developed the block, including laser grading. They used the block to run replacement stock, produce hay and occasionally produce a crop. In the first year or two after buying the block they put in a crop of sunflowers that 'didn't go that crash hot'.

With the added land on the dairy farm and the addition of the outblock, Neil's family was able to increase the number of cows they were milking. They built up their numbers slowly by keeping all of their replacement heifers. By 1986, the farm got up to milking 220 cows.

Through the 1980s and into the 1990s, Neil's father laser graded the paddocks and reconfigured the irrigation system on the dairy farm. How the irrigation was reconfigured was determined by what was going to enable better irrigation rather than trying to conform to current layout. This meant, for example, converting 50 bays down to 5 and changing the slope of the land.

While Neil's father used some contractors in this process, he determined the farm layout himself. He did this work in sections or areas, over time, and had plans done for some of these sections before doing the work. For some sections, what was needed was 'pretty obvious' and Neil's father just did the work without a plan. Neil's father 'had a pretty good idea of where the things needed to go' and 'was a very practical man'.

Family circumstances stall farm progress

In 1986 family circumstances drew family focus away from the farm. Neil, who was 14 at the time, was in a motorbike accident which put him in hospital for a while. Shortly after this, Neil's older brother was tragically killed in a car accident.

After the death of Neil's brother, Neil's father was considering selling the farm. At the time, Neil expressed interest in coming to work on the farm when he left school. It was because of this that Neil's father kept farming. This meant that there was a two year period after Neil's brother died where Neil's father was managing the farm on his own. He hired a worker to help out and sold 100 cows, reducing the herd back to 120. This was done to 'make life easier for that time'.

Neil came back to work on the farm when he left school in 1988. Neil, with his parents and sister, went overseas for a month in 1989. They were able to dry off the farm's 120 cows and have someone feed the animals while they were away.

After returning from the trip overseas, Neil's father could see that Neil was motivated by farming. Neil and his father started to run the business together and Neil was paid a share of the milk cheque (rather than a wage). They started building the business back up again, which included increasing the size of the 140-acre dairy property. In 1993 they bought 100 acres adjacent to the farm. In the mid-1990s, Neil and his father bought a nearby 50 acres and a couple of 'bits and pieces' that took the dairy farm up to around 300 acres in total, with 700 ML of irrigation water.

Breeding

From as far back as Neil could remember the farm had Friesian cows. Neil described Friesians as 'a hardier animal' than Jerseys. Historically, the herd was a 'closed herd', which meant that they bred all of their own replacements rather than buying in stock. In the cow breeding, they used artificial insemination (AI) and stud bulls to 'mop up'.

They'd had some fertility problems on the farm and through the years they found it 'harder and harder to get the cows in calf'. Neil thought that the fertility problem related to 'a combination of a lot of things'. In part, it related to natural variation in seasonal conditions. Neil also identified farm management as a cause, as it was easy to 'get too caught up in all the other farm work and not pay quite enough attention to the getting cows in calf part'. As well, cows were 'getting fed more grains and stuff so they're producing more' and 'the more a cow produces, the harder it is for her to get back into calf'. Neil thought that the best thing he could do for his fertility problem was 'probably just pay more attention to it'.

The fertility problem 'was one of the main reasons, at the start' that Neil and his father began split calving. When Neil's father used to milk 120 to 150 cows he calved in the spring. This enabled him to 'dry off all the cows in the winter and have a month or six weeks off without milking cows'. As cow numbers increased to 200, and more of them were ending up empty, Neil's family started calving some cows in the autumn.

From 1990 onward, they usually had 70 to 80 cows that they milked through winter, which 'used to bring in a reasonable milk cheque really' because the factory paid more for milk over the winter'. As cow numbers increased on the farm the number of cows milked over the

winter increased. Even so, Neil and his father tried not to milk more than 20 per cent of the cows through the winter. This was because the farm ‘used to get very wet’ over winter. Keeping the number of milking cows down reduced the associated damage.

Neil recalled that in the late 1980s, there were long periods of wet weather, where it stayed constantly wet for a month or more at a time. In weather like that ‘it would just keep everything all muddy and it was terrible’.

Wet weather

Given the farm ‘never had any high spots’ to put the cows in wet weather, the cows could easily damage the pasture through winter when grazing. In very wet winters Neil’s father found feeding hay out to the cows in the paddocks difficult. The hay would be stomped into the mud and wasted. In the early 1970s Neil’s father built a ‘double-storey hay shed’ on the dairy farm to manage this. In the double-storey shed the square bales of hay were elevated so that hay could simply be thrown down for the cows. The cows would come in during wet weather and eat in the shed. The shed was built to fit about 100 cows. They had managed to fit up to 150 in the shed but too many cows could lead to stock pushing each other, increasing cow stress.

While the double-storey shed was still on the property, in more recent times it was used for calves, as there were too many cows to fit in the shed. As well, Neil had switched from square bales of hay to round bales in the early 1990s. Round bales were a lot less labour intensive than square bales. The hay shed was set up for square bales. At the time of the interview Neil still had some square bales of hay that he had made a few years ago and was ‘just getting through them’ with the calves. While Neil knew he would use the shed in the future, he wasn’t sure how it would be used.

Feeding cows

Over the years, the pasture on the dairy farm was about 80 per cent perennial pasture and 20 per cent annual pasture. On the outblock, Neil and his father generally had about 350 acres of annuals (subclover) for hay production and 50 acres of perennial pasture for the replacement heifers. They used the hay that they produced on the outblock to fill any feed gaps and ‘usually produced enough off of the outblock to sustain’ the dairy farm.

While on the trip overseas, Neil and his father saw relatives growing corn. When they returned to their farm, they started growing a bit of corn themselves on the outblock. They harvested the grain and fed it to the cows in the dairy. While ‘there were a lot of people feeding in the bail then’ it was Neil’s family’s first experience of doing so.

Neil found that ‘it definitely does make a difference’ with milk production and continued to feed grain in the dairy over the years. Neil’s family generally bought in grain for the dairy. Prior to the recent drought, other than buying in grain, the family was able to grow sufficient pasture, hay and crops on the farm to feed the cows.

Changes to the dairy

The dairy on the farm had been changed a number of times through the years. The original walkthrough dairy was changed over to a ‘five or six double-up herringbone’ which was later extended to milk 12 cows and then 26 cows. The milking cows were getting bigger over the years. In the herringbone dairy Neil’s father found that he couldn’t fit as many cows as before. For example, instead of fitting 26 cows in the dairy he could only fit 23 or 24 cows. He changed the rails in the dairy, from zigzag rails to straight rails, to accommodate the larger cows.

While the 26 cow herringbone dairy was big, it ‘had a terrible yard set-up’. By the mid-1990s Neil and his father were milking almost 300 cows and decided to look at building a new yard for the dairy. Changing the yard to the dairy ended up being difficult because there was a dam that impeded the changes they wanted to make. Neil suggested that they consider building a whole new dairy, which would allow them to alter the yard set-up as well.

Neil and his father decided to put in a rotary dairy. With the help of a friend who was a retired engineer, Neil and his father built most of the rotary dairy themselves. Neil thought that they saved about half the cost of the new dairy by doing it themselves. With the new dairy, Neil could milk 500 to 600 cows, so there was room to keep increasing the size of the herd.

Neil takes over solo farm management

Neil and his father ‘had a fantastic relationship’ and talked through everything about the farm. While Neil’s father had more experience and ideas, he was willing to listen to Neil. The rotary dairy was an example of this.

In 1998 things changed for Neil and his family. Neil's father was diagnosed with cancer and ended up 'in and out of hospital all the time'. He died in 2000 at the age of 63. Neil's father left 80 acres from the outblock to Neil's sister. The subdivision of that block out of the farm reduced the outblock to 320 acres. Neil's sister has built a house on her land and is living on the 80 acres.

Neil then took on all of the farm management decisions. It was a major shift for Neil to go from working in a partnership to solo management. Neil 'found it pretty hard for quite a few years' and only 'started to get back on top of it again' more recently. While Neil had some workers on the farm, they were not people that he could talk to regarding farm management decisions.

The pressure that Neil was under at this time was further complicated by the fact that he got married to Nancy in 1999. Not only was Neil trying to work out how to manage the farm on his own, he was also 'learning to live with a person, to know another person's needs'.

Drought

Neil described the period of time from when his father got ill and then through a protracted drought as 'a challenging decade'. Leading up to the drought, Neil was milking 320 cows on almost 300 acres of dairy land, and a 320-acre outblock.

He had 700 ML of water. In a typical year he would easily use 1200 ML of water, because of the amount of perennial pasture he had. He never used to have to buy in temporary water, because he would generally get 1400 ML with 'sales' water. The first time Neil had to buy temporary water was in 1996 or 1997. He bought 200 ML of temporary water because there had been 'a few dry years'. In the early part of the recent drought, while Neil could buy water on the temporary market 'it was too expensive' to do so. As the drought progressed and the price dropped, Neil did buy some temporary water. After the drought Neil continued to buy temporary water as he needed it.

There were two spear point groundwater bores on the farm that Neil used to supplement his surface water entitlement. The two bores had licences to pump 100 ML each. The water from the bores was 'a bit average' but could be used for pasture irrigation when shandied. During the drought the two bores 'really eased off' so that Neil was only getting '70 to 80 ML out of them and using a lot of diesel to get it out'. Given the lack of surface water available Neil found that sometimes he had to irrigate straight from the bore, without shandying it.

With the high cost of water, during the drought Neil found that 'it was cheaper to buy feed in than to irrigate'. He dried off most of the paddocks and fed out to the cows in a dry 'sacrifice paddock'. He would then put the cows in a paddock to graze for a couple of hours. Neil kept a rotation going because it spread the manure out and would help everything regenerate.

Neil used more irrigation water on the dairy farm than he did on the outblock. Generally, he would only irrigate the outblock much later in the season, when he was establishing new pasture or crops. During the drought, Neil didn't irrigate the outblock at all. He just put in a crop, such as oats, and 'hoped' it would come to something. Any water he had, he used on the dairy farm 'because it's got the cows'.

The farm was entirely flood irrigated. Neil converted 60 acres to sub-surface drip irrigation and sowed it to lucerne. He did this because he was 'looking for a more efficient way to water and to grow feed' during the drought. He put in the sub-surface drip irrigation especially for growing lucerne. While 'you can grow just about anything' on sub-surface drip 'lucerne's one of the best plants to grow on that sort of a system' because it doesn't respond well to being flooded too much. Neil cut the lucerne and fed it out to the cows through a mixer.

When the drought 'really started to hit' Neil and Nancy 'scaled back' to about 220 cows. When reflecting on it Neil didn't know if he would do that again. Dropping cow numbers reduced cash flow and 'if you haven't got cash flow, you really can't do anything'. That may have 'hindered' things when the drought ended as Neil then had to start building his herd again with limited resources.

Financial pressure

While Neil's father had to borrow money to pay for the farm's 400-acre outblock, by the early 1990s it was paid off. The other blocks that Neil and his father purchased through the 1990s were paid for 'out of the farm' rather than through debt. Generally, Neil's father didn't borrow money, but was able to use the farm cash flow to fund infrastructure changes.

In 2001 Neil and Nancy bought a 120-acre farm 'up the road' with 300 ML of water. This was 'right at the start of the drought'. They bought the farm for \$600,000, borrowing the full amount to pay for it. It was the farm next to Nancy's parent's place. Nancy's parents moved onto the new block and began leasing it from Neil and Nancy.

Neil described the drought as ‘years where either you'd break even or where you'd get to the other end and you'd think “oh, well we've gotten through”’. Through the drought the \$600,000 farm debt increased to around \$700,000 or \$750,000. In 2007 Neil and Nancy sold the 300 ML of permanent water off the 120-acre block. A couple of years later, they sold the 120-acre block to Nancy’s parents. After selling the water and land they ‘were pretty even’ financially.

Changing pasture mix

During the drought Neil had altered his pasture mix by sowing lucerne to reduce his reliance on perennial pasture. After the drought he continued to maintain an approach that reduced reliance on perennial pasture because changes to the water rules and allocations meant that he needed to ‘use water more efficiently’. Neil put in more annuals on his farm and oversowed some of it with millet to get a ‘double crop’ for grazing. Neil also maintained the lucerne that he put in during the drought. The lucerne and the millet both offered Neil ‘extra feed through the summer’. While before the drought the pasture mix was 80 per cent perennial and 20 per cent annual pasture, post drought the pasture mix was 65 per cent perennial pasture and 35 per cent annual and lucerne pasture.

Where Neil put pasture-types on his farm had ‘a lot to do with location’ (for example, proximity to the dairy). Soil-type also played a part. ‘The outblock had heavier soil and really lend itself to annuals’. If the outblock had comprised ‘lighter soils’ Neil ‘would probably have more lucerne’.

Neil did most of the hay and silage himself on the farm. After Neil started doing round bales of hay he hired a contractor to wrap the round bales for silage. Within a year or two he had bought a silage wrapper and was doing it himself; however, wrapping silage took two people. In the early 2000s, Neil built a silage wrapper that could be run by one person.

In 2009-2010, Neil was trying to ‘make things more efficient and easier and cheaper’. He bought a second-hand forage harvester and started making pit silage. He decided to start making pit silage to reduce all the ‘running around’ that he was doing when feeding out to the cows. Pit silage could be put into a wagon and fed out.

Buying 160 acres

Within the last couple of years Neil and Nancy bought a 160-acre block, near the dairy farm. The block's close proximity meant that they were able to incorporate it into the dairy farm's grazing rotation. With the new 160-acre block Neil and Nancy had nearly a \$900,000 debt. While the debt was high, Neil thought that their equity had increased as well. Even so, Neil was focused on managing the farm over the coming years to reduce the level of debt.

The 160-acre block didn't have any permanent water entitlement, but it did have 'delivery shares', which enabled them to buy temporary water if they chose to do so. It was an undulating property and was set up as mostly perennial pasture, with 30 acres of annual pasture. As well, the block had a spear point bore with a 200-ML pump licence. The water from the bore was 'pretty good' which meant that Neil could use it for irrigation without shandying it.

Neil and Nancy bought the 160 acres to increase the farm size sufficiently to enable them to put on a share farmer. They wanted to decrease the amount of time that Neil was putting into the farm so that he could 'spend a bit more time at home with the kids'. Neil and Nancy found that getting the 'right person' for share farming had 'been challenging'. At the time of the interview they were on their third share-farmer and thought that they had 'found a really good person', after the first two hadn't worked out well.

Increase in autumn calving

With the new pasture mix, Neil was finding that the amount of feed he could grow through the autumn, winter and spring was 'a hell of a lot more with a lot less water' than he could grow through the summer. While Neil historically needed 1200 ML to irrigate, he thought that with the new pasture mix he could 'get away with 800 ML'. As well, the new 160-acre block had 'a fair bit of undulation' which meant that there were more options for where to put cows during wet winters. Given these two factors, Neil started altering the calving pattern to increase the proportion of autumn calves. At the time of the interview, Neil was 'getting closer to 60-40' with 60 per cent autumn- and 40 per cent spring-calving cows. This enabled Neil to take advantage of winter milk incentives.

Neil was considering putting in a feed pad, as a 'backup' in the wet. While the new undulating block helped with managing cows in wet weather, he was concerned that, if it got

wet for a long period of time, he might 'get a bit stuck'. With a feed pad, Neil would be able to keep the cows from damaging the paddocks in prolonged wet periods.

Increasing cow number post drought

Neil was trying to build up cow numbers again since the drought. He was trying to do it quickly to increase income because he had bought the extra 160 acres. He was also 'trying to push share farming' which meant he needed enough cows to 'sustain things at a reasonable level'. Neil found that the most financially sound way he could do this was to sell his replacement heifer calves and use the money to buy in dairy cows.

The export market for heifer calves was very good at that time. Neil was paid \$1400 for a six-month old calf which was shipped overseas. He used that money to buy milking cows for about the same amount of money. The dairy could then start making him money straight away. If he had kept the heifers he would have had to rear them for another two years before they would be ready to milk. When he wasn't having to feed young heifers, he was able to make more hay and silage and could milk more cows.

In the previous two years, Neil had bought 130 dairy cows. He was milking 340 cows, but wanted to quickly get the herd large enough that he would be able to milk about 400 cows all year round. With drying off cows, Neil needed to have 450 - 500 cows on the farm to achieve this. He was in the process of selling another batch of heifers so that he could buy more milking cows.

Neil didn't have any problems with the cows he bought into his herd. However, he was 'a little bit sad and disappointed' because buying in cows meant 'you lose your breeding'. Over the last 20 years or more Neil and his family had a 'straight Friesian' 'closed herd'. He associated his herd genetics with 'pride within yourself'.

While Neil had 'wanted to buy straight Friesians', they cost too much money and he ended up buying more economical crossbred cows. Though Neil was somewhat saddened by the changes to his herd, he acknowledged that it was the business decision that he had to make to 'make the business work'.

When Neil decided to increase his herd by selling his replacement heifers he changed his breeding program. He stopped using AI and went to using stud bulls. He wasn't going to keep

the heifers and didn't see the point of going to 'a lot of trouble with the heat detection, cost of semen and the time factor of AI-ing' cows.

Neil was going to continue to sell heifers and buy in dairy cows as long as he kept getting good money for the heifers. He was 'going with what the market tells' him to do. If the export market were to decline then he would go back to a closed Friesian herd. He would also revert to his previous breeding practice of using AI. Going back to a closed Friesian herd would mean that Neil would have to drop his herd size. Rearing his own replacement calves would mean he would have to feed them, and that would take feed away from his milking cows.

While Neil hadn't noticed a drop in milk production with his current herd, he would still go back to straight Friesians as he 'always liked Friesians because they were hardier animals'. Neil thought that building his Friesian genetics back to what they were would take him up to 10 years.

Changes to irrigation system

Neil was in the process of working out how current changes to the public irrigation infrastructure were going affect his farm. Most of the dairy farm was on the 'backbone' of the system. There was one area of the farm that was off the backbone, though it was less than a kilometre away. Neil had heard that G-MW was considering extending the backbone to reach his farm. As well, Neil's outblock was not on the backbone of the irrigation system. He was 'waiting to see what they're proposing to do' regarding his access to irrigation water on the outblock.

As a part of a related on-farm water use efficiency program Neil applied to convert the whole dairy farm to a pipes and risers system. Neil thought that he would be able to get his water use down to about 600 or 700 ML with pipes and risers. A major reason that Neil was interested in pipes and risers was 'for the lifestyle'. Growing feed and irrigation were the biggest jobs on his dairy farm, alongside milking the cows. He hoped to make those jobs easier to make dairy farming 'quite a reasonable lifestyle'. An important part of doing that would be automating the irrigation system. While Neil could automate his existing flood irrigation system, pipes and risers would mean less maintenance.

Neil described the pipes and risers application as being 'in the very early stages'. He was waiting to hear if the application had been approved and what the costs would be. When

thinking about the costs, Neil was considering the energy costs of pumping, changes to maintenance requirements with pipes and risers when compared to channels, and automation.

Neil was told that he would save about 400 ML if he converted to pipes and risers. The program would require him to give half of the savings over for environmental flows. If Neil went ahead with it, it would mean 'a lot more temporary transferring water'. Neil was considering buying more permanent water at some point in the future, when he could afford to do so, but had to take things 'one step at a time'.

The future

Neil described the hours on a dairy farm as 'pretty huge' and it could 'get pretty tough on family life'. Neil had children ranging in age from 12 years down to four years. With his children he found that he was 'pretty much constantly saying, "I'm busy doing this, I'm sorry"'. Neil didn't think that many people would do his job, as he was consistently working 13 to 15 hour days. With the farm's 'pretty high debt level', however, Neil would 'do just about anything to make things work'. Neil was hopeful that they could start 'getting on top of the debt and make things work better'.

The farm was a two-to-three person operation. Neil was pursuing the share farming so that he would not have to be so tied to the farm. Pipes and risers with automated irrigation would help with that as well. He was willing to work such long days because it was his farm. Neil was hopeful that by making things easier 'other people would be happy to do it'.

Through time, Neil had considered 'going up north and buying a decent-sized station' or working in the mining industry. Neil hadn't really considered using his farm for anything other than dairy. Neil didn't think that there were many enterprises that would give him the returns that he was getting from dairy farming. While dairy farming tended to also be a bit 'up and down', with debt 'under control' it is 'one of the best' enterprise types because it is 'always a steady source of income'.

Fruit production was not an option as it required money to set up for what he thought would be minimal returns. Neil could run beef on the property but beef had been very 'up and down' in the market. Neil thought that with beef 'you're really opening yourself up to the elements'.

Neil thought that cropping 'wouldn't be a bad thing' except it would require more land than he currently had. He would have to buy more land, on top of what he had just recently

purchased. Neil thought he could lock in contracts with grain production for more surety in his income stream. However, he just didn't think that there was 'a real lot of money' in it.

Farm Narrative 15: Owen

Owen owned a 120-acre irrigated property with a 600-acre outblock. He had a 320-ML surface water irrigation entitlement for the farm. Owen had 200 head of beef cattle on a property that his family had used for dairy production for over forty years.

Father bought a farm

Owen's father bought an existing dairy farm with 120 acres of land and 160 ML of irrigation water in 1957. The farm was set up with irrigation infrastructure and had established perennial pasture. It was a 'walk on, walk off' sale which meant 120 Jersey cows were included in the purchase.

Owen was seven years old at the time that his father bought the farm. He also had a brother who was four years older. Owen described how they all contributed to the farm when he and his brother were children. Owen's older brother went to work on the farm full-time when he left school in 1960. In the mid-1960s Owen also returned to work on the farm.

Early on, Owen's father had a second irrigated block in the region. Initially, he used the land as an outblock for young stock. He built a dairy on the block and brought in a share farmer who they had on the block 'for a number of years'. Owen's father 'eventually built the house on it and then he sold it'. Other than the block's early use as an outblock, it was run separately from the home dairy farm.

Once a share farmer was brought onto the second irrigated block, Owen's father leased some land that he could use as an outblock for the home block. The leased block was used to run stock over the winter.

Buying a neighbouring farm

In the 1960s, Owen's father bought another dairy farm that was near the home block. This new farm was 250 acres and had a 150-ML irrigation water entitlement. The farm was bought for Owen's brother and the family ran the two blocks together as one farm for a number of years.

Owen, his father and brother had a 'pretty complicated system' because of the pasture on farm. The new block was mainly sown to annual pasture, which was good for grazing over the winter. The home farm was perennial pasture, which was good for grazing over the

summer. Owen, his father and brother, used to milk on the block where they were grazing the cows. While they had a dairy on each block, they only had one milk vat. This meant that they had to 'shift the plant, the vat, everything over' to the farm they were milking on for the season.

In the late 1960s, Owen's brother got married and he moved onto his farm with his wife. At that time the farm business split in two. Owen and his father ran the home farm and Owen's brother ran his own farm. When the two farms were run together they were milking 200 cows. When Owen's brother got married and the farms split 'he took a fair chunk of the herd with him'. That left Owen and his father with about 120 cows. Owen and his father slowly built up their herd again. They had to transition from using the other farm for winter grazing, focusing instead on cutting a lot of hay and, eventually, a lot of silage.

Bought outblock

In 1970 Owen and his father bought a 600-acre outblock for the farm. The block was too far away for Owen and his father to milk off and it had no irrigation infrastructure. It was set up as a dryland block in three big paddocks. Owen and his father bought it to run dry stock and grow hay.

Owen and his father applied for a water right for the property and were allocated 160 ML. Over time Owen laser graded and set up irrigation infrastructure on one-third of the block. Two-thirds of the block could not be irrigated because 'it's quite steep, it's hilly'. With the irrigation infrastructure that they installed, Owen and his father still needed to pump the water up a hill. They couldn't water any more of the block 'without a lot of expense and it wouldn't be worth it'. However, the dryland portion of the block was 'quite good country' and grows 'a fair bit of feed when it rains, which it does occasionally'. After buying the outblock, Owen and his father discontinued the lease on the other outblock.

Breeding

The dairy herd was made up of Jersey cows when Owen's father bought it in 1957. In the early-to-mid-1960s Owen's father started 'slowly converting the herd over to Friesians'. By the time the farm was divided the herd was '100 per cent Friesian'.

The decision to convert to Friesians related mainly to their interest in using the outblock to start a beef enterprise. They had a considerable amount of land away from the dairy farm that

they wanted to utilise. They were looking for a dual purpose from the breed. A Friesian/Hereford cross is 'quite a reasonable beef animal'. However, putting a beef bull over a Jersey cow would be 'hopeless' as it 'wouldn't grow into anything of any value'.

Owen described how, when factories started taking whole milk, 'it was drummed into us that the Friesians were much better for protein'. That was also a part of the reason for the change.

In the farm breeding program, Owen and his father used to artificially inseminate (AI) all of the cows with Friesian semen for three to four weeks and then 'run a Hereford bull with the herd after that'. Any Friesian/Hereford cross bull-calves were reared as steers and the heifer cross calves were sold as bobby calves.

Owen and his father and brother emphasised spring calving. Drying off cows over the winter enabled them to move stock to the outblock over the winter. As time went on it got harder to get cows in calf, and the reality was that they 'had cows calving all the time' in the later years.

Owen takes over the farm

In 1974 Owen got married to Olivia. Owen and Olivia had four children over the years, starting in the mid-1970s. The day that Owen was married the farm was signed over to his name. Owen's father moved into town and stepped out of the dairy side of the farm business, though he did come out and help on the dairy farm. Owen's father 'maintained an interest' in the outblock and ran his own cows and calves there.

Owen bought the farm from his father. He paid him about \$200,000 through a payment plan that was organised through a solicitor. Owen acknowledged that 'we were fairly lucky in the fact that I owed the debt to my father, not the bank, so it was always reasonably flexible'. While the debt was at least 80 per cent of the value of the farm, 'there was no risk at all really'.

Through the mid-1970s Owen and Olivia kept slowly building up the herd until they reached about 180 cows. Owen was milking by himself. Olivia was looking after the young children and also worked as a nurse.

Owen, and his father before him, always produced their own supplementary feed. They 'never bought hay; never bought silage'. Owen described how they 'were always struggling'

to have enough feed when they had 180 cows. However, the farm had to be heavily stocked to be profitable. They had to be ‘on the ball with watering’ and could ‘get ahead of the feed quite easily if there was a cold snap in January’ which slowed down grass production. Owen started producing silage which was a ‘higher quality feed’ that he could use during the summer months to supplement the pasture growth.

When Owen’s father bought the dairy farm it had a small walk through dairy. This was extended to a 10-cow walk through. In 1964, Owen, his father and brother built a 10 swing-over herringbone dairy on both the home farm and his brother’s farm. In the mid-1970s, Owen converted the dairy into an 8-cow double-up dairy. He also installed automatic cup removers to make it easier on himself as a ‘single man operation’.

There was a drought over the 1976-1977 season. It was the first in which Owen didn’t get his full water right. The federal government made a subsidy available for dairy farmers to bail feed in the drought. Owen used the subsidy to introduce bail feeding in his 8 double up dairy. Bail feeding ‘made a huge difference’ and had a bigger impact than expected for Owen and Olivia. They were able to milk an extra 20 to 25 cows and they ‘were able to fill gaps in the growing season’. Owen thought that the government subsidies that year ‘changed farming in the area quite dramatically’ because at ‘that point there were probably very few people bail feeding, and after that nearly everybody was’.

Constraints on farm development

Owen wanted to redevelop the farm and in the 1980s had a WFP designed. He realised very quickly that he needed to increase the size of his farm if he was going to redevelop it. Without expansion, taking ‘land out of production for any period of time to do any major renovation was going to destroy the whole set-up’.

Owen’s ‘biggest issue was tied up with acquiring more land’. He ‘desperately needed more land’ and had two options: wait and hope to buy a neighbouring property; or ‘sell up and move’ to a bigger farm. Owen ended up deciding to wait and buy an elderly neighbour’s property. This meant that the redevelopment was ‘always put on hold’.

Owen’s son came back to work on the farm in the early 1990s. Owen and his son managed the farm together. All through the 1990s they continued to milk 180 cows, their farm ‘maximum’, and ‘were just going backwards’. They had plans to expand and put in a rotary dairy once they bought the neighbouring farm. Unfortunately, the neighbour didn’t sell Owen

the property. The property only became available much later, after the owner passed away. However, by that time it was 'in the middle of the drought' when Owen's son was having second thoughts about farming.

Due to his land constraints, Owen hadn't laser graded and developed the farm 'as much as other farmers'. However, even without the redevelopment Owen was still able to irrigate his farm pretty well. He had 'good recycle systems' and while 'it wasn't a Rolls Royce system', it worked.

Beef cattle

The beef cattle enterprise was 'a good sideline' to the dairy. Owen had 'good years and bad years' when it came to milk prices. Owen described milk prices as 'up and down your whole dairying career'. When the price was bad, he knew it would improve 'in a few years' time'. 'That's agriculture unfortunately', including beef cattle.

Over time, Owen did not change emphasis between the beef and dairy enterprises. Instead, over a thirty-year period he consistently ran about 100 head of steers on the farm. Owen estimated that the beef cattle were about 30 per cent of the farm income. Owen figured that the 'only way to make any money out of it was to have the same amount of steers to sell over a year'. 'The trick was to have the right amount of cattle at the right time' so that, 'if the prices were good', they did well.

Drought

Owen had the same amount of water on each property. Through the 1980s and into the 1990s, Owen used to get 100 per cent of his allocation and 100 per cent in 'sales' water. He used all of the water he could get, every year. In the 1990s, sales water started to decline. At around the same time, water rules changed which allowed water rights to be amalgamated. This enabled Owen to use the water wherever he needed it most.

A prolonged drought started in 2001. As water became scarcer, Owen ensured that most of his irrigation water was used on the dairy farm. Over the first few years of drought, Owen bought temporary water for the dairy farm, at times for 'ridiculous prices'. As well, Owen thought of it as a 'one in a 100 year drought' and focused on doing whatever it took to get through it. He 'spent an awful lot of money' buying fodder that first year, thinking they could

'afford to do that for one year'. Owen and Olivia ended up using close to \$100,000 of their personal savings in one season. Unfortunately, the drought didn't last for just one year.

Over the next few years of the drought, Owen minimised all expenses, including cutting the use of herd testing and AI. He also cut back his cow numbers by culling heavily. He got the herd down to 110 or 115 cows.

Owen was 'lucky' that he and Olivia didn't have any debts. If the drought had happened 20 years earlier, it 'would have been horrendous'. Owen 'throttled back' on farm expenditure, focusing on paying his son's wages. Olivia was working, which helped with their family expenses. While Owen and Olivia 'weren't making any money', they 'weren't going backwards either'.

After three to four years of the same pattern, 'it started to get a bit much'. The farm was not bringing in enough income to pay for both Owen and his son. Owen offered the business to his son, as Owen had 'had enough'. Owen's son didn't want to take over the business and took a part-time off-farm job that quickly turned full-time.

When Owen's son decided to leave the farm 'it made life a lot simpler' for Owen. Early in the drought Owen could tell that his son 'wasn't 100 per cent keen' on farming. After his son's decision to leave, Owen could make decisions without having to worry about his son's future on the farm. Owen acknowledged that he 'didn't do a lot of the things that other farmers did' because he 'was over it' and seriously thinking about getting out of dairy farming. He didn't change any of his pasture to annuals and he didn't buy a mixer wagon: 'the expense just didn't warrant it'.

In the 2005/2006 season Owen was getting 30 to 40 per cent of his irrigation entitlement, which 'made things really difficult'. 'It was just a nightmare really.' Owen didn't buy any water and instead dried off his pasture. Owen fed the cows grain in the dairy and bales of wheat and hay in the dry paddocks. The cows 'looked surprisingly well on just a bit of wheat and hay and grain'.

Owen and Olivia 'just bumbled through for probably a couple of years'. Olivia was also working as a nurse and helping to look after grandchildren. Owen and Olivia decided that they no longer wanted to run the dairy farm and sold the dairy herd.

Prior to selling the dairy herd, Owen had already started working towards building up a beef cattle herd. After Owen's son left, Owen thought that they 'weren't going to last all that long'. He decided to rear every Friesian/Hereford heifer that he produced so that he had some cows for setting up a beef herd. Things improved half way through the season and Owen ended up having 'a good year' with the dairy. He sold the Friesian/Hereford heifers that he had been rearing. The next year was when he and Olivia decided to get out of dairying. He again kept the Friesian/Hereford heifers that he produced. This enabled Owen to have 'a readymade beef herd to take over' when he sold the dairy cows.

Beef herd

In the first year that Owen transitioned the farm out of dairy and over to beef cattle they lived off the money that they made from selling the dairy cows and Olivia's nursing income. After 12 months, they had their 'first lot of veal for market'. The transition 'didn't seem to be a hassle' to Owen.

In the beef enterprise Owen used bulls in the breeding. The heifer offspring were sold at nine months as 'milk vealers'. The steers were kept on the old dairy farm for an additional 18 months and then sold. Owen got up to carrying 400 head of stock on the farm at one point, but was back down to about 200 at the time of the interview.

Owen was 64 years old and 'easing back' on his workload. When he first transitioned to beef he was 'still short of water' and not irrigating much. As water became 'very plentiful' he started focusing on improving pasture growth on the home block. In recent times on the outblock Owen 'didn't do a huge' amount, just sprayed for weeds and fertilised. He used the block for oats that he grew for hay. He also oversowed the annual subclover and rye pasture every two years. Very recently, Owen had been watering the outblock more than he had in a while, because there was a lot of water available.

He knew that he could do a lot more with his farm but wasn't motivated to do so as he had 'bought a caravan, unfortunately'. He described the beef-cattle as 'a totally different lifestyle'. He had even taken up lawn bowls.

Owen acknowledged that his and Olivia's income had dropped 'fairly dramatically' but felt lucky because they didn't have any debt. Olivia's income was enough for their day-to-day household expenses. Owen ran the farm with the hope of making enough money 'to have a

certain amount of improvements every year'. While Owen was 'not making huge amounts of money', it was enough and it kept him occupied.

Recent past and near future

In the last few years there were changes to the public irrigation infrastructure. Owen and Olivia's farm was on the backbone of the system, which meant obtaining access to irrigation water was not expected to be an issue. As a part of the changes, Owen's irrigation outlets were converted from Dethridge wheels to Magflow meters. Owen thought the new system was 'fantastic' and that it worked well for him. He was unsure how affordable it was going to be for G-MW to maintain it. Owen did 'very-little' to change his on-farm irrigation system at the time the public infrastructure was changed.

Owen's beef cattle herd was 'predominantly Hereford cows'. Herefords are 'really prone to eye cancers and things like that' because of their white faces. Owen had been having 'quite a few issues' with his Herefords and was 'thinking seriously about probably changing and going into Angus'. Owen thought that in 'another couple of years' he and Olivia might sell all of the stock, 'go for a good trip somewhere' and then come back to decide if they want to start with another herd or 'just sell the farm'. Owen wasn't sure what decision they would come to but knew that age would be a factor. If he were 10 years younger 'it would be totally different'.

Farm Narrative 16: Paul

Paul manages a cropping enterprise with access to irrigation water. He converted a large dairy enterprise over to cropping in 2008.

Paul is a sixth generation farmer in his family. His ancestors had been in the district since 1877, starting off as dryland farmers on a 320 acre block in a different part of the region. Government was preparing to install irrigation infrastructure in some parts of the region. In 1940, Paul's great-grandfather and grandfather bought a 220 acre block in an area that had been earmarked for irrigation. Paul's grandfather was motivated by the benefits he could see potentially coming from irrigation.

When they first bought the block it had been farmed; "the trees had been cleared off it and it had been cropped". Paul's ancestors used the block for mixed farming. They cropped wheat and grazed sheep and cattle. However, they did not live on the block, they lived on the dryland block that was in another area of the region.

Irrigation and soldier settlement

Paul was not sure how much water his great-grandfather and grandfather were allocated when irrigation came into the district. Farmers were allocated water based on land size within a land title and a consistent formula was used across the district. The idea was to ensure that farmers had "the ability to make a living from a title of land". This meant that smaller land title areas received larger entitlements per acre of land, with a view that, if a farmer didn't have the land, he "could make up for it with water". Paul thought that farmers did not have advance warning of how water was going to be allocated as "there wasn't a rush of subdivisions" in preparation for the coming of irrigation.

At the time that Paul's great-grandfather and grandfather bought the farm "there was no talk of the soldier settlement scheme". Even so, the scheme was rolled out at the same time as irrigation was installed in the district. The federal government compulsorily acquired land and broke up square mile blocks into six even blocks (of 106.6 acres). The irrigation infrastructure was built to irrigate the blocks and each soldier settlement block received a water entitlement of 160 ML.

Paul's ancestors did not have their block compulsorily acquired. Paul thought "it was a fluke" that their farm was unaffected.

Grandfather bought more blocks

In 1951 Paul's great-grandfather died and his grandfather, through inheritance, took over full ownership and management of the farm. In the early 1950s Paul's grandfather bought an adjoining 160 acre property upon which he built a house. This increased the farm to 380 acres. The farm had about 160 acre-feet (200 ML) of water across the two blocks.

Paul's grandfather sold the family's original dryland farm and moved his family to the irrigated farm. It was 1956 when the house was built. He had a wife, two daughters and one son. The son, Peter, was Paul's father, who was 16 years old at the time of the move.

Shortly after buying the 160 acre block, Paul's grandfather bought another adjacent block comprising 200 acres and a "huge water right" because it had an irrigation entitlement and it also had creek access. Paul thought that it was "a little bizarre" that government policy focused on ensuring there was sufficient water for a farmer to be able to make a living off of a title and yet it "ignored farms that had access to both the channel system and the creek".

Paul's grandfather also did some share farming, where they cropped on other people's farms. With the share farming and the 580 acres on their farm, Paul's grandfather was able to generate enough income to support his family.

Peter came to work on the farm when he left school in 1956. There had been serious floods "which destroyed large areas of stone fruit trees" and Peter and his father (Paul's grandfather) decided to plant 20 acres of their best land to peaches and apricots. This gave them an extra 20 acre-feet of water. The orchard didn't last long however, as changes in the market reduced profitability of fruit production.

The influence of the 1964 Water Act

In the 1960s Peter was married. He and his wife built a house on the 160 acre portion of the farm. They had three children, all boys. Paul, the middle son, was born in 1968.

Peter said that the amendment of the Water Act in 1964 was "a critical point for the farm". Up until then the allocations were "unrealistically low". The act "had a massive impact on what happened" on the farm. Given the farm had four allotments, they received enough water with the changes that they "became serious irrigation farmers" while before they were "just dryland farmers with some irrigation". In recent times, Peter reflected, the focus had shifted

for “water going to the environment and farmers not getting enough of it” which is a “crazy situation”.

Up until 1971, Peter continued to run the farm as a mixed farming business. He had the farm broken up into three different land uses. He had about 15 to 20 per cent of the farm in perennial pasture, which was irrigated weekly throughout the summer. On the balance of the farm, he used a cropping rotation in which they used pasture for a couple of years and then crops for a couple of years. This meant that the land was sown to southern rye and subterranean clover and alternated with crops of wheat or occasionally oats.

Peter mainly ran sheep on the farm but he also had beef cattle. The beef cattle were better suited to the perennial pasture than the sheep, which had “terrible trouble with liver fluke and footrot”.

The 200 acre block was “a poor area of land” as it had “a big swamp through the middle of it” which had never drained. Peter was “keen to not own it anymore”. Paul’s grandfather’s brother owned a 525 acre block four kilometres away. Peter bought the block. He sold the “poor” 200 acre block and a small subdivided house block off the 160 acre block. The proceeds from these sales were used to pay for the 525 acre block.

Similar to the 200 acre block that was sold, the 525 acre block was adjacent to a creek and had access to a considerable amount of water. The 525 acres had a 280 ML irrigation water entitlement and a 160 ML creek pumping licence. Overall, the block had access to 440 ML of water. Peter incorporated the new block into the mixed farming business. Initially, he did not alter his business approach, continuing with a mix of beef, sheep and wheat production.

Sunflowers

Beef were about 60 to 70 per cent of farm income for Peter. In the early 1970s there was “a major crisis in the cattle sector”. Producers were “shooting cattle and livestock were at give-away prices”. Peter started “looking for an alternative” to cattle. Farm debt was “fairly low” for Peter. Even so he “got a bit sick of not making any money”.

At that time, sunflowers were seen as being a great crop to grow. Peter decided to go into sunflowers and beef production “dwindled” on-farm to where “the livestock didn’t get any money invested in it at all”. Over a five to six year period, sunflowers took over emphasis in the farm production system, bringing in 60 to 70 per cent of the farm’s income.

Due to “major problems” with oilseed production in other parts of the world, “the prices for sunflowers were very high”. Sunflower production became very popular in the region because it was tremendously profitable for growers, compared to anything else. Peter put about half of the farm into sunflowers. Paul described how “it was a time to be pretty aggressive with it, because the profits were just so good”.

There were costs associated with putting half of the farm into sunflowers. Given these costs, Paul thought that “the numbers must have been pretty compelling” to Peter, otherwise he would not have made such significant changes to the farm. Peter had to purchase four to five row cropping machines. He also had to convert half of the farm from border check flood irrigation to 30 inch spacing furrow irrigation. To do this he had to modify the infrastructure by “abandoning the bays and putting furrows across the whole field”.

Sunflowers started out being profitable for the farm. However, after five or six years, Paul’s father got out of sunflowers for three reasons. First, the price he received for the crop dropped significantly. In Peter’s last crop of sunflowers he produced 150 tonnes and made a total of \$200 profit. Second, a serious root disease called sclerotinia began affecting the sunflowers making them more difficult to grow. And third, he had “terrible trouble” with bird pests (i.e. cockatoos) causing significant damage to the crops. After these things Peter decided, “blow that for a joke”, sunflowers were not worth growing.

Overall, furrow crops, such as sunflowers and maize, were not really viable options on the farm until the advent of laser grading in the late 1970s. With laser grading they could get the slope suitable for row cropping. After laser grading production of sunflowers improved for a short while, until disease, pests and market prices led to decline in the product. Importantly, laser grading led to a dramatic increase in furrow irrigated maize production, which was beneficial for the farm.

Dairy farming

In the early 1970s, Peter and his wife took over a soldier settlement block that belonged to Paul’s mother’s parents. Paul’s mother’s father was a soldier settler and established the block as a dairy farm when he got the land in the early 1950s. The dairy block was 10 kilometres away from the home farm.

Paul’s father “was adamant that he personally was never going to milk cows”. Paul’s parents had share farmers on the dairy property. Paul described them as “just investors in the dairy

farm”. They maintained their investment in the dairy property until the late 1970s, at which point they sold the block.

After being out of dairy farming for two years, Paul’s parent bought a 200 acre dairy property near the 380 acre home block. The property had 170 ML of irrigation water. With the new land the home block was increased to a connected 580 acre property. The 200 acre block was set up and being run as a “small 80 cow Jersey operation”.

Peter decided to combine the 200 acres with the rest of the home farm and establish a larger dairy enterprise. Peter had “decided that his boys would come home and run it” as he had no interest in milking cows himself. At the time, his eldest son was 15, Paul was 12 and then youngest son was six years old. Paul thought it was “staggering” that his father made such a decision when the boys were all so young. However, when he asked his father about it years later his father said, “Well, if you hadn't have done it I just would have sold it, because I knew that was the correct use for that land in that era”.

While Peter wasn’t interested in milking cows himself, he worked out that dairying was a good idea for the farm. “Most of the soil types” on the block were “more free-draining” making the 580 acres conducive to dairying farming. Milk prices, the farm’s “proximity to town and the availability of water” made dairying look like a good enterprise choice.

When Peter bought the 200 acre block in 1981, he bought it under “vendor finance”, which meant that “the previous owner agreed to leave money in the farm, and become a mortgage holder”. The vendor finance taken up for the property was “a pretty generous deal”.

Importance of off farm income

Over Peter’s 50 years on the farm, most of the time he did not draw an income from the business. Peter found that his off farm businesses were his main sources of income and provided resources for the farm. At the time of the interview Peter still worked in his off-farm business.

Setting up the dairy farm

This first thing that Peter did when pursuing the dairy enterprise was to purchase more cows so that he could increase production. He had 180 cows by the time the new rotary dairy was built. He “went straight for Friesians” because Friesians were seen as “the more robust

option”. In addition to buying cows, he started using Friesian semen through artificial insemination (AI). On the farm, they used Friesian semen through AI over the 27 years they ran a dairy enterprise. Even so, in 2008 Paul could still see the positive “Jersey influence” in the herd, as his herd’s milk tested “higher for butter fat”.

They milked out of the old dairy for the first year-to-18 months running the dairy. Peter then put in a rotary dairy, which he was able to pay for in its entirety using money from an off-farm business.

Peter “had a vision as to what the farm would look like” and designed how the farm would be laid out. Paul thought that his father’s “vision for the farm” was aided by his experience running a separate business. While his father hadn’t really “formally written down” his plan for the farm, “he got it pretty right”. Paul thought that his father understood “the landscape” and how the farm infrastructure should be set out within that landscape. Given much of the block was set up for cropping, Paul’s father had to make a lot of changes to the farm to make it work for dairy. As well, he changed the layout of the farm, irrigation channels and the fencing. This “happened gradually over a fair period of time”.

As they developed the dairy farm, the proportion of perennial pasture was a “moving target” because it grew each year. While it “took quite a while”, eventually the pasture on the dairy farm was all perennial pasture. The conversion to perennial pasture across the farm was done as a part of the farm redevelopment. When “there was a lull in the work” for Paul’s father’s other business, he would come home to the dairy property and work on the redevelopment. The fact that they could work on the redevelopment themselves was “a bit of an advantage” for the farm business.

Managing the dairy farm

Remembering that Peter had no interest in milking cows, there were a few years before Paul and his brother were to return to work on the farm. During that time, from 1981 until mid-1986, the dairy farm was run by share farmers. However, the “financial performance of the dairy operation was woeful”. When the share farmer left in mid-1986, Paul and his brother took over the day-to-day operation of the dairy farm.

From the late-1950s until the mid-1980s Peter “was responsible really for everything that happened on the farm”. When Peter had come home to work on the farm his father, Paul’s grandfather, had let him take over. Paul described how his grandfather “wasn’t one of those

fellows that hangs on to the bitter end”. Paul’s grandfather lived until 1993; however, he had long given up management of the farm.

When Paul joined his older brother to work on the farm in 1985, Peter was ready to do the same thing his father had done - pass on farm management to his sons. This meant that Paul never worked for his father when he was on the farm. He worked with his brother and his father. With Paul and his brother taking over a lot of the management of the farm, Paul’s father was able to largely focus on his other business.

Peter’s third son, younger brother to Paul, also returned to help on the dairy farm for a while. This son then decided to work for Peter in one of the off-farm businesses. He had married a woman from another country and they began building their own family. This third son worked for Peter for four to five years before moving overseas, to his wife’s country of origin, with his wife and children.

This third son, like the other two sons, was “entitled to a slice from the property”. When he left Paul paid his brother out by paying a stock mortgage owed to his mother (Peter’s wife) to this brother. Peter described how Paul was “very generous” in the arrangement to his younger brother.

525 acre outblock

While the share farmer was milking on the dairy farm, the other 525 acres was returned to a separate mixed farming block. The two blocks were run as “standalone” blocks. Peter took a year or two to “phase out of sunflowers” on the 525 acre block.

When Paul and his brother came back to run the farm, they converted the 525 acre block into an outblock for the dairy farm. The farm “focus was all about dairy” and the outblock was used for “really only feed and water”. By 1987, “the only income that came in the gate was through milk sales”.

Paul and his brother managed the farm by managing each, the outblock and the dairy block, separately. Paul’s brother managed the outblock, with one employee, and Paul managed the dairy farm, with a few employees. Overall, it look about five or six full-time equivalents to manage the farm.

Paul and his brother grew extra feed for the milking cows on the outblock. They had a small amount of perennial pasture and ran young stock. The soil type on the outblock was less free-draining than on the dairy block making it more suited to annual pasture and cropping. At times, Paul and his brother transferred water from the outblock to the dairy farm and used the outblock for dryland cropping.

Feeding

From the mid-1980s to the mid-1990s Paul and his brother focused on steadily increasing the number of cows that they were milking. They went from 180 to 600 cows in 1995. They were in the midst of renovating pasture on the dairy farm. They were “heavily supplementary-feeding” the cows. Some of the feed they produced on the outblock; however, they were purchasing 40 to 50 per cent of the feed they needed.

Paul described how their “big feed gap was in the summer/autumn/winter period”. They were only able to feed the cows without supplements during the spring and they still “fed out a little bit” then.

Paul and his brother started feeding cows in the dairy in 1989. In the same year Paul and his brother started using some of the outblock to produce maize, to feed to the cows. Maize was a regularly grown on 80 hectares (198 acres) of the outblock for about a decade. Prior to the maize, they primarily grew hay on the outblock. They started “getting into silage properly” when they started growing maize. They also “silaged” some of the maize grain.

Change in calving

When Paul and his brother first started with dairy farming they calved in the spring. Spring calving coincided the “cows maximum nutritional needs with when feed was available”. It enabled them to dry the cows off and have a break in the winter. As well, spring calving helped with managing wet winters. Wet winters were hard on the cows, hard on the pasture and hard on the farmer.

With spring calving Paul and his brother would join all of the cows and at the end of joining season, any cow that was not in calf “you’d just cut her head off”. However, in the early 1990s Paul and his brother started having problems getting cows in calf. They tried “every conceivable idea” to improve their calving percentage but nothing worked. While Paul had heard that changing to cross-bred cows was an approach that some farmers had used to

manage fertility issues, he “didn't believe that strategy had any credibility”. The fertility problem persisted for the rest of the time that they had a dairy herd.

As the fertility problems worsened, Paul and his brother were getting a 20 per cent empty rate or even higher, while “the industry standard at the time was less than 10 per cent”. The proportion of empty cows “ended up being too high a proportion” for Paul and his brother to continue to “wear the losses” associated with sticking to spring calving.

At the same time that Paul and his brother were struggling with fertility issues, winter seasonal conditions were changing. There were a lot of wet winters in the 1970s and 1980s. From the mid-1990s onward this changed and winters became much drier. “When dry winters became the norm” Paul and his brother decided that the prospect of “milking cows in the winter time wasn't too bad”.

In 1995, they started autumn calving. This meant that the cows had “two opportunities” to get into calf. This also meant that Paul and his brother received a better price for their milk when milking over the winter. From 1995 onward, Paul and his brother were milking all year round because they were split calving. They had about 30 per cent autumn calving cows and 70 per cent spring calving cows. However “the percentage was determined by the ability to get cows in calf”.

Paul and his brother continued to alter the calving pattern in response to the capacity to get cows in calf, which Paul referred to as “the tail wagging the dog”. They did not want to sacrifice good cows just because they were not in calf. To give the cows an “extra opportunity” they ended up calving three times a year; in January, May and September. This increased the proportion of cows that they were milking over the winter, but that did not worry Paul and his brother, because the winter milk price was so much better.

From the mid-1990s until Paul sold the herd in 2008, they continued with a split calving pattern. Paul acknowledged that, if wet winters had returned, the calving strategy would have “come unstuck”. He was “constantly worried about it and felt underprepared for it”.

Expansion

At about the same time that they started split calving, Paul and his brother decided to “go through another expansion phase”. They bought an adjacent 100 acre block with 120 ML of

water, which they were able to easily fit into their pasture rotation. They bought another 400 Friesian cows, which they bought in batches over a one year period.

Paul and his brother also built a feed pad “at vast expense”. They put in the feed pad with the idea of finishing the conversion of the entire dairy block to perennial pasture and supplementary feeding of cows as they came out of the dairy on their way to the paddock after they were milked. This was to “ensure that the cows were fully fed”. They continued to feed the cows in the dairy as well. Paul “believed that was the most profitable model” for the business.

By using the feed pad Paul and his brother could “feed the cows much better balanced supplements”. They fed “total mixed rations” [many farmers seem to refer to what he has described here as ‘partial mixed rations’]. They bought a mixer wagon that aided in this. The feed pad helped ensure the increased number of cows were fed, but it also ensured that Paul and his brother were “able to get the cows to milk better too”.

Dropping maize production

Paul and his brother “applied a lot more scrutiny to the cropping operation” on the outblock in 1998. They realised that they “couldn't make it economically work” to continue growing maize on the block. Growing maize had an “extraordinarily long” payback period because it requires upfront inputs and storage in silage bunkers. This meant that when they finally “got to sell it as milk in 15 to 16 months” time, they were not making adequate profit out of it.

After stopping maize production Paul increased the proportion of feed that he had to purchase for the farm. With the maize, he was buying in about 50 per cent of his feed. Without the maize, he was buying 70 per cent of his feed. Given Paul was milking a large number of cows, with the increased feed costs the business was still profitable, though “barely” so.

They started growing annual pasture on the outblock instead of maize, for lower costs and less labour. This meant that there was not sufficient work on the outblock to support Paul’s brother. Paul and his brother started managing the dairy farm together but Paul’s brother wasn’t interested in dairy farming and decided to pursue other interests in mid-1999.

When Paul’s brother left, Paul and his wife, Patricia, bought the farm. Until that time Paul’s father and brother both had interest in the business. Paul and Patricia had to borrow money

from the bank to pay them out. The mortgage was for about 60 per cent of the value of the farm.

Drought

For the next few years Paul and Patricia continued to run the farm as it had been run. They were milking a large number of cows “by industry standards” and not interested in expanding their herd any further. In 2002 they bought another 500 acre farm. It was an irrigated block and had a 369 ML irrigation entitlement. The new property was too far away to walk the cows. It was bought to grow food for the dairy and was already set up for cropping and annual pasture. At that point the farm comprised a 650 acre dairy block and 1025 acres across two outblocks.

Even before the farm expansion in the mid-1990s, Paul and his brother needed more than their irrigation entitlement to sufficiently water their crops and pasture. This wasn't a problem for them up until about 1997, when water rules changed. Paul said that before 1997 “you could have as much water as you like, as long as you paid your water bill”. He recalled using 400 per cent of his entitlement on a block that had a lower irrigation entitlement. After changes to the water rules, Paul and his brother started having to buy temporary water regularly to ensure they had enough.

In the early 2000s, Paul and Patricia had a water entitlement for 1050 ML. In a typical year they used about 3000 ML of irrigation water. This meant that they had to buy in two-thirds of their irrigation water needs in a year when they received a 100 per cent allocation.

In the 2002 season, Paul didn't get his full entitlement of irrigation water. He described 2002 as “a real shock” because they had “treated water as if it was always going to be there”. It was the first drought-affected year that Paul and Patricia experienced and their “world came crashing down from the point of view of water availability, and a combination of low milk price and high feed price”.

Paul converted a lot of his perennial pasture to annual pasture, which required a lot less water. It was “completely unaffordable” to buy extra water to make up for the shortfall in his allocation. The combination of low milk prices, high feed costs and low water availability was “a recipe to lose money hand over fist”. Paul “didn't want to change the structure of the business” and decided to “wear the costs”. He lost \$500,000 in that year. However, at the

time he was “convinced” that the drought would be short-lived and he wanted to be in a position where he could “rebound from the drought”.

After the 2002 season, it rained and feed and milk prices improved. He had three “seasonally good years, and even the economic equation was quite good”. He was able to rebound and made back the \$500,000 loss over those next few years. Paul had also converted “pretty near 100 per cent” of his dairy block back to perennial pasture, because he “didn’t think another drought would happen”.

In 2006 drought returned with another low allocation, though the “price equation wasn't quite as dramatic” as it had been in 2002. Based on the 2002 experience, Paul “didn’t muck around” and shifted quickly back into annuals, as he couldn’t irrigate to the same extent in drought conditions.

The price for temporary water was good and Paul ended up selling some of his water; “financially that helped”. He then bought in feed and fed the cows on the feed pad. He used a lot of “bi-product feeds” (e.g. waste lollies, brewers grain) between 2006 and 2008. He also bought grain for a fraction of the typical price by buying it from someone who “had a contract for taking away the grain cleanings from around bunkers”. These alternative feed sources “helped enormously”. To reduce the feed pressure on his farm, Paul also agisted heifers to Tasmania.

Over that three year period of drought, Paul and Patricia managed to “just” make a profit. Paul thought that they could have kept going as it was. They were able to manage the drought a lot better than others were because they could change how they fed the cows. Overall, Paul and Patricia “coped quite well during that period”.

Dairy an unsustainable path

With the dairy enterprise, Paul described how they had “gone down a certain pathway” to a “large herd that was intensively fed”. They “couldn’t break out of that path very easily”. Paul pointed to the difficulties he had getting cows in calf as an example. The calving problems pushed Paul into calving three times a year. As well, Paul and Patricia had an increasing problem treating sick cows.

During the drought, Paul needed to be able to sell a large number of cows to reduce the need for feed. If he had been able to do so, he could have then turned around and bought them

back “when the circumstances were right”. However, having a large herd made this difficult to do. Socialisation issues amongst cows “was an enormous problem”. He didn’t have the option of bringing a large number of cows into the herd “and expect them to do okay”. The reality was that “new cows would get knocked around”.

Overall, Paul and Patricia had a number of problems indicating that their production system was “unsustainable on a whole stack of levels”. Paul didn’t think that his dairy farm was “sustainable in the long term, from a workload viewpoint, from a farming system viewpoint, from an animal health viewpoint, from a lifestyle viewpoint”.

By the mid-2000s Paul was very aware that “the farm needed a huge new investment in infrastructure and enthusiasm”. Neither Paul, nor Patricia was prepared to give it. The biggest infrastructure problem was the dairy. The existing dairy was old, which meant high maintenance requirements. Its small size meant that milking was time consuming, generating high staffing requirements.

The farm needed a new dairy. However, the area where the dairy was located was small for the herd size. Building a new dairy meant that “a lot of renovations and various other forms of grief” had to occur for this to be possible.

Paul and Patricia got to a point where they didn’t want to keep going with the dairy. Once they had decided to get out of dairy they then had to work out how to get out of it. In 2006 and 2007 they had two separate marketing campaigns to sell the farm. Unfortunately, the farm wasn’t marketable as a dairy farm, because it needed a new dairy and they were unable to sell it.

Over that period, Paul and Patricia were just “marking time” and by 2008 they’d “had a complete gutfull”. Paul and Patricia modified their plans, sold the herd and went into cropping. They had 400 heifers that were still on agistment in Tasmania. Paul sold them from Tasmania. The cows that were on the dairy farm were sold through a two-day auction in April 2008.

Why cropping?

One of the key factors that attracted Paul to cropping was his greater capacity to control the price he got for his product, when compared to dairy. With grain production, “if the market

circumstances didn't suit, you didn't have to sell, because you could store it.” Paul could time the sale of his grain when it suited and the buyers “were being more reasonable with you”.

Paul thought that it was “appalling” how low paid dairy farmers were for their product. He believed that the “short shelf life” of the product enabled the milk factories to take advantage of farmers and control milk prices. For example, Paul had been a part of collective bargaining, to try and get a better deal from the factories. The milk factory would simply threaten to not pick up the milk from farms and farmers “just fell like dominos”, signing up to the factory’s terms. “Farmers didn't want to have rotten milk on their hands, and it was better to get something than nothing.” Paul didn’t think that the factories were “particularly serious about competing with one another”.

Another factor that attracted Paul to cropping was that it reduced his dependence on staff. Throughout his time in dairy farming, it got increasingly difficult to manage staff. He found that the “quality of the workforce declined” and he couldn’t do much about the fact that “people would work on a dairy farm as the job of last resort - full stop”. With cropping, Paul only needed to manage two employees.

In cropping, having enough land was essential. There were “lots of people who had also had a gutfull of dairying” but didn’t have enough land to make cropping possible. Paul thought that the amount of land he owned helped to make cropping a “viable option”.

There were a number of things “about the way that it had been farmed that helped in the transition to crop it out”. Paul’s farm “had a layout that was conducive” to cropping. This was aided by the farm’s history of cropping, which meant that he had large-sized paddocks and a “large enough tractor”. As well, the farm layout consisted of groups of irrigation bays that could easily be cropped as one large area, simply by removing one fence wire. The farm had not been “set up with loads and loads of trees on check banks, multi-wire fences, or channels going this way and that”.

Conversion to cropping

To convert to cropping Paul and Patricia only had to buy two implements, an air-seeder for sowing the crops and a boom spray. They already had a tractor that could operate the machinery. Initially, Paul and Patricia used a storage contractor rather than buying silos for their grain. Eventually, “for economic reasons”, they put in their own storage.

After selling the cows, Paul and Patricia bought more land. Since converting to cropping, Paul “changed a lot of things” regarding how the farm’s water was structured. Most of his farm was on the backbone of the public irrigation infrastructure. Any land that was not on the public irrigation infrastructure had connection agreements with Goulburn-Murray Water to ensure that his entire farm maintained access to irrigation water. Maintaining access to irrigation water was important to Paul.

After converting to cropping Paul grew his crops in a rotation: wheat, barley, faba beans and canola in the winter; soya beans in the summer. Paul consistently followed his rotation, rather than altering it based on changes in market price or other external factors. When he set up his cropping system, he “was determined to set it up as a sustainable system right from the outset, which meant sticking to a cropping rotation”. He didn’t want to go down the path of altering his rotation around because of “what happened in dairying”.

Income from cropping comes in more sporadically than the monthly dairy cheque. However, that “didn't frighten” Paul because selling the herd generated “a big income source” that they could use to get through the short-term income lag associated with converting to cropping. Paul found that they “could fund the initial years of the cropping program quite easily” with the herd money. Financially the shift was positive for Paul and Patricia; generally they were “doing better” than with dairy.

Concerned about the future of agriculture in the region

Paul was concerned that the “irrigation region is at risk” because so many farmers in the district were struggling to “actually generate adequate profit”. While Paul may have a viable irrigation business he was concerned because the farms in a district are all “dependent on one another” to be viable. He highlighted that as the percentage of viable irrigated farms decline, the sustainability of irrigation in the district is put at risk.

Paul also worried about farmers on the smaller, soldier settlement blocks. He questioned what farmers were going to be able to do with their 100 acre blocks “without the dairy industry at the scale that it formerly was”. Some have sold their permanent water and still had “a significant fixed rates and charges bill every year”. The farms are too small for grain production. Without a large enough dairy industry, fodder production is not an option, as there are no dairy farmers for whom to supply fodder. Manufacturing fruit production is also not an option as that industry is in decline.

Paul thought that the problem with agriculture in the region was being “masked” by Government’s investment in the irrigation infrastructure. When the money through these “farm water programmes” is gone, Paul is very unsure what the future holds for irrigation in the district. However, Paul was certain that “the toughest years in irrigation are still ahead of us”. State and federal governments have reduced investment in agriculture and shown that they “don't give a shit about agriculture, full stop”. Government is pushing the support of agriculture onto private industry groups, such as the Grains Research and Development Corporation and the Dairy Research and Development Corporation. Paul was convinced that such decisions are “really going to affect these districts, much more so than the policy makers think” they will.

Appendix E: Farm Matrices

Following are individual farm matrices developed in the decision mapping part of the analysis. Each row reflects a section of coded data in the order in which it appeared within a narrative. These were coded according to the model components used to analyse the narratives. Each critical juncture, as it arose in the narrative, is indicated by light blue shading. For example, the second critical juncture for narrative one is coded as 1.2, while the fifth critical juncture in narrative one is coded as 1.5. These critical juncture codes were then used in the CJ column to identify intersections with other data that were coded according to the other constructs of constraints (as reinforcing decisions). Hence, the code for a critical juncture is repeated where a linkage was identified. Where a linkage was not identified this was coded as ‘?’.

The maintenance in these matrices of the sequences in which the data actually appeared in the narratives means that matters related to critical junctures could arise both before and after the critical juncture was actually identified in the discussion and therefore in the matrix.

Key:

CJ – critical juncture

Adapt – adaptation

Plan – plan image change

Goal – goal image change

Infrast – infrastructure change

Tech – technology change

HRM – human resource management change

Proc – procurement change

In – inbound logistics change

Oper – operations change

Out – outbound logistics change

M&S – marketing and sales change

Narrative 1

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
personal/family goals	grandfather started out as a share farmer on the property.	1.1											
marriage and changing ownership	Albert and his wife took over the farm in 1978, after they were married	1.2			x	x		x					
Description of practices used on the farm, implied adoption of practices at some point but not clear when, this is all prior to Albert's involvement	borrowed Jersey bulls from the neighbour for joining	?			x				x				
Description of practices used on the farm, implied adoption of practices at some point but not clear when, this is all prior to Albert's involvement	used to get some cows from the market in Bendigo, though half would have to be returned because of poor performance or bad temperament	?			x				x				
herd genetic quality impeding goal of building business	When Albert came to work on the farm in 1965 he told his father that they needed to try and do something to sort out the mixed-breed 'motley group of cows'.	1.3				x			x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changing genetics to improve herd	To improve the herd Albert and his father changed how they bred the cows	1.3	x	x			x						
practices associated with breeding to improve genetics	try AI on some of the cows, while continuing with the use of Jersey bulls for the rest of the herd.	1.3	x	x			x						
changing genetics to improve herd	focus on breeding Jerseys.	1.3	x	x			x						
changing genetics to improve herd	bought 25 registered Jersey cows	1.3		x					x				
changing genetics to improve herd	stopped keeping replacements from the cross-bred cows.	1.3	x	x							x		
practices associated with breeding to improve genetics	start herd testing	1.3	x	x			x						
practices associated with breeding to improve genetics	Over time the farm was converted to exclusively AI breeding.	1.3	x	x			x						
side business related to use of AI in breeding practices	1969 Albert began working as an artificial breeding inseminator off-farm, which led to a 26-year part-time career in AI in which he artificially inseminated over 50,000 cows.	1.3			x			x					
side business related to use of AI in breeding practices	This part-time work led Albert to become 'more involved in the herd improvement side' of the farm business.	1.3	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
registered herd for improved value	register his Jersey cows in 1980	1.4			x		x						
identified opportunity to improve value of herd in policy change	the Jersey Society opened the books to register Jersey cows with sufficient records.	1.4											
building registered jersey herd	build up a totally registered Jersey herd	1.4	x	x			x						
building registered jersey herd	The value of his herd now is about \$500 per head better than the average standard commercial herd of cows due to the breeding potential.	1.4				x							
opportunity to sell stock because of registered Jersey herd	sell surplus heifers into special sales	1.4			x								x
opportunity to sell stock because of registered Jersey herd	developed a profitable product line in selling bulls	1.4	x	x			x						x
opportunity to sell stock because of registered Jersey herd	Generally, Albert has a 'good strike rate' with the bull and surplus stock sales, which make up about 5 per cent of farm business profit. It's something else Albert can sell 'other than just putting milk through the vat'.	1.4								x			x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Farm development activity with an implied association with increasing productivity imperative	laser graded 50 per cent	?	x	x			x						
Farm development activity with an implied association with increasing productivity imperative	whole farm was sown to summer pasture.	?	x	x							x		
Identified opportunity seen in increasing dairy size	allowed him to milk 16 cows at a time	1.5											
increasing dairy size	built a new herringbone dairy	1.5	x	x			x						
new dairy enabled installation of supplementary feeders	put a feeding system into the new dairy	1.5	x	x			x						
altered feeding pellets for maximised benefit	though the mix is more fine-tuned these days to suit the cows' needs (e.g. early lactation, joining).	1.5	x	x			x						
Drought means the farm is struggling to feed cows	In the early 80s there were 'some dry years'. Once water got scarcer Albert needed to find another way to get the water.	1.6		x					x				
costs associated with bore	Albert took out a loan to pay the \$28,000	1.6				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
bore installed to increase access to water	installing the spear point bore.	1.6	x	x			x						
influence of bore	This worked well for Albert as it gave him access to 85 ML of saline shallow groundwater, which needs to be shandied for use on his pasture.	1.6		x					x	x			
Description of the 1980s-90s generally (rather than in response to a specific event) and the constraints on investment in the farm	Money that could have gone toward farm improvements had to be used elsewhere, to meet other priorities.	?			x	x							
Description of the 1980s-90s generally (rather than in response to a specific event) and the constraints on investment in the farm	Albert and his wife were putting two kids through university during that period	?			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
change in farm ownership	In 2000, Albert's father passed away. Before his father passed away, farm debt would have been at about \$100,000. With his father's passing Albert needed to buy out his two sisters from the farm, at a significant, though reasonable, cost. To pay the costs, Albert had to take on a bit more debt. Albert reflected that things have worked out with regard to the farm business ownership.	1.7			x	x							
alter feeding system to manage with less irrigation water	Albert then had to change how he fed his cows. This had a significant impact on Albert's farm and led him to make some changes to his farm system.	1.8	x	x			x						
costs associated with drought. Debt load here also influenced by payments relating to father's death	he borrowed heavily	1.7/ 1.8				x							
built to feed out in altered feeding system to manage with less irrigation water	build a feed pad at the dairy,	1.8	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Drought means the farm is struggling to feed cows	As the drought continued he realised that he couldn't keep borrowing and just feeding out. All of his income was going to feed the cows. He had to get a lot smarter if he was going to maintain the business.	1.8			x								
reduced access of surface water is exacerbated by drop in bore water	Extra water was out of the question for Albert. Even when the temporary water was at around \$300/ML he was right out of the market. In the middle of the drought, Albert's spear point bore also ran out.	1.8			x				x				
use of carryover water - reflection of change in policy re carryover rules	Since carry over water became available, later in the drought, Albert has been buying a bit each year, when the price looks to be at its lowest.	1.8			x				x				
change in pasture with drought	oversowed the farm pasture with a new hybrid annual rye grass, which he was able to water in the autumn and dry off over summer.	1.8	x		x		x						
change in pasture management with drought	used nitrogen to boost the growth	1.8	x		x		x						
feed production during drought	had a little bit of surplus annual pasture which he put into silage. He ended up with 60 rolls of silage one year and 40 the next, which he fed back out later in the year to his cows.	1.8	x		x		x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
feed management during drought	set up a feeding pattern that included strip grazing, pellets in the dairy, feeding out on the feed pad and providing hay in the paddock	1.8	x	x			x						
changing sup feed in dairy during drought	upgraded the pellets	1.8	x	x			x						
more imported feed during drought	bought in failed crops with high protein and energy and he purchased lucerne when he could afford it.	1.8		x					x				
more imported feed during drought	fed supplements to the young stock to help improve the break down of poorer quality hay.	1.8	x	x			x						
new practice to ensure feed quality given the increase in bought feed	feed testing	1.8	x	x			x						
support for feed decisions	help of a nutritionist.	1.8		x			x						
changing feed decision making as became confidence with decisions on own	After a couple of years Albert worked out what the nutritional needs were for his cows and didn't use the nutritionist anymore.	1.8	x	x				x					
purchased feed decisions in drought	Where Albert buys his hay is regularly feed tested anyway.	1.8		x					x				
reducing cow numbers in response to drought	During the drought he dropped the number down to 90 cows at home. Thirty of his cows were parked	1.8	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified in a changed policy context	He was successful in acquiring funding through two state and federal programs that are providing him considerable funding towards \$225,000 worth of on-farm improvements. He never could have afforded this kind of upgrade without the funding.	1.9											
altered irrigation infrastructure with grant	redeveloping the on-farm irrigation infrastructure.	1.9	x	x			x						
altered irrigation infrastructure with grant	set up with gravity fed pipes and risers.	1.9	x	x			x						
altered irrigation infrastructure with grant	laser grading	1.9	x	x			x						
altered irrigation infrastructure with grant	installation of new lanes and a reuse system	1.9	x	x			x						
altered irrigation infrastructure with grant	connection to the irrigation system has been reduced to one outlet	1.9	x	x						x			
connecting bore to new system increases capacity to use bore water on other areas of farm during low water years	spear point bore has been tapped into the on-farm channel system	1.9	x	x						x			

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
costs associated with irrigation changes	This reduced Albert's irrigation allocation. These days, generally, Albert gets a little under 200 ML of water, with the surface and groundwater. While he does have about 88 ML of low security water, there is no sign of that becoming regularly available. The reality is he needs 300 ML / year to water the farm. This means that he is likely to be in the market every year for 100 ML of temporary water.	1.9			x				x				
altered farm infrastructure with grant	reconfigure paddocks so that he now has 36 fairly even bays for strip grazing and irrigating.	1.9	x		x				x				
altered farm infrastructure with grant	put in 250 pine posts as a part of fencing off check banks.	1.9	x		x							x	
altered farm infrastructure with grant	The check banks have also all been planted out to gum trees for shade.	1.9	x		x							x	
altered farm infrastructure with grant	reuse sump and upgraded the laneways	1.9	x		x				x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflections on impact of drought on the farm	He went backward by \$60,000 - 70,000 in the first year of the drought because of extremely high feed costs. Also, during the drought, not only was there no water, but the price of milk fell as well, due to the strength of the Australian dollar. Since then he has been able to maintain the debt but hasn't been able to lower the debt over the last few years.	1.8				x							
looking to infrastructure change to enable increased production and reduction in debt	He is hoping that the farm upgrade will mean he can now make major inroads into lowering farm debt.	1.9			x	x							
post upgrade development	sowing his farm back to pasture since the improvements.	1.9	x	x							x		
post drought pasture decisions	Albert's current pasture management consists of morning and evening strip grazing when possible, followed by cleaning up the bay after the cows with a mower to promote even fresh growth. The bay will then be watered and occasionally fertilised.	1.8	x	x							x		
post drought pasture decisions	going back into perennial pasture on about 50 per cent of the farm	1.8	x	x							x		
post drought pasture decisions	plans on having 20 per cent in lucerne	1.8	x	x			x						
post drought pasture decisions	30 per cent still in annual pasture	1.8	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
		post drought pasture decisions	putting in some winter dormant lucerne; that way, if he has surplus feed, he can cut it for hay and feed it on the feed pad	1.8	x	x			x				
change in personal goals	Albert has retired from his off-farm artificial breeding work and he has stepped back from some other long-term volunteer community work he has been involved in. He plans on spending some time focusing on doing a few more things around the farm.	1.10	x	x				x					
wants to reduce debt to achieve personal goals	wants to pay off the last \$100,000 of debt so that he and his wife could either stay on the farm or move to a retirement facility.	1.10				x							
reflection of short term future	If he milked 150 cows for five years that should clear the debt and allow him and his family to have a reasonable lifestyle. Also, if none of his children were interested in farming, he and his wife could stay on the farm for longer if there was no debt.	1.10			x								

Narrative 2

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals	bought the original 80-acre farm block	2.1			x								
establishing business	set up the dairy business.	2.1	x	x		x		x					
buying land to build business	bought the adjacent 80 acres	2.1	x	x		x							
buying land to build business	160 acres was purchased	2.1	x	x		x							
practices started when building business	started herd testing and using AI.	2.1	x	x				x					
Having children leads to change in family context, reduced time on farm	When they started having children they stopped using these practices.	2.2	x	x								x	
changed practices to reduce time requirements	Using bulls was a bit easier and allowed them to spend more time with their children.	2.2			x								
change in family labour units	Ben left school in 1981 and became an apprentice on the farm.	2.3											
knowledge from apprenticeship used to inform change in breeding practice	apprenticeship he got an AI certificate and he pushed to get back into herd testing and using AI.	2.3	x	x								x	
Threat identified with current herd genetics	actively trying to build up the herd numbers, given the recent doubling of the farm size. The cows at that time were a mix of cross-breeds. It was like 'liquorice all sorts.'	2.4			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
trying different herd genetics to increase quality	Ben's parents had started with a Jersey herd and over time had tried different crosses with Guernseys and Friesians to try and breed good cows.	2.4	x	x			x						
pure bred Friesians for increased quality	shifting the herd over time to be entirely Friesian	2.4	x	x			x						
genetics used in breeding Friesians	used American genetics	2.4	x	x			x						
genetics used in breeding Friesians	then swung back to just using Australian bred bulls,	2.4	x	x			x						
practices used in breeding Friesians	bought in some cows, he has only done so occasionally. He generally manages his herd numbers internally rather than through purchasing outside stock.	2.4		x					x				
Drought reduced access to irrigation water and required change to farm	couple of years after Ben came to work on the farm, there was a drought	2.5											
increasing supplementary feed to manage drought	start feeding cows 'in the bail'	2.5	x	x			x						
increasing supplementary feed to manage drought	bought in grain and some hay.	2.5		x					x				
increasing supplementary feed to manage drought	The family tried to get better at conserve feeding over the next few years.	2.5	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
started producing silage to increase feed	started producing silage.	2.5	x	x			x						
Opportunity to increase herd size in alignment with increasing productivity imperative	herd-size increased to about 180 cows	2.6	x	x		x							
Implied link to increasing productivity imperative	built a six-a-side herringbone dairy	2.6	x	x			x						
changed rails to accommodate larger cows (Friesians)	replacing the zigzag rails with straight rails and 'pushed an extra cow in the shed'.	2.7	x	x			x						
Threat identified to farm if changes to dairy were not made	They need to be able to milk more cows, as they had just bought 160 acres, doubling the farm size.	2.7											
feeding during milking enabled matching the increased feed need of larger Friesian cows	put feeders in front of the shed stalls so that they could start offering supplementary feed to the cows during milking.	2.7	x	x			x						
family goals change with marriage	In 1989, Ben got engaged to Betty, and they were married in 1990. In 1989, Ben and his parents knew that there were going to be 'two families trying to make a living' from the farm. An extra house had to be built and, while Betty did work off-farm, there was a 'push to try and milk more cows'.	2.8			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
buying land to grow the business	bought a 250-acre dry outblock	2.8	x	x		x							
use of land bought to grow the business	put dry cows on the outblock over the winter and they were able to use the block for young stock at other times	2.8	x	x							x		
growing business includes increased cow numbers. Bigger dairy to meet need to milk more cows	20-a-side herringbone dairy	2.8	x	x			x						
more feed needed to match nutritional needs with more cows	started buying in more feed	2.8		x					x				
additions when new dairy installed	put stall gates in the dairy,	2.8	x	x			x						
additions when new dairy installed	put automatic cup removers	2.8	x	x			x	x					
Change in family context, farm management and finances	In 1995 there were significant changes in the family; Ben and Betty had their first baby, a daughter, and in late 1995 Ben's mother died of cancer. This increased the pressure on Ben to do more on the farm as Ben's father decided that it was time to transition away from owning and managing the farm.	2.9											
reflection of farm finance before change in management	while Ben's parents' owed money on the farm, 'it wasn't a huge amount.'	2.9				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan		Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
				Goal									
transition in management	Ben and Betty to take over the farm and to buy out Ben's father over time.	2.9			x	x							
transition in management	started off by buying the herd of cows and the machinery from Ben's father and becoming share farmers.	2.9			x			x					
transition in management	half of the profit went to Ben's father.	2.9				x							
transition in management	developed clear guidelines regarding who covered what costs and what were shared costs.	2.9		x		x							
Implied that an opportunity has been identified in purchase of land to increase productivity	bought a 100-acre block of land	2.10	x	x		x							
Implied link to increasing productivity imperative, use of land bought above	grazing young stock and producing extra silage for the home block.	2.10	x	x							x		
Implied link to increasing productivity imperative, development of land bought above	fenced and didn't have irrigation outlets on the bays. While they had to do a little work to the river block	2.10	x	x				x					
changing management and ownership	It took about four to five years to pay off the cows and machinery. As well, in 1999 Ben and Betty had another baby, another daughter.	2.9			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changing management and ownership	borrow 50 per cent of the farm value to buy the farm itself. They completely bought out Ben's father in 2000.	2.9			x	x							
Drought reduced access to irrigation water and farm is struggling to feed cows	When the drought hit and there was not enough water to water the perennial pasture	2.11											
changing pasture mix in response to drought	converted it all to annuals.	2.11	x	x							x		
changes in practices associated with annual based pasture mix	lot more time on the tractor reseeding.	2.11	x	x				x			x		
changes in practices associated with annual based pasture mix	developed a program of reseeding	2.11	x	x							x		
changes pasture species associated with annual based pasture mix	new varieties of rye grasses and Persian clovers	2.11	x	x			x						
changes in practices associated with annual based pasture mix	had to manage their annual pastures differently	2.11	x	x							x		
relates back to when they were struggling to produce enough feed for cows during earlier drought	grew and cut their own silage	2.5	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
relates back to when they were struggling to produce enough feed for cows during earlier drought	one of the first farming families to use round bail silage	2.5	x	x			x						
relates back to when they were struggling to produce enough feed for cows during earlier drought	had their own wrapping machine and baler	2.5	x	x			x						
change in feeding pattern associated with drought	had to feed out through the summers.	2.11	x	x							x		
changed silage practices due to increased time pressure associated with having to sow annuals	shifted during the drought to bulk silage in bunkers.	2.11	x	x			x						
seeking alternative feeds during drought	purchase in some extra feed, such as cotton meal.	2.11		x			x		x				
needed this to feed out bulk silage	buy a mixing wagon	2.11	x	x			x						
feeding out through summer during drought, so built feed pad to enable this	put in a feed pad with concrete troughs to enable them to feed out	2.11	x	x			x						
feeding out through summer during drought, so built feed pad to enable this	'it was an enormous amount of money'; however, 'it all evolved over a few years'. If they could have afforded it, Ben would have put in a concrete pad rather than a gravel one.	2.11				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
support for their new practices with feeding out over summer	They hired a nutritionist to help ensure they achieved the right blend.	2.11		x				x					
reducing cow numbers in response to drought	park 50 cows	2.11	x	x		x							
reducing cow numbers in response to drought	selling the parked cows	2.11	x	x		x							
reduced labour given pressure of drought	Their paid worker left at around that time and Ben and Betty decided not to replace him	2.11	x	x				x					
change in practice stemming from transition to annual based feeding system	transition toward split calving	2.12	x	x			x						
switch to annuals due to drought led to a need to change calving pattern	drought helped to 'force' the move regarding split calving. They had no summer pasture during the drought and had a lot of autumn and winter pasture. If they wanted to make the most of what they had, they needed to milk more cows through the winter, to make use of that grass.	2.12											
change in practice stemming from transition to annual based feeding system	shift to split calving wasn't really difficult. Ben and Betty already milked a few empty cows through the winter each year. They thought 'well, if we're milking a few we may as well milk a few more but fresh cows'	2.12	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
stretched split calving patter	fewer cows calving but over a longer period of the year.	2.12	x	x							x		
change in irrigation stemming from drought	they are not irrigating much over summer.	2.11	x	x							x		
current experience in calving practice	he is now drying off cows for autumn calving,	2.12	x	x							x		
changing land to increase capacity to feed young stock	sold off the 250 acre dry block that was on the edge of the bush and used that money to buy a 238-acre irrigated block	2.13	x	x		x							
opportunity to increase productive capacity of pasture through buying new block	They bought the new irrigated block because they needed to be able to run more young stock than they could carry on the dry block.	2.13	x	x							x		
use of new block	bring home more fodder for the herd.	2.13	x	x							x		
reflection on farm debt related to the change	increased the farm debt load. It was a 'fairly risky thing to do' but Ben and Betty had to try and improve their position.	2.13				x							
drought response	buy-in silage	2.11		x					x				
drought response	they focused on being able to carry over as much as possible	2.11		x					x				
drought response	ended up growing more crops	2.11	x	x			x						
drought response	That led them to having 'a lot of cereals' at the end of the drought, which meant that coming out of the drought they	2.11		x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
	had to buy a lot less fodder.												
buying property from her parents to help increase land area for running young stock	acquired another 150-acre block	2.13	x	x		x							
payment of new block from parents is deferred	will be paying it off but haven't so far. Betty jokingly referred to it as her 'inheritance' property.	2.13				x							
use of new block	using the dry block for cropping	2.13	x	x							x		
reflection of farm debt given drought and buying land	debt on the farm increased and Ben said that they are 'still in more debt' today when compared to before the drought.	2.11/2.13				x							
Change in policy leads to change in public irrigation system but has had little impact on the farm, hence it has not emerged as a critical juncture. The only change thus far is to irrigation scheduling.	the new channel regulators have led to better delivery of water, given the farm is on the backbone. They now only have to give a day's notice to get water, while before it was four days	?		x					x	x			
Description of farm development over a very long period of time, from when Ben's father ran the farm	started the process of grading	?	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
finish laser grading farm through grant	ultimately completed last year by Ben and Betty. The last bit of land that needed to be laser graded, about four paddocks, was graded	2.14	x	x			x						
opportunity identified in policy change and associated funding	help of a recent federal government water efficiency grant.	2.14											
work to be done post-laser grading	With the laser grading recently completed, Ben and Betty will need to finish fencing it and to purchase a few water troughs, but this is 'not a huge amount' of money on their part.	2.14	x	x		x							
via an overseas exchange program. Post drought building business again.	employed another person	2.11	x	x				x					
post drought pasture renewal	started to put a little bit' of perennial pasture back	2.11	x	x							x		
post drought pasture renewal	The issue now is to try and use it all. That is why they can put in some perennial pasture.	2.11	x	x							x		
drought crops	have also grown some summer crops like maize and millet.	2.11	x	x			x						
drought crops	put in a small amount of lucerne	2.11	x	x			x						

Narrative 3

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
farm ownership/management change	farm was split into two 150-acre blocks and given to Colin's father and uncle who ran them as two separate businesses.	3.1											
opportunity identified to increase milking capacity	in the late 1960s, Colin's father built a six-a-side double-up dairy which meant that 12 cows could be milked at a time.	3.2	x	x			x						
Interviewee clearly described himself as a waged employee, hence was not coded as a critical juncture.	working on the home farm in the early 1970s as a waged employee.	?	x	x				x					
description of his father's approach to building the business	he got to a certain point and stopped investing in the farm. This meant that the farm business 'fell behind' compared to other dairy businesses.	3.2		x		x							
change in farm ownership/management	Colin took over his father's farm in 1993. He inherited rather than purchased the home farm.	3.3			x	x		x					
adding land to build business, linked to putting original farm back together again so identified as goal	bought his uncle's farm which brought the original 300-acre farm back	3.3	x		x	x							
management of the two farms	consolidate the two farms and milk on the home farm	3.3	x		x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
description of constraints on how he was developing the farm after consolidating the farm	preferred to do it slowly and avoid debt, only investing in improvements to his farm when he had the money.	3.3		x		x							
description of constraints on how he was developing the farm after consolidating the farm	has been a lot of pressure to keep his costs down so he 'wasn't burdened with children at university on one hand and low milk prices and bank interest on the other hand'.	3.3			x	x							
identified threat to the business -the land is bad in wet weather	A persistent problem on the farm is that it 'isn't a good farm in a wet year'. Historically, they had trouble getting water off the paddocks because they are a bit 'landlocked' and the water had nowhere to go. For 20 years, from 1973, there were a few weeks each year in which half the farm was underwater 'except for the odd drought'. They used to 'dread the wet weather' and had to plan for it: make sure the drains were clean, getting pumps and fuel ready and figure out where they could put the cows.	3.4											
enabled improved management of irrigation and drainage	laser grading was in his plans	3.4	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changes to paddocks associated with laser grading	it enabled Colin to set up his paddocks as he wanted them, with greater uniformity in paddock size which helped with production.	3.4	x	x			x						
laser grading progress	He started on his uncle's half and was able to laser grade it	3.4	x	x			x						
laser grading progress	This meant that Colin could laser grade smaller amounts at a time, for less cost and as he could afford it	3.4				x							
laser grading progress	did keep up laser grading, it was slow progress and in small amounts.	3.4	x	x			x						
laser grading progress	Since the drought ended he has continued to work on laser grading the home farm and only has a corner 40 acres to go before the entire 300 acres will be complete. He has 'left the expensive area till last'.	3.4	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
identified threat to business stemming from fertility, calving and paddock issues associated with current breed choice	He was having some fertility issues with the Friesians. While he had some 'really nice Friesian heifers,' many of them were not going into calf. The Friesians were also problematic during calving. There were times when it was like Colin was 'pulling every second calf'. It was stressful and time consuming. This is especially true as Colin has set up his business as 'a one man operation' and keeping that side of the labour down is important. Another impact of Friesians was that they are bigger cows and tended to pug out the paddocks in wet weather. Colin had 'an awful lot of wet years' when he had a real problem with pugging because of the Friesians.	3.5											
changing herd genetics to manage problem, mid 1990s	started breeding Jerseys	3.5	x	x			x						
last year trialled use of different genetics to see if it will lead to increased production	just last year decided to try some Aussie Reds, a Scandinavian red breed	3.6	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity to increase productive capacity of cows - because the farm was now all laser graded and issue in wet weather had lessened.	He was looking for more milk and bigger cows.	3.6											
farm better able to manage wet weather after all the laser grading and infrastructure change	The farm is now graded so that everything is joined together and he will only need two pumps and they will be at the head of the recycle system which already has a pump set up there.	3.4	x	x			x						
Drought reduced access to irrigation water	Then for nine years from the early 2000s it was enough to just make it through the year. The drought really slowed Colin down; all of his 'ambitions just were put to the side'.	3.7											
changing pasture in response to drought	had to rely much more heavily on annual pastures.	3.7	x	x							x		
managing labour needed for annual pasture that was put in due to drought	using 'contractors rather than investing in machinery'.	3.7		x				x					
changing pasture in response to drought	He did diversify what he sowed; trying a few different crops (e.g. oats) and pasture varieties (e.g. Medics) that had reduced or no irrigation water requirement.	3.7	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changing pasture management in response to drought	Colin oversowed a 'fair bit of ground' each year as he oversowed a lot of his perennial pasture as well.	3.7	x	x							x		
buying more feed in response to drought	decided instead to supplement what pasture he could grow with some purchased feed	3.7		x					x				
buying temporary water in response to drought	purchase a little bit of temporary water.	3.7		x					x				
buying more feed in response to drought	the amount of feed required during the drought to keep his cows fed increased significantly.	3.7		x					x				
buying more feed in response to drought	During the drought he had to buy in significantly more feed than usual.	3.7		x					x				
buying more feed in response to drought	Colin found that he had to purchase his hay early in the season which required money up front.	3.7		x					x				
reflections on costs associated with drought	Colin said that they 'just squeaked through', though he had to borrow some money from his wife's inheritance to pay upfront for hay. He did eventually pay the money back to his wife, at the end of last financial year.	3.7					x						
dropping cow numbers to reduce feeding pressure during drought	dropped his numbers back slightly, to about 120 cows. In doing so Colin culled a bit more harshly; anything that was getting mastitis or anything that he thought was extra.	3.7	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
trying new feed type that is lower water use during drought	put in 15 acres of lucerne.	3.7	x	x			x						
WFP related to planning his farm irrigation system design to improve farm in the wet - farm development was based on it, focus has been on implementing the plan	developing a WFP	3.4		x		x							
general comment about his investment in the farm	Any money he has made has gone back into the farm	?				x							
recent change to farm infrastructure based on implementation of WFP. This is linked back to CJ 3.4	laser graded 30 acres	3.4	x	x			x						
put in recycle system because area was already disturbed	put in a 2-ML recycle sump (with channels and laneway pads) at the same time, because they were already moving the dirt around.	3.4	x	x			x						
costs associated with recent changes	He ended up spending over \$50,000 out of last year's income on farm improvements.	3.4				x							
implementation of policy change on farm	rationalised one outlet	3.8	x	x			x						
policy change	During the modernisation process NVIRP put in five mechanised gates.	3.8	x	x			x						
impact of policy change	Having the new gates has 'saved a bit on labour'.	3.8		x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflection on prioritising finances during drought	Colin has a farm management deposit account that before the drought was used to save money for expensive jobs, such as laser grading. During the drought this money got used for hay.	3.7			x	x			x				
general comment about his investment in the farm	Basically, his finances are 'year-by-year'. If it has been a tough year, he spends less on the farm and he seems 'to strike it lucky' in that, every time he has made a commitment to spend money on the farm, the money has been there. He has got a bit of money put away so he can 'sleep a little bit better'. Colin thinks there is 'not a lot of margin' these days. He worries about the potential for more and more costs associated with farming - such as water, irrigation allocations and government policies.	?				x							
family issue - change in available labour	The tricky thing is that his wife is no longer interested in working in the dairy.	3.9			x			x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan		Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
				Plan	Goal								
constrained in what he can do with problem, dairy is a difficult dairy for one person and he cannot put in automatic cup removers. Plus if he wants to sell the business the dairy may make this hard. He sees building a new dairy as a big stress.	Colin's dairy is the main issue he has on the farm at the moment.	3.9			x								

Narrative 4

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
background in relation to buying farm	They had no prior farming experience when they bought the original 54-hectare (133-acre) farm in 1989	4.1			x			x					
personal goals lead to purchase of farm	The farm was already a fully functioning dairy farm when they bought it in a 'walk in walk out' arrangement.	4.1			x	x		x					
costs associated with buying farm	They ended up having to borrow about half of the cost of the farm.	4.1				x							
starting out with new business	When they first bought the farm, finances were tight. This limited what improvements could be made to the farm. Dennis and Donna focused mostly on maintenance, such as fixing fences.	4.1			x								
Description of change that occurred prior to interviewee purchase of the business	laser graded the worst 10% of the farm	?	x		x			x					
building the business	laser grading, changing fences and paddock sizes. As they laser graded Dennis and Donna also changed the on-farm irrigation system to what were considered 'standard at the time' 9 inch pipes with manual gates. They continued to laser grade over time and today the whole farm is laser graded.	4.1	x		x			x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
constraints on laser grading that was being done to build the business	Dennis thinks the biggest constraint on him laser grading the farm was financial. Dennis and Donna 'weren't ever big into borrowing money to make improvements' to the farm.	4.1				x							
Identified threat due to lack of access to sufficient feed quality and quantity	They did not get the nutrition right to begin with and it was 'fairly hard on the animals'; some of the cows 'got a bit skinny' and a few died.	4.2											
increasing knowledge regarding feed needs to enable them to access sufficient feed for animals	It took Dennis and Donna a while to learn more about the nutrition.	4.2			x			x					
developing feeding approach based on knowledge	developed their own approach for over-wintering the cows	4.2	x		x		x						
buying more land to increase feed access	bought more land	4.2	x		x	x							
goal to grow sufficient feed	Dennis and Donna have always had the intention of growing sufficient feed on the farm to meet the needs of their cows. While it 'hasn't ever worked' yet, they keep working towards this aim.	4.2			x								
buying more land to increase feed access	In 1992 they bought a 64-hectare (160-acre) block 'over the road' from the farm.	4.2	x		x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
use of newly bought land for feed production	but it was possible for Dennis and Donna to use a pump to irrigate some annuals.	4.2		x						x			
use of newly bought land for feeding over winter	used as a dry block. The block was bought for over-wintering cows.	4.2	x	x		x							
use of newly bought land for hay, increasing feed	Twenty four hectares (60 acres) of it was cropped for hay.	4.2	x	x							x		
Flooding - reduced available feed	The flooding meant that the cows couldn't get enough grass and it was hard to get hay as everyone else needed it. Subsequently, the cows' nutrition wasn't good enough during joining and they ended up with 'a lot of empty cows'.	4.3		x					x				
managing empty cows	decided to try joining the dry cows later	4.3	x	x			x						
split calving to manage empty cows	shifted part of the herd over to autumn calving so that the farm had 30% autumn calving and 70% spring calving.	4.3	x	x			x						
with split calving there were increased time pressures, no time off, Sunday milker employed to manage this	After a while they got someone to milk on Sundays, which made a difference.	4.3	x	x				x					
still looking for good quality feed, maize identified as an option	decided to try a new way to get the nutrition they needed for their cows. They purchased maize to feed out to the cows,	4.3	x	x			x		x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
technology change to enable feeding out the maize	They also retrofitted an old manure spreader to turn it into a silage wagon.	4.3	x	x			x						
build calving pad as identified opportunity	In the late 1990s Dennis and Donna put in a calving pad.	4.4	x	x			x						
identified opportunity for the business	The intention was to make it easier to check on the cows when they are close to calving. It also enabled Dennis and Donna to have more feed control up until calving, to 'lead feed for milk fever' and get the cow's 'gut ready for pasture' after calving.	4.4	x	x			x						
Identified threat in using calving pad	While they used the calving pad for a few years they found that it led to more problems than benefits.	4.5											
changed calving practices to reduce threat	decided to try leaving the cows to calve where they were. They had a 'bush block', a paddock with some sheltering trees, where they put the cows. They checked them two or three times a day and it 'worked fantastically'.	4.5	x	x			x						
Breed selection when first bought farm	decided to breed Friesians exclusively.	4.1	x	x			x						
Identified threat in herd genetics	But the Friesians were having increasing fertility problems.	4.6											
managed fertility problem through changing genetics	decided to try Kiwi crosses	4.6	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
identified problem with Kiwi cross current genetic choice	the bigger the gap between the best and worst heifers.	4.7											
managed gap between best and worst problem by changing genetics	now use a three way cross of Friesian, Jersey and Red.	4.7	x	x			x						
continuing to build business by buying land - linked to need to grow more feed	bought an 85-hectare (211-acre) block 'across the road'	4.2/ 4.3	x	x		x							
connecting new land to farm for irrigation flexibility	They amalgamated the water into their home farm water entitlement	4.2/ 4.3		x					x				
use of new land to grow more feed	this block was used for annuals and cropping for hay.	4.2/ 4.3	x	x							x		
new dairy to accommodate bugger herd	upgraded the dairy to a ten-a-side herringbone.	4.8	x	x			x						
Identified opportunity to increase dairy size	The new dairy suits 200 cows.	4.8											
water scarcity leads to buying more water	bought another 100 ML of permanent water.	4.9	x	x		x							
cost of water	They paid \$900 per ML for the water, or \$90,000.	4.9				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
linking new land purchase (as well as drought) to water purchase	They also had plans to develop the recently purchased 85-hectare (211-acre) block, so that it could be irrigated, which meant they would need more water. The development was started in the mid-2000s (i.e. set up to plant 20 acres of lucerne), but stalled when the modernisation process was started.	4.15	x		x								
Drought leads to reduced access to irrigation was and a need to change farm practices	During the drought Dennis and Donna managed the reduction in irrigation water broadly in three ways: changing how they fed their cows, irrigating a reduced amount of pasture and reducing cow numbers.	4.9											
trying to come up with way to provide sufficient feed for cows (relates to earlier time on farm, when facing serious nutrition issues)	They used a feed pad to reduce wastage of the imported feed. They had old baths next to the dairy that they filled with chopped maize.	4.2/ 4.3	x		x								
trying to come up with way to provide sufficient feed for cows (relates to earlier time on farm, when facing serious nutrition issues)	then put in concrete troughs on the laneway near the dairy that they used as a feed pad.	4.2/ 4.3	x		x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat due to location of feed pad	Having the feed pad in the laneway to the dairy 'was a mistake'. Cows would come in for milking, 'leaking milk and they're getting muddy and dirty and manure on them'.	4.10											
drought response, managing feed and costs	went away from chopping silage back to hay because of the cost.	4.9	x	x							x		
drought response, more purchased feed needed	They had to buy in a lot more feed during the drought.	4.9		x					x				
use of feed testing associated with increased use of purchased feed of varying quality	they needed to feed test any imported feed to ensure they understood what they were getting	4.9	x	x			x						
changing from use of feed pad in response to emerging problem	changed from using a feed pad and started feeding out in the paddocks	4.10	x	x							x		
new practice for feeding out away from feed pad	They developed a feed regime that suited their cows and 'suited our style of farming': palm kernel and cereal hay.	4.10	x	x			x						
new practice for feeding out away from feed pad	tried sacrificing a paddock	4.10	x	x			x						
Identified threat associated with practice of sacrificing paddock	had the same problem when they tried to sacrifice a paddock. 'It just filled up full of shit'. Cows were getting mastitis and when they tried to re-sow at the end of the season, 'there was just so much stuff that you couldn't get rid of it'	4.11											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changing practices for feeding out again	how they could move the feed around the farm. They used a 6'x4' trailer to haul palm kernel and they built a trailer to go on the back of the tractor that they could just pick up with the forks. They filled the trailers up with the front end loader, picked them up with forks and took them to the paddock. They also welded mesh on the bottom of the hay rings so that they could be picked up and shifted.	4.11	x	x			x						
drought response, increasing water efficiency	put 'more effort' into their irrigation system. They worked to improve any 'slow spots' to make better use of the water.	4.9	x	x			x						
technology adoption to enable water use efficient irrigation in small targeted areas, associated with drought	buying a travelling irrigator with big sprinklers for \$10,000.	4.9	x	x			x						
drought response, looking for alternative sources of feed that could be grazed	decided to try sorghum	4.9	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
identified threat associated with the use of sorghum	Dennis and Donna had a couple of cows that stabbed their milk vein on the sorghum stalks when they went to sit down. The cows just bled to death. 'It just poured out like a tap.' That just put Dennis and Donna 'right off' growing sorghum again.	4.12											
reflection of farm debt given drought	Leading up to the drought the farm was sitting at about 50% net equity, because Dennis and Donna had just bought the 85-hectare (211-acre) block across the road. During the first year of the drought they made a loss. It was the first time they had ever made a loss. They ended up having to borrow about \$30,000.	4.9				x							
reducing cow numbers in response to drought	decided that they needed to drop their cow numbers	4.9	x	x		x							
reducing cow numbers in response to drought	They sold some of their cows.	4.9	x	x		x							
reducing cow numbers in response to drought	also parked 40 or 50 cows 'down south'	4.9	x	x		x							
converted back to spring to achieve identified benefits	They went back to spring calving in 2005.	4.13	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
		identified increased benefits associated with spring calving over autumn calving	Dennis and Donna sat down and worked out all of the costs and premiums associated with split calving. They figured out that they would be better off financially going back to spring calving. The difference was due, in part, to the fact that the cows were dried off earlier for autumn calving so they had a shorter lactation and a lower overall milk production throughout the year.	4.13									
transition back to spring calving	moved the spring calving back to the 1st of July.	4.13	x	x							x		
fertility problem is threat to business	The cows started to develop fertility problems again after they had converted back to spring calving.	4.14											
this production focus was seen as leading to CJ 4.14	They had hired a nutritionist who 'was all about production'.	4.9		x				x					
responding to fertility problem through use of seeder, autumn calving is not seen as option for response	having to use seeders to try and 'get their ovaries to kick into gear', which was 'very expensive stuff'. Dennis and Donna were not autumn calving anymore either, so that wasn't an option for the empty cows	4.14	x	x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan Goal	Infrast Tech HRM Proc	In Oper Out M&S
Changes they have made to their irrigation system due to drought	significant changes to their on-farm irrigation system. They have put in a smaller number of larger outlet gates that enable them to water more efficiently.	4.9	x	x	x	
planting lucerne was planned during drought as was to access low water use feed	they set up about 8 hectares (20 acres) to put in lucerne.	4.9	x	x	x	
policy change stalled plans to plant lucerne	They stopped what they were doing, never put in the lucerne because they thought the system was going to change 'anytime'. Of course, 'eight years down the track they still haven't done anything'.	4.15				
altering pasture to match spring calving cycle	They sowed down the home farm to perennial pasture because they are spring calving, that means they need some summer-active pasture for grazing. Dennis said that the farm is 'more flexible now' and that they can change pasture 'depending on water availability'.	4.13	x	x		x
reflections on farm debt following drought	In recent times the level of farm debt had decreased 'a little'. It helped that Dennis and Donna were able to keep making payments through the drought. They did not have to drop back to interest-only payments like a lot of people had.	4.9			x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
buying neighbouring property	in the process of buying 19 hectares (47 acres) from the farmer next door	4.16	x	x		x							
in relation to purchase of neighbouring property	There is no water with the land but there is an irrigation outlet and a half of a delivery share, which allows them to buy up to 170 ML of temporary water to irrigate it.	4.16		x					x				
increased flexibility of water with amalgamation, in relation to purchase of neighbouring property	amalgamate that irrigation outlet into the home farm and so that they can use water across both adjoining blocks.	4.16		x					x				
identified opportunity for the business. Driven by proximity to existing farm	Dennis and Donna acknowledge that it is a bit of a risk, because it, too, is not on the backbone. However, Donna laughingly stated 'it's just next door and they don't make land next door'.	4.16											
buying neighbouring property increases feed access	Having the new land will help reduce the costs of purchasing feed; however, they are not going to increase cow numbers. They currently have to agist their young stock for 18 months. With this new bit of land they will not have to agist them for as long.	4.16	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Change in farm labour units what their Sunday milker retired, however, it was not described in a way that implied it was a critical juncture, nor did it link directly to other critical junctures	do not have a Sunday milker at the moment either. Their previous milker retired and they haven't looked yet for anyone else.	?	x	x				x					
personal/family goals influenced by family tragedy	Dennis and Donna lost their son in an accident three years ago. At the time they had been 'thinking about moving on maybe to another farm or out of farming'. However, when they lost their son they just 'weren't ready to move'. Since then they are still here, still 'plodding on'.	4.17			x								

Narrative 5

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
personal goals drive decision to buy farm	Edward's grandfather bought the farm	5.1			x								
change in farm ownership	In 1978 Edward's father purchased the farm.	5.2			x	x							
buying land to build business	That same year Edward's father also purchased a 100-acre outblock with a 90-ML water entitlement	5.2	x	x		x							
use of land bought to build business	This 100-acre block was purchased for raising young stock and fodder production.	5.2	x	x		x							
change in family labour available for the farm business	As a youth he worked on the farm, though most of this work was unpaid. At one stage he did start to get paid for his work but then 'things got a bit tight' on the farm and he told his father not to worry about paying him.	5.3		x		x		x					
description of his personal goals	Edward wasn't fully invested in farming at that time anyway. He was pursuing a career as a professional musician.	5.3			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
personal goals drive decision to return to family farm	Edward had no intentions of giving up music when they started having children. He thought he could do both. But he would come home after being on the road for a couple of weeks and his children wouldn't know who he was. That changed things for Edward and he moved back to the farm with his growing family.	5.4			x								
Identified threat to farm from salinity	The bore was installed to help reduce salinity and was unregulated	5.5	x	x			x						
Description of the change to water entitlement associated with the bore	groundwater bore was regulated to 258 ML	5.5	x	x		x			x				
change in father's input on the farm related to changing personal goals	had 'pretty much lost interest', moved into town and semi-retired.	5.6			x			x					
change in father's input on the farm meant that he had little option (if he wanted to get desired price) but to sell it to son	The farm had been allowed to get so run down that Edward's father couldn't sell it and get the money he wanted for it unless he sold it to Edward.	5.6			x	x							
change in farm management	discovered that he and his father couldn't work together very well as 'two bosses just don't go down'.	5.6			x			x					
transition to buying farm	led to Edward and Ellen buying the farm from Edward's father in 1993.	5.6			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
transition to buying farm	set up a 30 year loan	5.6		x		x							
focus on building business included improved pasture use	aiming to get more stock control for better pasture utilisation	5.6											
fencing to improve pasture use	the re-fencing he changed some of the fence lines to increase uniformity amongst the paddocks.	5.6	x	x			x						
demonstration of improved production enabled borrowing of money to continue to grow business	The bank was suitably impressed with the production increase that he had been able to achieve. This meant that when the farm next door came up for sale Edward's father was able to take a second mortgage on the home farm to enable Edward and Ellen to buy that property.	5.6		x		x							
bought second dairy farm to grow business, with its own dairy	new property was another 100 acres	5.6	x	x		x							
bought more cows to enable growing business	purchased an extra 110 cows.	5.6	x	x		x			x				
growing business meant there were too many cows to milk out of one shed, used both dairy sheds	had to milk out of two sheds for a little while.	5.6	x	x		x							
new shed enabled milking out of one shed	built a new dairy	5.7	x	x			x						
Opportunity identified to change milking	enabled them to milk out of one shed.	5.7											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
lots of pasture given the improvements but not enough cows yet. Went to 3 x day milking to increase productive output without having to buy in cows. Enables him to continue to grow business	go to milking three times a day	5.7	x	x			x						
labour to support increased milking	put on a third person to help with the third milking.	5.7	x	x				x					
cow #s increased after two years to desired #, returned to 2 x day milking	then they went back to twice-a-day milking	5.7	x	x							x		
adoption of technology associated with growing herd	used AI	5.7	x	x			x						
adoption of technology associated with growing herd	herd testing	5.7	x	x			x						
when took over farm decided on breed for increased production, so this relates to earlier CJ	Edward decided to move the herd to Holsteins	5.6	x	x			x						
associated with altering herd to Holsteins, and growing herd	bought a herd of 110 Holsteins	5.6		x									x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
strategy for how he increased herd size. Management of calving problems with heifers via using Jersey bulls	he wanted to increase cow numbers on the farm he would save the calves out of heifers that had been joined to a Jersey bull.	5.6	x	x							x		
infertility problem with Holsteins a threat to business	He could see that he was constantly struggling to maintain his Holstein breeding, mostly through infertility.	5.8											
changed genetics to manage fertility problem	Edward is now using Australian and New Zealand genetics for his cows.	5.8	x	x			x						
changed genetics to manage fertility problem	changing his herd over from Holsteins to three way crosses now	5.8	x	x			x						
managing stock via buying in as well as breeding on farm	sometimes buys in stock for his farm. When he does he makes sure that he knows the seller and he tends to buy locally. It is important to him to see how the cows have been treated and know the history of the herd.	5.8		x					x				
Drought leads to decreased access to irrigation water	The prolonged drought starting in the early 2000s didn't affect Edward and Ellen's farm much to begin with, as they had sufficient water to manage. After a while though, their groundwater 'started to peter out'.	5.9											
part of the reason he bought the block was for access to groundwater	bought an 80-acre block	5.9	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
increased groundwater access used to manage drought	access to shallow groundwater which meant that Edward and Ellen had three properties that had access to groundwater.	5.9	x	x		x			x				
managing access to groundwater	They put in an easement on an old G-MW spur channel and Edward took over the responsibility of looking after the channel. Edward used the channel to transport the groundwater to his 80-acre block.	5.9		x		x			x				
changing access to groundwater	Edward no longer has access to the groundwater. Therefore, Edward hasn't been actively maintaining the spur channel lately, as its purpose was to access the groundwater bore.	5.9		x		x			x				
changing access to groundwater	The 80-acre block does have an irrigation outlet and, with the easement, he can access the G-MW irrigation system, which is on the backbone, to irrigate the block.	5.9		x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Tragedy influences family labour and personal/family goals	Edward and Ellen had a family tragedy in December 2008 that impacted on their capacity to manage the farm for a few months. Their three children were involved in an automobile accident and one daughter died. The other two children were also injured. Edward broke his leg at the scene of the accident and Ellen had broken her arm in the dairy a week earlier. It was obviously quite traumatic for the family; Ellen said, 'If it wasn't so sad, it was hilarious'.	5.10											
family pressure on top of drought and milk price drop was huge. Couldn't manage farm for a while and altered set up to enable someone to help in the short term	they couldn't manage the farm on their own for a while and yet with a drop in milk prices that occurred in November and the prolonged drought, they were under pressure already. They ended up having someone look after the farm for three months.	5.10			x			x					
reducing workload to manage in time of stress	reduced their cow numbers by selling off the dry stock	5.10	x		x	x							
reducing workload to manage in time of stress	dropped back to milking once a day	5.10	x		x						x		
reducing workload to manage in time of stress	stepped back from absolutely everything at that time.	5.10			x			x					
reducing workload to manage in time of stress	all the feed was bought in. 'It was just ring the bloke and send another load.	5.10			x								x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
after stressful time returned to the farm, increased production again	three months they went back to twice-a-day without any problem.	5.10	x	x							x		
shifted to autumn calving because drought meant the farm had more annual pastures	decided to swing the farm over to autumn calving	5.9	x	x			x						
response to drought, less water use for annuals	shifting to predominantly annual pastures,	5.9	x	x			x						
changing farm practices relating to change to annuals	The change did mean that there was 'a bit of a mad panic in spring, with silage and stuff'.	5.9	x	x				x					
changing farm practices relating to change to annuals associated with the drought	Putting in annuals requires sowing them and given that Edward had increased the area of his annuals significantly, that was a big job	5.9	x	x				x					
challenge for him given change to annuals	how to get enough sown quickly enough	5.9		x				x					
increased labour needed to sow annuals. Had problems getting help	Edward had a hard time getting contractors to commit to coming and sowing his annual pasture.	5.9		x				x					
bought equipment and sowed annuals himself	that first year after changing Edward bought a seeder so that he could get out and sow it himself.	5.9	x	x			x	x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan Goal	Infrast Tech HRM Proc	In Oper Out M&S
problem associated with contractor helping with sowing annuals	ago he was able to get a contractor to help him sow his pasture. Edward put all of his seed in the contractor's 'you beaut big machine' and it rained so it was too wet to sow. The contractor then 'disappeared out the gateway' and Edward never saw the contractor nor the seed again. While Edward didn't get a bill for what the contractor had done, about \$5,000 worth of work, the seed that was lost was worth \$15,000.	5.9		x	x	
changing pasture to make sowing easier given issues with labour needs and timing of watering	change some of the annuals he has been using.	5.9	x	x		x
Threat identified in current farm land area on development	However, he couldn't do the development work he wanted done on the home block to help achieve this. The ageing infrastructure really needed upgrading but the layout meant that the work needed to be done in 'serious chunks' which would have taken too much of the farm out of production at a time. Because of this barrier to making changes to his existing land Edward could 'see some advantages with buying' other blocks, so that he could then start redeveloping the home block.	5.11				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
managed land constraint by increasing land area, so that other land could be redeveloped	bought a nearby 127-acre block with a 258-ML shallow groundwater licence.	5.11	x	x		x							
managed land constraint by increasing land area, so that other land could be redeveloped	bought two more neighbouring properties in February 2010	5.11	x	x		x							
identified possibility of redevelopment on new land	knowing that they could apply for the grant to do any development that was needed	5.11		x		x							
water access on new land	Neither block had surface water but they both came with shallow groundwater licences: 258 ML and 190 ML respectively.	5.11				x			x				
development of irrigation system with funding	put a brand new channel system into this block	5.12	x	x			x						
policy change altered public irrigation infrastructure linked into changes to irrigation system funded through grant	taking out a spur channel that runs through his property and will then get connected to the backbone for the part of his property that was on that spur.	5.12	x	x		x							
Opportunity identified to improve irrigation system with the aid of policy change which offered grant funding	At the time of the interview Edward was in the process of doing some irrigation development work that was funded through Round Two of the Catchment Management Authority's on-farm irrigation efficiency program.	5.12											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflection of costs to change irrigation system	the work will cost Edward and Ellen a proportion of their surface water entitlement.	5.12				x							
development associated with changing irrigation system	work includes irrigation outlet rationalisation, laser grading, automating his irrigation system and a centre pivot.	5.12	x	x			x						
benefit of changes to irrigation system includes automation	in the process of automating the farm	5.12	x	x			x						
development associated with changing irrigation system	Edward still has some 'bits and pieces' of the farm that need to be laser graded, including about 50% of the original home block and 60% of the block next door. These will all be completed in the current development project.	5.12	x	x			x						
development associated with changing irrigation system	in the process of putting a centre pivot	5.12	x	x			x						
development associated with changing irrigation system means he can go back to perennial pasture	Edward is viewing it as a development opportunity. He is going to put perennial pasture under the centre pivot a	5.12	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
development associated with changing irrigation system	Overall, Edward has been quite happy to give up some surface water entitlement for the irrigation development work. Edward will 'give them as much as they like at \$2,700 a ML because it's well above value.' He has no problem with selling water: 'it's just a market' and 'water's not worth owning at the moment'.	5.12											
post drought, concerned about the potential to increase salinity problems in his groundwater if he uses it now	he isn't currently relying on groundwater.	5.9											
response to concern about the potential to increase salinity problems in his groundwater if he uses it now	Edward wants to 'take control of the groundwater in the region'.	5.9											
response to concern about the potential to increase salinity problems in his groundwater if he uses it now	Edward has pulled up his pumps for a while so that he does not end up dragging in salt from everywhere.	5.9											
focus on having more surplus feed available for the farm now that the drought has ended.	focusing on putting a 'bank of feed' away for the future	5.9	x		x								x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified in to change calving pattern	With the combination of the surety of water in carryover and the added 93 acres of perennial pasture under the centre pivot,	5.13											
more summer active pasture encouraged him to shift back to spring calving	decided to shift back to spring calving.	5.13	x	x							x		
reflection of his goals for simple systems, relates to decision to shift back to spring calving, as feeding cows on grass (rather than feeding out hay) is simpler system to him	acknowledged that his business exists within a volatile world market that is not very high paying. This means that for the business to survive it needs to have 'very simple systems'.	5.13							x				
importance of carryover water (which was a policy change) to managing low water risk such as in drought	Edward said that carryover water is important to him because it 'enables me to manage my own risk in water'.	5.9			x						x		
concerned about potential changes to policy	He is going to sit back and watch how a potential change to the rules affects the water market to see what this may mean for him and his farm.	5.9			x						x		
General description of current farm finances	When Edward and Ellen first bought the farm they had 20 per cent equity in the business. Today, Edward describes the business as worth about \$3 million, with \$1 million of debt.	?								x			

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changing personal/family goals	Edward and Ellen are now talking about 'stepping back' from the dairy farm a bit more. Ellen wants to get out of working in the dairy. Edward and Ellen's children are not interested in the farm.	5.14		x			x					
ideas regarding changing business management structure	He is not sure what the business structure will look like but he is thinking about putting on a share farmer or two. Edward is considering turning the dairy farm into two dairy farms.	5.14	x	x	x		x					
ideas regarding changing business management structure	They will likely start with one share farmer,	5.14	x	x	x							

Narrative 6

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
personal goals drive decision to buy farm	Frank's father and his father's uncle bought a 150-acre property with a 170-ML water entitlement in 1967.	6.1			x	x							
family goals lead to moving locations	eventually Frank's father, along with his wife and children, moved to the farm in 1969.	6.2			x								
transition in management	After this, Frank's great-uncle went back to run the tobacco farm.	6.2			x			x					
transition to solo ownership	his father bought out the great-uncle's share of the farm.	6.2			x	x							
building business, operational requirements for feeding cows	had to buy in supplementary hay	6.2		x					x				
Drought leads to insufficient water access	There was a dry period in around 1974-75 and Frank's father started looking for more water for the farm.	6.3											
increasing access to water	He was able to find shallow groundwater and put in a spear point bore.	6.3	x	x			x						
allocation associated with new bore installed to increase water access	has a 200-ML groundwater entitlement	6.3		x		x			x				
recycling of water increases access to irrigation water	put in a recycle dam	6.3	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
family context changes that alter labour units on farm	Frank's younger brother left school when he was 17 or 18 and came to work on the farm. He was on the farm until four years ago. Frank left school at the end of 1981 and has worked on the farm ever since.	6.4	x	x				x					
Change in family labour units	As Frank had just left school to work on the farm, Frank's father decided to purchase the block so that they could increase the farm size and milk more cows.	6.4	x		x	x							
buying land to grow business	They bought the block for \$115,000 and, when borrowing the money from the bank, they borrowed \$5,000 to \$10,000 more than the purchase price because the block needed considerable work.	6.4				x							
developing land purchased to grow the business	Frank and his father immediately got to work redeveloping the new block so that it better suited their needs. Laser grading was 'starting to get popular' so they started the redevelopment by laser grading 55 acres, half of the new block, in late 1982/ early 83.	6.4	x	x				x					
use of land bought to grow the business	They set up these 55 acres as more pasture for the cows, with 'mostly perennials' and 'a little bit of annuals'.	6.4	x	x								x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
laser grading to enable more optimised production	already started laser grading the home block	6.5	x	x			x						
laser grading to enable more optimised production	They laser graded the first paddock on the home block in 1981. By 1991, about 90 per cent of the farm had been laser graded and at the time of the interview all of it had been done.	6.5	x	x			x						
Opportunity identified to develop farm	It was all a part of a plan to 'modernise' the farm with wider bays that would enable easier management of irrigation and use less water.	6.5	x	x			x						
irrigation system development to enable more optimised production	on one 13-acre part of the farm Frank and his father were able to change the bays so that there are now 10 where there used to be about 50.	6.5	x	x			x						
better irrigation system and laser grading enable increased area of perennial pasture	increased to 200 acres of perennial pasture	6.5	x	x							x		
irrigation system development to enable more optimised production	put in another recycle dam	6.5	x	x			x						
Family and personal goals, change in farm labour/management	Frank's father had a heart attack	6.6											
changed dairy to make things easier for father	made an eight double-up herringbone	6.6	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified to increase dairy size to match bigger cows on farm	'Bigger dairies and faster milking'; it was what others were doing	6.7											
changed dairy to enable milking of more cows	put in an 18-a-side swingover.	6.7	x	x			x						
farm growth and development means less of an agistment need	their need to agist young stock was reduced.	6.4/ 6.5	x	x							x		
management of agistment	To prevent problems Frank agists locally	6.4/ 6.5		x							x		
Change in family labour units	In 1991 Frank's younger brother finished school and returned to work on the farm.	6.8											
increased labour leads to growing business phase	Given there were to be three people working on the farm they decided to buy another property to continue to increase the size of the business.	6.8	x		x		x						
buying land to grow business	bought a 637-acre outblock	6.8	x	x			x						
development of land bought to aid in growing the business	to redevelop the outblock so that they could use it for fodder production and running dry/young stock.	6.8	x	x				x					
fencing of land bought to aid in growing the business	put up fencing	6.8	x	x				x					
laser grading of land bought to aid in growing the business	laser graded 100 acres.	6.8	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflection on investment in the new block bought to aid in business growth	Frank and his family have invested considerable resources over the recent farm history on improving the outblock.	6.8				x							
installation of pasture on newly developed land bought to grow the business	put in 50 acres of perennial pasture for the heifers they planned to run on the property.	6.8	x	x							x		
extra land in newly purchased block means there is space for beef cattle	70-90 beef cattle on the outblock as well, because they had enough land to carry the extra stock at the time	6.8	x	x							x		
use of land bought to grow the business	Much of the outblock has been used for fodder production.	6.8	x	x							x		
use of land bought to grow the business	Frank has also grown oats and wheat.	6.8	x	x			x						
use of land bought to grow the business	brings the fodder from the outblock home to the dairy farm to feed to his cows.	6.8	x	x							x		
use of land bought to grow the business	He now uses that land for stock over the winter.	6.8	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Threat identified in land not being good in wet - Reduces farm capacity to graze cows over winter.	Frank's farm didn't cope very well with really wet winters. Frank remembers in the 1980s putting cows into paddocks during wet winters in order to feed them out hay. The cows would end up pushing all of the hay down into the mud underfoot: 'in a day or two the paddock is brown' and in the spring they would end up with no pasture. As well, the wet winters were not good for the cows. The cows would get mastitis because they would be 'lying in the wet all the time'.	6.9											
option for managing grazing cows over winter	Once they bought the outblock they had another option for the wet winters.	6.9	x	x							x		
changing to annuals reduces threat associated with wet winters, but change was made in response to drought.	changed his pasture mix in recent times so that the dairy farm is mostly annuals and can handle a lot more water over the winter.	6.9/ 6.13	x	x							x		
change practice associated with desire for winter milk money in 1991	started split calving	6.10	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
opportunity identified with winter milk prices. Problems with wet winters reduced with access to new outblock, plus they need money to pay for increased debt associated with the outblock	They did it to increase cash flow over the winter to help with their loan repayments for the new property.	6.10											
change practice associated with desire for winter milk money.	have practiced split calving 'on and off' over the years.	6.10	x	x							x		
split calving due to fertility issues	Over the last three or four years Frank has been split calving again.	6.11	x	x							x		
Threat identified due to fertility issues	He is doing it because of fertility issues.	6.11											
started with Friesians when he did an AI cert when he first came to work on the farm. Relates to general early decisions to build the farm business and an identified opportunity to increase cow milk production	generally focused on maintaining a Friesian herd since then.	6.4	x	x				x					
changing breed due to fertility problem	decided to try a different breed because of the farm's fertility problems. He got five Swedish Red heifers.	6.11	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
after changing breed due to fertility problem decided to change to a Friesian genetic line due to concern that he will lose his Friesian genetics if he goes with the Reds - which would have given him cross bred cows	Frank decided to start using the Scandinavian Friesian semen to help improve fertility while maintaining a Friesian herd.	6.11	x	x			x						
when bought outblock, amalgamation enables flexibility in water use across the business	amalgamated the water entitlement with the 260-acre dairy property. They used more of the water on the dairy block at that time, because there was 'just nothing' on the outblock and it wasn't laid out to irrigate.	6.8	x	x		x			x	x			
Threat to farm identified when redevelopment of outblock led to more irrigable land and the need for more irrigation water.	Since then they have developed the outblock so that now the 405 ML of water that came with it is not enough to irrigate it fully.	6.12											
recycling of water increases access to irrigation water	put in a recycle dam	6.12	x	x			x						
infrastructure change when seeking more irrigation water	put in a spear point groundwater bore	6.12	x	x			x						
costs associated with the bore installation to increase access to irrigation water	The spear point bore was put in through a government scheme and cost Frank about \$20,000 at the time.	6.12				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
continuing to increase cow numbers as a part of growing business	got up to milking 250-60 cows	6.8	x	x		x							
General description of the use of labour on farm, point here was that they were happy to have occasional labour but did not want to keep increasing business size so that they needed more labour – this was an indication of a constraint	They did occasionally hire help, but only when they were going away or, in more recent times, if they were busy with hay making.	?		x				x					
drought leads to inadequate access to irrigation water	There was a drought over a number of years which really started affecting Frank's farm in 2007.	6.13											
response to drought, not enough feed for head of stock	sold 110 head of stock in a week	6.13	x	x		x							
response to drought, not enough feed for head of stock	He sold the steers and yearling beef cattle that he was carrying on the outblock. The steers 'weren't good enough' and the yearlings weren't ready but he sent them to the cattle sales anyway. Frank sold empty cows.	6.13	x	x		x							
response to drought, not enough feed for head of stock	sold 42 young cows	6.13	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
response to drought, supplementary feed for stock	started buying more hay	6.13		x					x				
change in family labour units available	In 2008 Frank's younger brother decided to leave the farm.	6.14			x			x					
impact of brother leaving, farm labour reduction	This turned the farm into a predominantly one-man operation as their father was elderly.	6.14	x		x			x					
managing labour reduction	Frank's mother helped a little, Frank was able to hire someone to help for a couple of months and Frank had someone come and help milk for a little while.	6.14			x			x					
reduced labour required changing cattle yard to enable single person operation	put in new cattle yards	6.14	x	x			x						
response to drought	made significant changes to the feeding system so he could get by with less water.	6.13	x	x			x						
response to drought	put crops back into the entire irrigated block because they could grow more with less water	6.13	x	x							x		
changing feeding in response to drought	had to feed out hay to his stock.	6.13		x					x		x		
purchasing feed in response to drought	Frank pre-bought hay	6.13		x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
significantly altered feeding system in response to drought	has a more annual-based feeding system. Much of the irrigated portion of the outblock is back into annuals and he still only has 25 acres of perennial pasture on the dairy property. Most of the dairy farm is now annuals, with a small amount of millet.	6.13	x	x							x		
started new practice in response to drought	now makes silage and hay in the spring to feed to the cows later. He then starts up again in the autumn for a new season of fodder production.	6.13	x	x							x		
Description of personal goal regarding the importance of inclusion, underpinned by implicit value regarding farm and family	Frank didn't want to seem as though he was pushing his father aside as Frank took on more management of the farm business over the years. Frank and his brother still included their father in the farm as much as possible. Frank thinks that probably kept their father alive an extra 10 years.	?			x								
farm ownership/management decision - they were considering selling the farm	Frank's father passed away in 2010.	6.15											
Personal goals drive decision to stay on farm - change in ownership. (Closely linked to CJ above)	Frank said that they were going to sell the farm but he has now decided that he is going to stay.	6.16			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
transition to buying farm	He is in the process of working out 'what everything's worth' so that he can see what he may have to do to pay his younger brother out.	6.16			x	x							
setting up farm to suit his needs as solo owner, including reduction in labour requirements	focus now is finding ways to make running the farm easier.	6.16			x			x					
reduced labour requirements associated with new technology	bought a new baler	6.16	x	x			x						
cow number drop during the drought	dropped milking cow numbers to about 220	6.13	x	x		x							
negotiating access to water input in relation to policy change	However, a neighbour is 'being real friendly' and allowing Frank to go through his property to connect to the backbone.	6.17		x						x			
Opportunity identified to alter farm irrigation through accessing funding for farm works and negotiations relating to policy change regarding the public irrigation system.	NVIRP wants to get rid of the spurs on the irrigation system as a part of an irrigation modernisation program. As well, there are government incentives (round two) for water-use efficiency upgrades. Frank has put these two things together to redevelop his dairy property.	6.17											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
farm irrigation changes	remove four waterwheels, pipe the water to his property and convert the whole dairy property to a pipes and risers irrigation system.	6.17	x	x			x						
opportunity to automate associated with installation of pipes and risers, links back to need for easier operations as one-person operation	automate his irrigation system.	6.17	x	x			x						
costs of changing irrigation mean loss of water entitlement	In exchange Frank has to give up some of the water that is expected to be saved.	6.17	x	x		x							
development work associated with the changes to irrigation system	exception of a small area next to the dairy, the bull paddock, which needed cleaning up and laser grading anyway.	6.17	x	x			x						
based on irrigation upgrade on dairy farm, he is now interested in redeveloping the outblock in the same way	enable him to redevelop the outblock.	6.17	x	x			x						
change to automate linked to interest in decreasing work load because he is one person operation	would be to put in pipes and risers and automate the system.	6.17	x	x			x						
change to automate linked to interest in decreasing work load because he is one person operation	It would mean that he could sit at his home, 20 kilometres away and irrigate his property.	6.17		x				x					

Narrative 7

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals drive decision to buy farm	parents bought an 80-acre dairy farm	7.1											
Change in available family labour	came home to work on the farm in the early 1980s.	7.2											
Building business	the family set up the farm business as a partnership involving the two sons and the parents with each son running a portion of the farm. Some aspects of the business were shared.	7.2			x	x		x					
buying land as a part of building business	bought a 122- acre dairy farm with 150 ML of water several kilometres away	7.2	x	x		x							
improving land bought as a part of building business	Over about ten years the partnership re-fenced, gravelled laneways, put in pipes and new irrigation outlets and built up the channel banks to 'catch the farm up'.	7.2	x	x				x					
leasing land as a part of building business	Geoff and Gary ended up leasing the block.	7.2	x	x		x							
using land bought as a part of building business	grew annual rye grass and clovers that they predominantly cut for hay	7.2	x	x				x					
using land leased as a part of building business	The leased block was also used for young stock and occasionally for grazing dairy cows.	7.2	x	x								x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
altering how water can be used across the properties that were bought as a part of building business	amalgamate the water entitlement on the 122 and 80-acre properties so that they could use the water wherever it was needed across the two properties.	7.2		x		x			x				
Identified threat to business in terms of risks associated with current technology being used	After a couple of years they'd 'had enough of it'. They didn't enjoy putting together the square bales. As well, feeding it out to the cows was difficult. It required two people to feed it out safely as doing it by yourself 'was a bit dangerous' (i.e. it required jumping in and out of a slow moving tractor).	7.3											
changed technology and practices associated with hay baling	bought their own round baler and a bigger tractor	7.3	x	x			x						
changed technology and practices associated with hay baling	major benefit of round bales is that a single person can feed them out in the paddock, they are 'a lot easier to handle'.	7.3	x	x			x	x					
feed needs associated with building business	bought hay from a 60-acre paddock across the road from Geoff's block.	7.2		x					x				
feed needs associated with building business	they bought in about 20 per cent of their hay	7.2		x					x				
buying land as a part of building business	bought a 110-acre block 'down the road' from Geoff's farm	7.2	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
use of land bought as a part of building business	bought it for use as an outblock. Three quarters of it was perennial pasture and the rest was in annual rye grasses and cereals that were grown as winter crops.	7.2	x	x							x		
buying land as a part of building business	bought the 130-acre farm next door to Geoff's farm, with a 120-ML water entitlement	7.2	x	x		x							
use of land bought as a part of building business	They used it for a mix of permanent and annual pasture laser grading. Geoff did this as well as laser grading about 30 acres 'down the back' of the 80-acre block.	7.2	x	x							x		
improving land bought as a part of building business	as well as laser grading about 30 acres 'down the back' of the 80-acre block.	7.2	x	x				x					
growth of cow numbers associated with building business	business was milking 260 altogether.	7.2	x	x		x							
milking practices as result of farm configuration associated with building business	they decided that Geoff's dairy would be used for the more challenging cows. The family used to 'break in' the younger heifers in Geoff's dairy.	7.2	x	x							x		
change in infrastructure to enable milking of increased cow #s	Gary built a new dairy	7.4	x	x				x					
change in infrastructure to enable milking of increased cow #s	had been altered four times.	7.4	x	x				x					
Identified opportunity to increase dairy size	that it could hold close to 200 cows so that they could milk a lot of cows.	7.4											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified to select productive herd genetics	When the partnership was established the home farm was milking Jerseys. Gary's farm was milking Friesians at the time of purchase.	7.5											
selection of Friesians - uniformity across farm	Within a year of starting the partnership, they 'decided to go Friesian'. To convert the Jersey herd to Friesians they started putting Friesian bulls over the Jersey cows.	7.5	x	x			x						
Identified threat associated with calving issues from the conversion process of Jersey to Friesian	After that they did have some calving problems because they started getting little Jersey cows having big Friesian calves. When a cow's calf was too big it could sometimes lead to nerve damage in the hips and paralysis. If this happened then the cow would have to be put down. Geoff and Gary were losing anywhere from four to ten cows a year because of this.	7.6											
response to calving problem	bought Friesian bulls with smaller frames 'just to try and eliminate paralysis and calving problems'	7.6	x	x			x						
response to calving problem	started using AI and was selecting for smaller frames	7.6	x	x			x						
conversion to new technology for identifying stock	changed to freeze-branding.	7.7	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to business if they couldn't distinguish cows from the different property. Ear tags failing out	They were finding identification of cows difficult because ear tags were dropping out.	7.7											
conversion to new technology for identifying stock	freeze-branded his bulls with a code	7.7	x	x			x						
business model change leads to split of business	In 1996 the partnership was dissolved. Geoff and his wife Gini took over the home farm as their farm business. Gary and his wife took over the other farm as a separate business. Their parents retired.	7.8			x	x		x					
Personal goals lead to changes in farm ownership/management	Geoff and Gini wanted to get out on their own and run their farm as they wanted to.	7.8											
setting up new farm business after partnership split	When the partnership was dissolved, Geoff put a lot of effort in setting up his farm so that he could get more time away from the farm as he has 'never had a lot of time off'. Since he left school he had worked on the farm seven days a week.	7.8			x								
transition to new business	split the cows in half	7.8	x	x		x							
transition to new business	He decided that milking 130 cows by himself was enough.	7.8	x	x		x							
practice adopted in transition to new business	started pregnancy testing	7.9	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
threat to business associated with fertility issue	discovered that 24 (20 per cent) of his 120 cows were not in calf.	7.9											
response to fertility issue	Geoff put a bull in with them and 22 got in calf. From that point on Geoff followed a split calving pattern when empty cows would be calved for autumn.	7.9	x	x			x						
drought is threat to business, drove changes to feeding	the drought 'sort of pushed'	7.10											
supplementary feed in response to drought	feeding in the bail	7.10	x	x			x						
nutritionist sought as result of cow fertility issue	nutritionist advised	7.9		x				x					
based on nutritionist advice - relates to fertility issue	start lead feeding his cows	7.9	x	x			x						
altering use of the practice that was adopted in relation to fertility issue	Geoff followed lead feeding again, however he didn't use the lead feed product. Geoff thinks that the extra cost of the lead feed product wasn't worth it. He 'just used pellets out of the silo'.	7.9	x	x								x	
lower water use feed option during drought	Geoff sowed 15 acres of lucerne in a dry paddock and it grew; 'it was fantastic'.	7.10	x	x			x						
lower water use feed option during drought	ploughed up 30 acres that he was using for growing winter crops and put in more lucerne.	7.10	x	x								x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
lower water use feed option during drought	got up to having 80 acres of lucerne	7.10	x	x							x		
lower water use feed option during drought	he could go through the lucerne and direct drill cereals.	7.10	x	x			x						
with even greater reduction in water converted to annuals and cereals	started to slowly get out of lucerne from about 2007 onward. He was getting less water, about 50 per cent, and 'it wasn't enough to do anything with'. So Geoff decided to grow annuals because he could sow cheap annuals and cereals, cut it for hay and silage and store feed for use as he needed it.	7.10	x	x							x		
share cropping increased access to supplementary feed during drought	Geoff had started share-cropping on a neighbouring 80-acre block in 2008.	7.10	x	x		x							
share cropping increased to significant land area once he got a 'taste' for the enterprise	He has since built up the acreage that he is share-cropping to 200 acres	7.11	x	x		x							
changed how he fed cows during drought so he could cut and carry all the feed he was growing through cropping to the cows	shifted to 'lot feeding' the cows.	7.10	x	x			x						
enabled feeding out during drought	bought two hay rings	7.10	x	x			x						
altered practice to increase feed quality for feed given to cows during drought	decided to start making silage to increase quality feed for his cows	7.10	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
grew surplus feed and decided to harvest/process it as a different output - grain	Geoff decided to strip the grain rather than cut it for hay. This was the first time that Geoff sold grain.	7.10	x	x			x						x
Opportunity identified to change enterprising enterprise	Geoff sees the decision to sell grain in 2010 as 'one of those stepping stones'. He was still planning on milking at that stage and wasn't sure what to do with the cereal. Geoff's father-in-law encouraged him to sell the cereal because at least he would get some money out of it. While it was a wet year and everything was wet, the price for grain 'was still reasonably good' and Geoff ended up getting \$220 a tonne for it. This experience gave him 'the taste of it' and increased his confidence for cropping.	7.11											
reflections on farm debt coming out of drought	Geoff and Gini had some farm debt. They had a plan to be out of debt within three years. In reality it took around four years to	7.10		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Replacement of machinery costs, not related to changing enterprises, not related to any changes in practice. Not related to increasing productivity, just about replacement based on machinery getting old	buy a tractor	?	x	x			x						
reflections on farm debt coming out of drought	received some money as compensation for deregulation of the dairy industry. That compensation paid off the last of their farm debt.	7.10		x		x							
reflections on costs associated with drought	they sold a property (not related to the farm) for about \$100,000 which was used to cover some of the costs. That money got them through two years or more; the cows 'chewed up that house money, turned it into crap'.	7.10		x		x							
personal/family goals drive farm management approach	The last four or five years that Geoff and Gini ran the farm as a dairy they really focused on keeping a 'great life balance'.	7.12			x								
response to need to balance farm and family goals	had a relief milker who would milk Friday through Sunday.	7.12	x	x				x					
response to drought	had to lay off the milker	7.10	x	x				x					
post drought response	when things picked back up they were able to hire another one	7.10	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
selling cows as a part of getting out of dairy enterprise	sold some of the cows on Wednesday	7.11	x	x		x							
selling cows as a part of getting out of dairy enterprise	sold the cows over the last twelve months and still has about 12 to sell.	7.11	x	x		x							
transition to new enterprise	Geoff and Gini decided to go into cropping.	7.11	x		x								
finances to help transition to new enterprise	Geoff and Gini put most of the money aside to help them get established. They used money from the last 40 to 50 cows that they sold	7.11		x		x							
costs associated with changing to cropping	buy silos, 'a few old trucks' and a header.	7.11	x	x			x						
changing fencing associated with going into cropping. Interesting that he chose to do it carefully to enable a return to dairy	cut back some of the fences. He plans to pull out every second fence. Of the fences that he cut back he was careful to cut the ends and tie them back neatly as 'it's still a dairy farm'.	7.11	x	x		x							
reflections on transition to cropping and changing nature of income stream	things have 'tightened up a little bit' and Geoff is 'being careful' with money. It is a bit challenging for Geoff and Gini because 'now there's nothing coming in' so they have to rely on savings to carry on. At harvest Geoff thinks that he will 'probably sell a bit of grain off the header'.	7.11		x		x							
sales associated with change to cropping	Geoff had sold 25 tonnes of soy beans recently	7.11		x									x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
crops associates with new enterprise type, importance of crops over the summer as well as winter	planning on sowing some summer crops. He wants to make sure that he is 'not totally relying on the winter crop harvest'	7.11	x	x			x						
increasing storage identified as important	the importance of storage so that he can hold on to grain until he gets a good price. He can currently store 180 tonnes.	7.13		x		x						x	
his approach to guaranteeing some income associated with change to cropping	sell some grain and was able to lock in a price of \$170 a tonne	7.11		x									x
storing grain enabled him to get a better price	He kept 30 tonnes and two months prior to the interview had sold it for \$240 a tonne.	7.13		x									x
Opportunity identified to build cropping business	Increasing storage capacity is one of Geoff's main aims for the farm now. This should enable him to 'ride the good with the bad'.	7.13		x									
increasing infrastructure associated with storage	bought several secondhand silos so that he can hold onto his grain.	7.13	x	x			x					x	
cropping decisions in relation to his change in enterprise	had to make some changes to existing crops.	7.11	x	x			x						
cropping decisions in relation to his change in enterprise	Geoff had 500 acres of two different types of wheat,	7.11	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
cropping decisions in relation to his change in enterprise	Geoff had 100 acres of lupins, which is his rotation crop for his wheat. He plans on continuing with lupins. There are also a few other crops that Geoff wants to try as well.	7.11	x	x			x						
cropping decisions in relation to his change in enterprise	Last year he grew 37 acres of soy beans. 'They went OK.'	7.11	x	x			x						
Policy change regarding the public irrigation system has instigated consideration of water access	Geoff's farm is 1.5 to 2 kilometres from the backbone on a spur channel. At the time of the interview he was 'in the middle of discussions' regarding his farm's access to irrigation water.	7.14											
thinking about selling water after enterprise change and uncertainty regarding water access	Geoff has spoken to a water agent and is considering selling most of his permanent water. He has put a price on it.	7.14	x	x		x							
changing water use with change to cropping. Considering how much water he may need in relation to negotiations with GMW	Last year he had 400 ML of water towards the end of the season. He didn't need it all and sold 200 ML for \$10 per ML 'just to get rid of it'.	7.14		x		x			x				

Narrative 8

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals, marriage drive decision to get into farming	In 1956 Harry was thinking about getting married and knew that he needed to find somewhere to live and 'get a job or do something'.	8.1											
starting an orchard business	buying a 25-acre orchard	8.1	x		x	x							
financing the orchard business	parents helped him buy the property as the bank wouldn't loan Harry the money.	8.1				x							
infrastructure costs associated with starting an orchard	bought trucks and spray pumps	8.1	x	x			x						
reflection of debt associated with starting an orchard	Harry paid off the orchard in about five years.	8.1				x							
Personal and family goals led to changes in enterprise as he was looking for a more consistent income to support a family Threat identified to business - market price drop + debt load lead to bank freezing his accounts.	Harry had a growing family and was looking to expand his farm business so that he could support his wife and children. The problem with the orchard was that 'if you get a hailstorm on your fruit you've got no income'. There were times that 'things were tough to get through' because of this.	8.2											
starting and building a dairy business	bought a 60-acre dairy farm	8.2	x	x		x							
costs associated with starting a dairy business	mortgaged his orchard for £4,500 and borrowed £10,000 from the bank to enable the purchase.	8.2			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
cows for starting a dairy business	bought 45 Jersey calves.	8.2	x	x			x						
the importance of the orchard still to the family as an income source	The orchard made more than 30 per cent of the farm income when the dairy was not so profitable.	8.1		x		x							
increasing land area associated with building a dairy business	leased a 100-acre block	8.2	x	x		x							
development of land purchased as a part of building a dairy business	ran young stock on the block and milked off	8.2	x	x		x							
increasing land area associated with building a dairy business	bought a 20-acre corner block	8.2	x	x		x							
increasing land area associated with building a dairy business	bought 120 acres	8.2	x	x		x							
increasing land area associated with building a dairy business	bought a 32-acre block	8.2	x	x		x							
increasing land area associated with building a dairy business	He thought that he would be better off buying the 32 acres and giving up the lease on the 100 acres.	8.2	x	x		x							
reflections on debt associated with building a dairy business	After these last couple of land purchases Harry's debt load increased to about 50% of his farm business asset value.	8.2		x		x							
development of land purchased as a part of building a dairy business	sown to perennial pasture.	8.2	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
building up herd size as a part of building a dairy business	continuing to build his herd and it was up to around 200 head of cattle,	8.2	x	x		x							
Threat identified to business - market price drop + debt load lead to bank freezing his accounts.	the money that Harry was getting for his milk decreased as price for butter fat dropped. He was 'broke'. Harry got a letter from the bank that told him to stop writing cheques from the farm account until he came up with some money.	8.3											
response to farm debt problem	Harry had shares in Murray Goulburn Cooperative (a processing plant) and was able to borrow some money against these.	8.3				x							
response to farm debt problem	he sold the stock he had just set up on the 32- and 100-acre blocks for \$65 a head. This was a bit under what he was thinking that the calves would have been worth (\$100 a head) after giving them a bit more time to grow.	8.3	x	x		x							
Change in farm family labour available	One son started working on the farm in the 1970s,	8.4	x	x				x					
Change in farm family labour available	chose a different career path other son came back to work on the farm in the early 1980s	8.5	x	x				x					
Change in farm family labour available	and has been on the farm ever since.	8.6	x	x									

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified opportunity given location of land	owned property between some of Harry's blocks sold 120 acres to Harry	8.7	x	x		x							
development of land purchased as a part of building business with son	lay out the block for dairy. This included installing bridges over the drainage and irrigation channels, fencing and installing troughs in paddocks.	8.7	x	x				x					
development of land purchased as a part of building business with son	laser graded the 120 acres	8.7	x	x				x					
Development of land implicitly associated with increasing productivity imperative though not directly linked to a CJ here	already laser graded some of his other land which he started doing in the 1970s and continued laser-grading portions of the farm over the years.	?	x	x				x					
Development of land implicitly associated with increasing productivity imperative though not directly linked to a CJ here	Harry's entire farm, except for 20 acres, was laser graded.	?	x	x				x					
Drought reduced access to irrigation water	there was a drought and Harry 'was out of water'.	8.8											
response to drought	installed a 120 metre deep lead bore	8.8	x	x				x					
response to drought	grow millet through the two years of that early 1980s' drought	8.8	x	x				x					
allocation in relation to the deep lead bore	given an allocation of 470 ML	8.8	x	x			x		x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified to increase herd size	building up a herd	8.9											
increasing dairy to cope with increased herd size	doubled the units to 12.	8.9	x	x			x						
Buying land led to increasing herd size again and an identified opportunity to again increase milking capacity of dairy	When he bought the 120 acres and leased 100 acres in the early 1970s	8.10											
increasing dairy to cope with increased herd size	increased it again to a 20 unit herringbone.	8.10	x	x			x						
in response to changes in how he was paid for milk	converting the herd over to Friesians	8.12	x	x			x						
Identified threat to business if they did not change dairy to manage larger sized and larger number of cows.	With the increased number of larger cows it was taking too long to milk. Harry knew that converting to a Friesian herd meant bigger cows and that they would have to make provision for them. Harry considered 'knocking a hole in the side of the wall, like the cows come in and their heads could stick out of the side'. He also started looking at other options.	8.11											
new dairy installed to manage larger sized cows and greater number of cows	built a new 32 swing-over dairy	8.11	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
new dairy enabled feeding in the bail, started feeding supplements in this dairy	feeding the cows grain and pellets in the dairy shed	8.11	x	x			x						
conversion to Friesians in response to changes in milk check	conversion to Friesians began on Harry's farm in the mid-1980s.	8.12	x	x			x						
Identified opportunity for him to alter herd genetics to increase the money he got for his milk	Harry decided to go with Friesians because the milk payments changed. Previously he was paid based on butter fat and a proportion of 'city milk' (fresh milk). These payments changed to focus on protein, which meant that increasing the amount of milk became more important than butter fat. Friesians were better cows for volume.												
changes to split calving to increase income	split calving	8.13	x	x			x						
Identified opportunity to increase income by altering calving pattern	he decided to start calving some cows in the autumn so that he could get the better pay that comes with winter milk. 'It pays you to milk all the year round.'												
started pregnancy testing as a part of management of split calving	pregnancy tested	8.13	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
started pregnancy testing as a part of management of split calving	monitored the cows more carefully to ensure that he had the right proportion of cows calving in the spring and autumn.	8.13	x	x							x		
continuing to build business with son	bought 188 acres just across the road	8.6	x	x		x							
reflections on costs associated with building business with son	Harry paid \$352,000 for the 188 acres which he thinks was at market value, because the land had a limited amount of water.	8.6		x		x							
property in son's name reflects goals about including his son more directly in ownership of the farm	The 188 acres was bought in Harry's son's name. While Harry's son had been working on the farm for 16 years at that time, all of the land was in Harry's name. There were also some family circumstances at the time which meant that it made the most sense to buy that property separately from the farm.	8.6											x
leasing associated with goal to have property in son's name	Harry then leased the block back from his son and paid all of the expenses to improve it and manage it.	8.6	x	x		x							
continuing to build business with son by improving newly bought land	put in recycle dams and set up the paddocks, which included laser grading and new fencing.	8.6	x	x									x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to business led to enterprise change	Harry pulled out the fruit trees on his orchard in 1999. The birds were eating the fruit and he 'couldn't get labour to pick it'. As well, the local fruit processing factories shut down and Harry had to cart his fruit a 'blood long way' to the nearest factory.	8.14			x								
moving to dairy on old orchard	converted the 25 acres to pasture and started running calves	8.14	x	x							x		
Drought leads to decreased access to irrigation water	almost 10 years of drought	8.15											
altering irrigation and bore water access in response to drought	connected the bore to the 188-acre block	8.15	x	x			x		x				
altering irrigation and bore water access in response to drought	bought a lot of bore water and pumped it because it was 'cheaper to buy and pump bore water than to buy wheel water'	8.15		x					x				
altered pasture to manage with less water	oversown his paspalum and clover pasture with rye	8.15	x	x			x						
altered pasture to manage with less water	started planting lucerne.	8.15	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
pasture management in response to drought	set up and laser graded the paddocks so that one paddock was one irrigation bay. This enabled him to set up a pasture rotation that included lucerne, as they could selectively water each paddock separately. When the lucerne died off they planted rye and clover.	8.15	x	x			x						
tactical response to drought	Harry agisted more of his cows. He trucked the cows wherever they could get agistment.	8.15		x							x		
installation of bore in response to drought	put in a shallow groundwater bore	8.15	x	x			x						
reflection of how he was able to offset some costs associated with drought	Harry and Helen received about \$300,000 compensation when the dairy industry was deregulated at about the same time that the drought emerged. He used some of that money through time to pay for some of the farm costs.	8.15		x		x							
putting money aside reflected emerging personal goal to look at alternatives outside of farming. Retirement was an option given his age	He also put some of the money aside to pay to build a house in town so that he and Helen could move off the farm.	8.16			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to farm business from debt and milk price drop that could have serious implications given he was close to retirement.	The year 2009 was 'the really bad year' for Harry. His property was mortgaged and he was 'battling to keep going'. Murray Goulburn dropped the milk price which put Harry and Helen under so much financial pressure that they considered getting completely out of dairy.	8.16											
keep business going because of son	their son wanted to keep the farm going so Harry and Helen decided to carry the debt and pay what they could.	8.16			x	x							
aim to reduce debt while keep business going for son.	Some of the deregulation money was used to pay the debt.	8.16		x		x							
aim to reduce debt while keep business going for son.	sell 200 ML of permanent water,	8.16	x	x		x			x				
aim to reduce debt while keep business going for son.	Harry was able to clear all of the farm debt and buy a unit in Melbourne, to diversify the income.	8.16			x								
Identified opportunity through policy change which offered water grants	After the drought Harry's son used an irrigation modernisation program and a water efficiency grant	8.17											
changes to irrigation relating to water grant	converting the 188-acre block over from flood irrigation to pipes and risers.	8.17	x	x			x						
changes to irrigation relating to water grant	the cost of setting up that block with pipes and risers was about \$330,000.	8.17		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changes to irrigation relating to water grant	shift pump locations and piping under a drainage channel along a neighbour's fence.	8.17	x	x			x						
changes to irrigation relating to change in policy and grant	rationalised six irrigation outlets down to one outlet.	8.17	x	x			x						
changes to irrigation relating to water grant	put plastic pipes into all of the channels to stop loss of water through seepage.	8.17	x	x			x						
changes to irrigation relating to water grant	give half of the water saved through increased water-use efficiency to the government for environmental flows	8.17	x	x		x			x				
changes to irrigation relating to water grant	gave his son 35 ML of permanent water to ensure that there was enough water to qualify	8.17	x	x		x			x				
Identified opportunity through policy change which offered water grants	planning on putting in an application for the next round of funding for water efficiency grants to get pipes and risers installed on the 345 acres of land that he owned. The next round of funding was due to open in about six months.	8.18											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Changing personal/family goals, succession planning	When Harry turned 70 he decided that he was going to stop milking cows as he thought he had 'done enough'. At that time he had already bought a block of land in town so he could build a house for himself and Helen. Helen wasn't very interested in moving into town so Harry said to the builders 'whatever she wants she gets.' It took a long time, but they have transitioned to living comfortably and happily in town.	8.19			x								
changing farm management	changed to a share farm arrangement	8.19	x		x			x					
son buying farm equipment in response to his father retiring	in the process of buying his own equipment.	8.19	x		x		x						
increased stock, relating to changing farm management rather than recovery from drought (as he didn't indicate reduced stock numbers other than via agistment)	recently increased stock numbers	8.19	x		x		x						
hired labour needed given drop in labour associated with changing farm management	had two full-time staff working for him.	8.19	x		x			x					

Narrative 9

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal / family goals drive decision to buy farm	father and uncle bought the original 240-acre flood irrigated farm in about 1960.	9.1											
setting up business	the old shearing shed was converted to a hay storage shed	9.1	x	x		x							
setting up business	set the property up as a dairy business	9.1			x								
setting up business	building a dairy shed	9.1	x	x			x						
Change on ownership	father bought out his brother and took on sole management	9.2			x								
Father altered the irrigation entitlement to access more water. This was prior to Isaac's time on the farm and he was unsure about the amount or significance, so this was not coded as a CJ	applied 'some years ago' to get the water right increased.	?	x	x		x			x				
Change in family labour units available	When he left school in 1976, at nearly 18 years of age, he came back to work on the farm as a part of a farm apprenticeship.	9.3	x	x				x					
Changing family goals associated with getting married and having children (concurrent with below)	Isaac got married in 1987. The first of his three children was born a year later. At the same time that Isaac's family was growing, Isaac and his father were increasing	9.4											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
growing business by increasing herd size	increasing the size of their herd. From the mid-1980s to the early-2000s they increased from about 150 or 160 milking cows to 220 milking cows. Isaac described it as 'a natural progression' as 'everybody was starting to get bigger'.	9.4	x	x		x							
Change in family labour units available (concurrent with above)	As well, there were two of them working on the farm and they thought the 'farm could handle' increasing cow numbers, getting bigger.	9.4											
growing business by leasing land	leased a 100-acre block across the road.	9.4	x	x		x							
running stock on leased land as a part of growing business	running dry stock on the block, they cut hay off it	9.4	x	x							x		
buying land as a part of growing business	bought a 60-acre block that	9.4	x	x		x							
maximising productive output of land through laser grading	completely laser graded,	9.4	x	x				x					
Opportunity identified with regard to farm irrigation	The farm irrigation infrastructure was built to take advantage of this natural flow.	9.5											
installation of recycle dam to maximise benefits of natural flow in irrigation system	turned into a recycle dam and then made bigger over time so that the whole farm now drains into it.	9.5	x	x				x					
installation of channel to maximise benefits of natural flow in irrigation system	a channel has been installed across the farm to drain the water into the recycle dam.	9.5	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
laser grading to maximise benefits of natural flow in irrigation system	Laser grading has helped with this.	9.5	x	x			x						
maximising productive output of land through laser grading	Isaac has laser graded 'virtually the whole farm'.	9.4	x	x									
increasing silage production as a part of growing business	Isaac started making silage	9.4	x	x			x						
Small change dates for spring calving, from early to mid-July due to personal/family needs. Wasn't counted as a CJ because it was not significant	When Isaac's children were 'getting a little bit older' and they all wanted to go away during school holidays Isaac brought the spring calving back to around July 20th.	?	x		x		x						
Alteration of his preference in relation to the proportion of cows calving in the spring and autumn. Not identified as a CJ as did not appear significant in his description.	more recent times Isaac preferred 75 per cent spring- and 25 per cent autumn-calving cows.	?	x	x							x		
conversion to Friesian	By the time Isaac started working on the farm the cows were Friesian/Jersey crosses,	9.6	x	x			x						
Opportunity identified to alter herd genetics for improved production	'supposed to be the better milking cow'	9.6											
continuation of conversion to Friesian	continued to breed for Friesians which means the Jersey is 'slowly being bred out'.	9.6	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
breeding practices used when they were breeding Friesians	used AI	9.6	x	x			x						
breeding practices used when they were breeding Friesians	using pregnancy testing	9.6	x	x			x						
growing business included a new dairy as cow numbers increased. There may have been a more discrete CJ beyond growth, but this did not come out of the data	built a 10-a-side zigzag herringbone dairy	9.4	x	x			x						
growing business included a new dairy as cow numbers increased. There may have been a more discrete CJ beyond growth, but this did not come out of the data	turned it into a 12-a-side zigzag herringbone	9.4	x	x			x						
new dairy to accommodate more and larger cows	changed the dairy again to a straight rail 18-a-side	9.7	x	x			x						
Opportunity identified to increase rate of milking for their increased herd / cow size - done by altering dairy	increased their herd size they wanted to be able to milk quicker; therefore, they increased the number of cows they could milk at a time.	9.7a											
new dairy to accommodate more and larger cows	change from a zigzag rail to a straight rail in the 1986 renovation had to do with cow size	9.7	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
characteristic of CJ above, need for larger stalls to accommodate larger cows	Friesians the cows increased in size. Straight rails meant they could 'squeeze more cows in' the dairy at a time given their larger size.	9.7b											
reference to costs associated with growing business	had to borrow some money when they purchased the 60-acre block in the early 1990s.	9.4			x		x						
Change in farm ownership/succession planning	Isaac's father retired in about 2001-2002, just prior to the drought.	9.8							x				
costs associated with changing farm ownership	At that time there was 'not much debt' in the farm. In order to buy Isaac's father out of the business Isaac and his wife borrowed about 40 per cent of the farm asset value from a bank.	9.8	x				x						
labour changes associated with changing farm ownership	Isaac then took on his father's business management tasks	9.8	x		x				x				
labour changes associated with changing farm ownership	wife took over the book work.	9.8	x		x				x				
Drought reduced access to irrigation water	This meant that when the drought arrived it was 'stressful' and 'a traumatic time' for Isaac.	9.9											
leased land owner response is related to drought	owners of the 100 acres of leased land decided that they could make more money selling that water on the temporary water market than including it in the lease to Isaac.	9.9				x				x			

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
drought related	continued to lease the block, at a reduced price, and maintained it as a dry block.	9.9	x	x		x					x		
Policy change	In the middle of the drought Isaac's outlets to the public irrigation system were automated as a part of an irrigation modernisation program through G-MW. This included changing some bay outlets.	9.10	x	x					x	x			
change to his system relating to the change in public irrigation infrastructure	Due to his concern over gates not opening or shutting properly, Isaac only very rarely had a gate switch off in the middle of the night and when he did he would go out and check it. He tended to prefer to start them at night and finish in the morning.	9.10	x	x							x		
finding alternative feed source during drought	installed feeders in the dairy	9.9	x	x			x						
finding alternative feed source during drought	buy 'a little bit of hay'	9.9		x					x				
finding alternative feed source during drought	Given the poor quality and high cost he could see that it wasn't going to work.	9.9		x					x				
response to drought, had to reduce stock given lack of capacity to feed	park stock to get his numbers down	9.9	x	x		x							
response to drought, had to reduce stock given lack of capacity to feed	also culled 30 head.	9.9	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
drought influenced decision regarding son returning to the farm	Isaac's son left school at about the same time that Isaac had cut back his herd size. Isaac thinks he 'probably would have come home on the farm' if the timing had been different.	9.9			x								
drought response	He was always 'a little bit short of water' over the drought years and tried to work out roughly how much water he would have for the year and 'irrigate to suit'.	9.9		x					x				
response to drought, had to reduce stock given lack of capacity to feed	Isaac had three different lots of 40 to 50 cows at a time parked	9.9	x	x		x							
response to drought, had to reduce stock given lack of capacity to feed	selling the last lot of cows to the people he had parked them with.	9.9	x	x		x							
reducing production as a response to drought led to reduced staff needs/capacity to pay staff	laid off the employee	9.9	x	x				x					
installed cup removers because had to lay off employee	cup removers installed in the dairy.	9.9	x	x			x						
costs associated with cup removers	borrowed the full \$25,000 needed for the purchase and installation of the cup removers.	9.9				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflections on costs associated with drought	Isaac thinks that he and his wife have 'been pretty lucky during the drought in a way' because they 'never missed a payment' to the bank for their loan. They had to refinance once, but have paid a lot of the debt' which 'was better than most people' were able to do. As well, Isaac and his wife had to stop paying into their superannuation fund during the drought, though they have started building it up again since the drought ended.	9.9			x		x						
reflections on things that have helped minimise the consequences associated with drought	Tatura Milk was bought by Bega and paid a dollar value for shares that Isaac and his wife had in the company. That was 'a little bit of luck' and helped them to put some money away. The value of the farm, the water and the cows have all gone up as well. That has reduced the percentage of debt to equity, which is now sitting at about 20 per cent.	9.9			x		x						
Identified threat in increasing fertility issue	last year he had an especially bad year with it. He got the cows in calf but 'they just seemed to be one or two cycles behind what the pregnancy test showed' (i.e. 20 to 40 days).	9.11											
response to fertility issue	administering Prostaglandin to all of the cows that calved late last year	9.11	x		x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
response to fertility issue	focusing on trying to improve on the 'ten or a dozen' little things that influence fertility including AI practices, visual assessment, and nutrition.	9.11	x	x			x						
response to drought	sowed a paddock of lucerne on the 60-acre block	9.9	x	x			x						
response to drought	soil tests	9.9	x	x			x						
response to drought	lease the remaining 50 acres as a dryland block.	9.9	x	x		x							

Narrative 10

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goal drives decision to start farming	The 80, 80 and 60 acres were combined and run as one farm of 220 acres.	10.1			x								
continuing to add to land to build the business	another 112 acres two miles	10.1	x	x		x							
Policy change means the farm has more water	In around 1959 the rules regarding water changed so that water rights were determined by titles rather than acreage.	10.2											
could convert to summer pasture because of increased water allocation	convert the lucerne over to summer pasture	10.2	x	x							x		
Change in available family labour	At about the same time a 15-year-old John came back to work on the farm full-time. John had three sisters none of whom were interested in working on the farm. While he was working full-time on the farm he was not paid.	10.3	x	x				x					
continuing to grow business by increasing herd size	increase the dairy herd size	10.3	x	x		x							
decision to focus on dairy in growth of business	they got out of sheep	10.3	x		x						x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Policy change imposed by factory changing how they take output	A year later the factories started taking whole milk rather than just cream. This meant that there was no longer excess skim milk for the pigs.	10.4											
vat required for the change to whole milk	installed a milk vat	10.4	x	x			x						
Description of change in family context. Father still worked on the farm, though he just didn't live there. There was an implication that HRM had changed a little due to this but it appeared to be relatively insignificant	His parents had moved off the farm and into town.	?			x			x					
response to factory taking whole milk	kept pigs until 1967 or 1968.	10.4	x	x							x		
response to factory taking whole milk	transport whey from the milk factory back to the farm for the pigs.	10.4		x					x	x			
put this in with the vat, focus on whole milk means greater push with dairy	put in a herringbone dairy	10.4	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
associated with the push for dairy production from whole milk	expanding it so that they could fit in an eighth cow	10.4	x	x			x						
associated with the push for dairy production from whole milk, started converting to Jersey-Friesians to increase productive output	bought in a heap of heifers	10.4	x	x					x				
associated with the push for dairy production from whole milk, started converting to Jersey-Friesians to increase productive output	gradually converting from Dairy Shorthorn to Jersey-Friesian crosses	10.4	x	x			x						
Looking for production increase away from Dairy Shorthorn	'had an odd fling' with another breed: Ayrshires. But the 'fad died out a bit' with the Ayrshires, even though 'they were all right'.	10.4	x	x			x						
identified change to AI with when he came to work on farm.	started with AI	10.3	x	x			x						
Identified opportunity to develop land	Ever since laser grading emerged as an irrigation management practice in Australia John has been doing it.	10.5											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
laser grading relates to identified opportunity to improve production and grow business	whole farm has been laser graded and was done, a little bit each year, to improve irrigation efficiency.	10.5	x	x			x						
Identified threat to business margins	There was a downturn in the dairy industry starting around 1972-1973. At that time other farmers were 'shooting all the cows'. 'The cows were worth nothing. The milk was worth nothing.' Luckily John and Jacqui didn't have to shoot any of their cows though they did sell 'a few for nothing, just to get rid of them'.	10.6											
add tomato enterprise in response to threat	growing irrigated tomatoes	10.6	x	x			x						
add tomato enterprise in response to threat	started off with about an acre-and-a-half	10.6	x	x			x						
add tomato enterprise in response to threat	got up to about 15 acres of tomatoes.	10.6	x	x							x		
add tomato enterprise in response to threat	The income from the tomatoes kept the farm going.	10.6				x							
add cabbage enterprise in response to threat	John and Jacqui grew cabbages	10.6	x	x			x						
changing farm management	share farmers on the family farm.	10.7	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Family tragedy leads to change in farm management	John's father used to come out on the farm to help with things, such as baling hay, but had 'just lost interest' in the farm in the mid-1960s after the tragic death of one of John's sisters. Since that time John made the farm management decisions.	10.7											
changing farm management	bought the 112-acre outblock from John's parents.	10.7	x	x		x							
Buying more land at the same time that John was taking over the farm from his father. Relates to imperative to increase productivity.	bought another 77 acres at the back	10.7	x	x		x							
changing farm management	From 1982 up until 1995 John and Jacqui had a farm labourer.	10.7	x	x				x					
Buys rest of farm business, farm management change over is finalised	bought the 220-acre farm	10.7			x	x							
Buys rest of farm business, farm management change over is finalised	John's parents financed the farm for a couple of years with no interest and then John and Jacqui put the loan through a bank to pay John's parents out. John and Jacqui had to take on a bit of debt to buy the farm.	10.7			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
increasing milking capacity	sold the 189-acre outblock and bought a 90-acre block adjacent to the home block.	10.8	x	x		x							
increasing milking capacity	bought the 90 acres because it enabled them to graze more cows on the dairy farm and they wanted to be able to milk more cows	10.8	x	x							x		
Identified opportunity for the farm - need for growth	With costs increasing John knew that he had to do more: 'get bigger or get out'.	10.8											
increasing milking capacity	feeding pellets to the cows in the dairy to boost production.	10.8	x	x			x						
Threat to business identified regarding length of time spent in dairy	They were spending four hours in the morning doing the milking, which was too much time in the dairy	10.9											
increasing dairy to manage growing herd	built a 24-a-side swing-over herringbone.	10.9	x	x			x						
Identified threat to farm due to increasing fertility problem	having problems getting cows in calf. While there were always some that didn't get in calf, the number started increasing. John described it as something that 'creeps up on you'. At first he noticed more cows were calving later. Then he started having an increasing number of empty cows.	10.10											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
response to fertility problem	John started split calving	10.10	x	x			x						
managing labour need for growing business	take on a share farmer	10.11	x	x				x					
Identified opportunity associated with hiring a share farmer (not within family)	Having a share farmer meant that the farm could continue to increase cow numbers.	10.11			x								
managing labour need for growing business	share farmer took on all of the herd management decisions	10.11	x	x				x					
managing labour need for growing business	John worked with him to make decisions about the farm infrastructure.	10.11	x	x				x					
house for share farmer, meeting share farmer needs to enable management of labour needs for growing business	built a new house	10.11			x	x		x					
growing business. Bridge increases area that can be grazed and therefore milking capacity of farm	bridge over the drainage channel	10.11	x	x			x						
Threat to farm identified in relation to insufficient feed	it must have been pretty tough times' producing enough feed for the cows	10.12											
managing feed shortage by removing cows	park 50 cows in	10.12	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
managing feed shortage by producing pit silage	producing and feeding pit silage.	10.12	x	x			x						
managing feed shortage by feeding out on a feed pad	feed pad	10.12	x	x			x						
Threat to farm business due to reduced labour when share farmer leaves	He bought his own farm and left in about 2006	10.13											
filling labour need	took on a second share farmer	10.13	x	x				x					
Threat to farm when second share farmer leaves and takes equipment needed for silage (labour and feed production)	The second share farmer had his own feed cart for the pit silage. When he left he asked for too much money for the feed cart and John just told him to take it with him.	10.14											
having no silage producing equipment leads the farmer to change his silage production	stop producing pit silage	10.14	x	x								x	
having no silage producing equipment leads the farmer to change his silage production	went back to doing wrapped silage so that he didn't have to buy 'all the big equipment again' that came with doing pit silage.	10.14	x	x								x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
managed farm on own after second share farmer left. Drought was also on and creating pressures on the business	John ran the farm himself for about a year and a half,	10.14/10.15	x	x				x					
Drought reduces access to irrigation water	John and Jacqui learned 'a whole new way of farming' because of the drought.	10.15											
response to drought	decided to purchase hay to feed the cows rather than watering	10.15	x	x					x			x	
response to drought	That irrigation season John sold the water on the temporary water market to someone in Mildura for \$1,170 per ML. John doesn't 'know how the poor guy' could afford to do it as 'you'd have to go broke doing things like that'. After Christmas in that same year John bought temporary water back for about \$300, or even \$150, per ML.	10.15		x					x				
third share farmer brought in to fill labour shortage once drought starts to diminish,	took on a couple as share farmers.	10.11	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
building cow numbers to return to a point where income can support all the labour (them + sharefarmers)	built the milking cow numbers up to about 260	10.11	x	x							x		
enables increasing of herd size on dairy block by removing requirement to graze young stock on dairy block.	agisting the young stock from his farm on this other block	10.11		x							x		

Narrative 11

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals drive decision to buy farm	purchased the original 138-acre farm	11.1			x								
Changing personal and family goals when married	Things started to change' on the farm when Karl got married to Katherine in 1949.	11.2											
building business for changed family context	Karl and his father bought another 138-acre farm	11.2	x	x		x							
farm given to Karl after married, changed context	At that time Karl's father put the original farm over into Karl's name and Karl took over exclusive management of the farm. Karl's father moved to the new farm and managed it as a separate business.	11.2	x	x		x		x					
reducing vegies so can change focus to dairy/pigs	decided to reduce the vegetable production to a focus on 10 acres of potatoes.	11.3	x	x							x		
decision regarding enterprise mix that stemmed from changing management	started new enterprises in dairying and pigs.	11.3	x		x			x					
Identified opportunity in enterprise selection	went into dairy production	11.3											
built for new enterprise of dairy	put in a six cow walk-through dairy shed.	11.3	x	x				x					
built for new enterprise of dairy	sowed about 100 acres of pasture for the dairy cows	11.3	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified opportunity in enterprise selection													
	went into pig production	11.4											
built for pig enterprise	built pigsties, feed and water troughs (including the installation of a windmill)	11.4	x	x			x						
built to link pig and dairy enterprises	pigsties were connected to the dairy shed via a milk line in which skim milk could be pumped into the feeding troughs.	11.4/11.3	x	x			x						
Identified opportunity to expand the business													
	Getting bigger	11.5											
increasing land area as a part of getting bigger	bought a 105-acre block	11.5	x	x		x							
development of land purchased	cropped it for grain.	11.5	x	x			x						
increasing land area as a part of getting bigger	bought a 150-acre block	11.5	x	x		x							
development of land purchased	divide it into paddocks and install irrigation infrastructure	11.5	x	x			x						
costs associated with growing business	borrowed about £10,000 to buy and renovate the 150-acre block. Prior to buying the block Karl did not have any debt on the farm. Karl thinks that he paid about £50 per acre for the land.	11.5		x		x							
cow selection when went into dairy when	herd of Jersey cows	11.3	x	x			x						
increased milk volume	convert the herd to Friesians	11.6	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified opportunity to increase milk production by changing herd genetics	For Karl, a greater volume of milk meant more cream for the factory and more skim milk for the pigs.	11.6											
started using AI when converted to Friesians	(AI)	11.6	x	x			x						
Friesians are bigger cows. Increasing herd size linked back to getting bigger	increased the size of his cows and the size of his herd.	11.5/ 11.6	x	x		x							
Identified opportunity to make changes to dairy for larger number and sized cows	This led Karl to make significant changes to his dairy	11.7											
original dairy when set up dairy enterprise	six-a-side double-up herringbone	11.3	x	x			x						
increase size so can milk more cows and cope with increased cow size	11-a-side double-up herringbone in about 1968, when Karl had 240 cows that were predominantly Friesian. The 11-a-side dairy meant that Karl could milk 22 cows at a time.	11.7	x	x			x						
increase size so can milk more cows and cope with increased cow size	setting up the dairy with moveable breast rails	11.7	x	x			x						
development of pasture for producing sufficient feed for cows	150-acre block across the road was sown to a subclover-based annual pasture.	11.5	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal					In	Oper	Out	M&S
						Infrast	Tech	HRM	Proc				
Identified opportunity to increase access to irrigation water	About a year after Karl took over the family farm Lake Eildon was enlarged to enable a greater regional storage capacity for water. Karl, and other irrigators were offered the chance to double their water use through 'sales' water. Karl 'never ran out of water'.	11.8											
land bought block for beef	bought a 217-acre block	11.9	x	x			x						
Identified opportunity to diversify as a part of aim to grow business	Karl bought the block to run a beef cattle enterprise as a part of the farm business.	11.9	x	x							x		
Identified threat to the farm associated with accessing labour (Non-family)	Karl already had problems getting enough labour to help him on the farm. When he bought the 217-acre block this problem worsened. He continued to have a hard time finding workers. When he did find them he 'had headaches all the time' because the workers wanted to tell Karl what to do rather than taking on the tasks that needed completing. Fairly quickly Karl worked out that the extra block 'was too much' for him given the labour problems.	11.10											
gave away beef property to reduce staff needs	decided to give the block to his eldest son (who was in his mid-20s at the time) to run as a separate farm.	11.10	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
no surplus milk for the pigs	started getting out of pigs.	11.11	x	x							x		
Policy change - factories change how they accept farm output	factories started taking whole milk rather than just cream	11.11											
Identified threat to business margin due to prices	'pig prices dropped'. 'Everything was going wrong' for Karl as the milk and cattle prices also fell with a downturn in the market. Karl recalled other farmers having to shoot their stock.	11.12											
Cumulative impacts of reduced market prices and conflict with tanker driver over milk collection lead to changes regarding personal motivation/goals	Karl 'got discouraged'	11.13											
reducing farm production due to problems	ended up getting out of vegetables	11.13	x	x							x		
reducing farm production due to problems	reducing his dairy herd size from 240 down to 150 cows.	11.13	x	x							x		
reducing farm production due to problems	'got rid of all labour'	11.13	x	x				x					
reducing farm production due to problems	In around 1978, Karl decided to get out of dairy completely and converted the farm to beef cattle.	11.13	x		x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
converting to beef, which required fewer inputs	putting beef bulls over the dairy cows	11.13	x	x			x						
converting to beef, which required fewer inputs	got the Friesians in calf using AI Friesian semen, at which point he sold his 120 dairy cows.	11.13	x	x		x							
Change in farm management associated with family and personal goals.	Keith, Karl and Katherine's youngest child, came back to manage the farm in August 1991. Keith was 27 at the time. He had gone to university and worked in Melbourne for a number of years. Over those years he was living in Melbourne, Keith travelled home 'most weekends' and helped his father. Keith was married in 1990. He and his wife decided to move back to the farm because of 'a growing disinterest in the city'.	11.14			x								
change in manager	Karl leased 243 acres of the farm to Keith	11.14	x	x				x					
relates to change in farm management	Karl and Katherine moved into a nearby town. However, Karl 'didn't really retire' because he continued to help Keith on the farm.	11.14		x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to staying with current enterprise	In the first year Keith continued managing the farm as a beef cattle enterprise. He realised that they 'were going backwards fast staying in beef'. They couldn't 'sustain a decent income on beef'. The lack of income from beef meant they couldn't put fertiliser back on the pasture and that meant Keith couldn't grow enough grass.	11.15											
converting to dairy	Keith decided to convert the 243 acres to dairying.	11.15	x		x	x							
converting to dairy	bought 100 Friesians cows and 35 two-year-old Friesians heifers	11.15	x	x		x							
converting to dairy	increased the milking herd size from 100 to 150 cows.	11.15	x	x		x							
converting to dairy	put in a 7600 litre milk vat.	11.15	x	x			x						
converting to dairy	tried 'a little bit' of autumn calving but found that the farm was 'too flat to run dairying through the winter'.	11.15	x	x				x					
Identified threat to business if pasture productivity could not be increased	With his increasing cow numbers, he needed to also increase his pasture productivity.	11.16											
starting point for redevelopment of pasture for increased production	had a WFP developed	11.16			x		x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
farm salinity issue that tree planting helps with, part of WFP and increasing pasture production	plant trees to reduce the problem	11.16	x	x			x						
redevelopment of irrigation for increased pasture production	infrastructure changes to increase irrigation efficiencies, such as laser grading and bigger irrigation bays with bigger bay outlets.	11.16	x	x			x						
redevelopment of irrigation for increased pasture production	lot of changes to the layout of paddocks.	11.16	x	x			x						
increasing land area as a part of increasing pasture production	started leasing the 150 acres that Karl had been using for steers	11.16	x	x		x							
increasing land area as a part of increasing pasture production	used the 150-acre block for his young stock and for making hay	11.16	x	x							x		
Change in water policy alters access to irrigation water	Water started to become scarcer	11.17											
given land out of production due to low water, he renovated faster	implementing the WFP faster than he expected	11.17	x	x			x						
Drought means reduced access to irrigation water	once the drought reached a peak in 2002	11.18											
managed low water and subsequent low feed by removing stock	parking 40 to 50 cows for one season	11.18	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
managed low water and subsequent low feed by removing stock	sell his worst-producing cows and reduced the herd down to around 130 cows.	11.18	x	x		x							
managed low water and subsequent low feed by removing stock	For the next few years he maintained a seasonal pattern where he would milk 150 cows through the spring, when there was plenty of feed. When the grass dried up and Keith had to pay for supplementary feeding, he would reduce his herd size down to between 120 and 130 cows. He was 'still trying to be as self-sufficient as possible'.	11.18	x	x		x							
post-drought, building business again	Keith had 'starting picking the herd number up' again since then.	11.18	x	x		x							
managed low water and subsequent low feed by buying feed	buy in some hay	11.18		x					x				
storage capacity required for feeding out during drought	bought a silo	11.18	x	x			x						
managed low water and subsequent low feed by supplementary feeding in the dairy	started feeding pellets in the dairy	11.18	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
increasing on farm capacity to produce and store high quality feed for times of scarcity. Relates to when low security water was not available and he was renovating pasture	produced all of his own wrapped silage, which he starting doing in around 1997.	11.17	x	x			x						
effect on farm finance of drought	Through the drought Keith did not have to take on any farm debt.	11.18				x							
Policy change affecting public irrigation infrastructure which interacts with his farm	The public irrigation infrastructure had been upgraded and Keith thought that the new system 'works great'.	11.19											
changes made in relation to public irrigation infrastructure change	Keith rationalised two of his five irrigation outlets	11.19	x	x			x						
infrastructure change funding related to public irrigation infrastructure change. He decided to use money for other farm needs	It was valued at what it would cost to make some on-farm infrastructure changes to enable irrigation on the 18 acres. This was cheaper for G-MW than the cost of installing new outlets. Keith decided to use the money for other things rather than the infrastructure changes.	11.19		x		x							
due to decision above some of his land has converted to dryland	now uses the 18 acres for dryland production	11.19	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan Goal	Infrast Tech HRM Proc	In Oper Out M&S
post drought, building business again, with a different pasture mix	The balance of annuals and perennials has shifted so that he now has more annuals and fewer perennials. While before he had probably 60 per cent perennials and 40 per cent annuals, today he has the reverse.	11.18	x	x		x
Personal and family goals lead to a need to make changes in the farm	About four years ago his wife's business was thriving and she was off the farm for an increasing amount of time. Keith took on the role of 'home dad'. This meant that he looked after the house and managed the children's needs. Keith did that over three years and it was difficult. The most challenging part was the evening milking as that same period was when he needed to be looking after the children and their needs and preparing the evening meal. Keith just couldn't be in two places at the same time and he was 'burning out'.	11.20		x		
labour to help with time pressure associated with the farm	hired someone to do the afternoon milking	11.20	x	x	x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
investment priority in wife's business and personal savings	any money that came in was being invested off-farm to set Keith and his wife up for retirement.	11.20			x	x							

Narrative 12

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Changing farm ownership/ succession planning	grandfather had five sons and divided the 600 acres up into sections, giving a block to each son in the mid-1950s. When Lachlan's father was given his 160-acre block	12.1			x								
infrastructure associated with starting dairy business	built a house, sheds and a seven-a-side herringbone dairy. He put in a 1400 litre milk vat and started running the 160-acre block as a dairy enterprise.	12.1	x	x		x	x						
infrastructure associated with starting dairy business	installed on-farm irrigation infrastructure	12.1	x	x			x						
conversion to perennial pasture associated with dairy business, installation of irrigation system enabled this	converting some of the existing annual pasture over to perennial pasture.	12.1	x	x			x						
Misalignment between dairy farming and personal goals.	In 1989, Lachlan's father decided to stop dairy farming.	12.2			x								
selling stock relating to decision to get out of dairying	sold all of his cows	12.2	x	x		x							
description of reasoning for getting out of dairy farming	Lachlan's father was 'never really a farm bloke' and saw it as 'just a means of making money and a job'. Lachlan's father had always had other businesses that were profitable and 'he'd just had enough of the farm'.	12.2			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
son decides to use land productively after father sells cows	Lachlan decided to get the farm back up and running.	12.2											
uses land for hay/beef after father's decision to get out	got into hay production and beef cattle.	12.2	x	x		x	x						
Identified threat to business with current enterprise mix	He realised pretty quickly that he was not going to make any money out of hay and beef.	12.3											
shifting back to dairy to increase income generation from farm	decided to get the farm back into dairy production as he thought he was more likely to make a profit in dairy.	12.3	x	x		x							
purchasing stock in relation to shifting farm back into dairy	buying 40 or 50 cows. He then bought some other smaller batches of cows.	12.3	x	x				x					
purchasing stock in relation to shifting farm back into dairy	got 'up to 120 cows pretty quickly'	12.3	x	x		x							
decision regarding breed type made when shifting into dairy	bought were predominantly Friesian	12.3	x	x				x					
breeding practices adopted when getting into dairy	artificial insemination	12.3	x	x				x					
breeding practices adopted when getting into dairy	herd testing	12.3	x	x				x					
breeding practices adopted when getting into dairy	brought in technicians to do these tasks	12.3	x	x					x				
calving practice adopted when getting into dairy	Lachlan had two calving cycles in the year.	12.3	x	x									

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
capacity to invest in establishing dairy influenced by having other income	Lachlan used the income from the other business to cover his living expenses. This enabled him to funnel all of the profits from the farm into developing the farm.	12.3		x		x							
When first took over, implication that old dairy size not sufficient for growing business, linked to 20 year plan to have twice as much or twice as big as needed	demolished the old dairy	12.4											
new dairy to enable growth of business	built a new 20 double-up herringbone dairy.	12.4	x	x			x						
new vat to enable greater milking capacity in alignment with dairy	put in a 10,000 litre milk vat.	12.4	x	x			x						
Identified threat due to the farm's condition when he took over	Before Lachlan took it over, the family farm was 'an old-fashioned, old-style' farm with 'a lot of laneways and channels and little paddocks'.	12.5											
developed farm to increase productive capacity	redeveloped the entire farm, starting with a WFP	12.5	x	x			x						
developed farm to increase productive capacity	finished laser grading the property and laid out the farm into five-acre paddocks that are 'a lot easier to maintain, a lot easier to irrigate'	12.5	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat due to salinity	the farm had a 20-acre block that had a salinity problem due to poor drainage on low-lying country.	12.6											
changes when redeveloping to reduce problem	As a part of the infrastructure upgrade Lachlan put in a recycle system to drain excess water, run it back to a dam and enable its reuse on the farm. Once Lachlan put in the recycle system the drainage issue and its associated salinity problem diminished.	12.6	x	x			x						
Identified threat to farm if more irrigation water is not acquired	Within a couple of years of taking over the farm Lachlan realised that he needed more water if he wanted to milk more cows.	12.7											
bought water to enable increased production	buy 40 ML of permanent water at \$1,000 per ML. This brought his water entitlement up to 160 ML.	12.7	x	x		x			x				
set up pasture mix based on new water availability	set it up so that it was about 60 per cent perennial pasture and 40 per cent annual pasture.	12.7	x	x							x		
Conflicting personal and farm goals relating to work load on farm	He became increasingly aware that, as a one-person operation, he was working seven days a week with no time off.	12.8											
partnership established to reduce work load	join the two herds together and run it as a partnership.	12.8	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
partnership established to reduce work load	could each have alternate weekends off and there would always be someone who owned half of the cows in charge,	12.8		x				x					
partnership established to reduce work load	swap weeks off over holiday periods.	12.8		x				x					
partnership established to reduce work load	Lachlan's eldest child, a son, was born during the time Lachlan ran the farm in partnership, so having extra time for family was important.	12.8			x								
partnership established to reduce work load	help each other with larger tasks that took two people, such as drenching.	12.8	x	x				x					
partnership established to reduce work load	they had 'similar production' approaches that only needed to be 'tweaked a little bit'.	12.8	x	x							x		
partnership established to reduce work load	decided to use Lachlan's dairy	12.8	x	x		x							
practice adopted when he took over business and converted it to a dairy enterprise	used the advice of a nutritionist when making his farm nutrition decisions	12.3		x				x					
Identified threat to farm when partnership dissolves because partner cannot contribute required amount of water during drought (not family)	The partnership only lasted two to three years because, when the drought started, Lachlan's partner 'was really struggling'.	12.9											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changing back to single operator business	Lachlan just went back to how he was running the farm before the partnership, including his cow numbers which had dropped back to 160.	12.9	x	x		x		x					
drought response	convert a 16-acre paddock of his annual pasture over to lucerne.	12.10	x	x			x						
drought response	cut it for hay to feed out to the cows.	12.10	x	x							x		
drought response	produce a couple of hundred extra bales of lucerne hay that he was able to sell for \$50 a bale	12.10		x									x
drought response	His allocation was 50 or 60 per cent.	12.10		x					x				
Drought reduces his access to water	During that first year of the drought, when he got a 50 to 60 per cent allocation	12.10											
infrastructure change to increase water access	put in a shallow groundwater bore	12.10	x	x			x		x				
drought response	got a groundwater licence to pump 320 ML	12.10	x	x					x				
drought response	perennial pasture that Lachlan dried off he then sowed to annual pasture	12.10	x	x							x		
drought response	the amount of feed he had to buy increased considerably and the price he paid for it was much higher.	12.10		x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflections on impact of drought	, Lachlan thinks that he came through the drought better than many other farmers because he started the drought with less debt.	12.10		x		x							
Reduction of time available for farm due to changing personal goals	While Lachlan had focused full-time on the farm between 1998 and 2005, in 2005 he became involved in another business off-farm that was essentially a seven-day-a-week business. This other business was not necessarily his 'passion' and he approached it the same way he did the farm. As long as the business was going well and making money he would stay in. If things were not going well, he would just move onto something else.	12.11			x								
helping fill some of the farm labour requirement	employed someone to manage the milking	12.11	x	x				x					
changing farm management	Lachlan came home in the afternoons to do all of the other farm work.	12.11	x	x				x					
managing multiple businesses	Lachlan kept the finances of his farm and the other business separate, though every now and again 'one will give the other one a hand'.	12.11		x									
getting out of dairy	decided in 2009 to sell his cows.	12.12	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Conflicting goals and time, drought and other stresses force a change	Lachlan was under a lot of stress. He was 'sick of working and not making money'. Lachlan decided that the time was right to sell the cows because things were starting to turn around and 'people started getting a bit of confidence'. Cattle prices and milk prices were improving as well. Lachlan made the decision to sell the cows with the idea that he may go back to farming again.	12.12											
Identified opportunity seen in changes in weather patterns	After a while he could see that weather patterns were changing from El Niño to La Niña and he decided that it was a good time to get back into dairying	12.13											
getting back into dairy	bought 50 Friesian cows in March or April 2010.	12.13	x	x		x							
labour to help manage dairy	employed a milker for the 50 cows.	12.13	x	x				x					
getting back into dairy	bought about another 100 Friesian cows	12.13	x	x		x							
labour to help manage increasing herd	increased the hours of his milker	12.13	x	x				x					
debt taken to get back into dairy	Prior to buying the cows, Lachlan 'was never in debt'. He borrowed \$250,000 to buy 120 cows. Lachlan didn't think \$250,000 was a large amount of debt in a dairy enterprise and overall thought that the farm debt was only around 30 percent of the value.	12.13				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
labour help for getting back into dairy	used a contractor to do all of the pasture work.	12.13	x	x				x					
policy change has little impact on him	His one irrigation outlet was converted from a Dethridge wheel to a 'flow meter' as a part of the upgrade with no ill-effect.	?	x	x			x			x			
Personal goals intersecting with the farm business - current critical juncture	In considering the future of the dairy farm, Lachlan thought that it would either stay as it was or he would buy a neighbouring block and double the size. Lachlan was seriously thinking about increasing the size of the farm. His monthly milk cheque was 'worth a lot less' and getting bigger was the only way to improve that. As well, Lachlan thought that he was only going to stay in his off-farm business for another 12 months or so. If he did get out of that business, then he would focus on building up his farm business.	12.14											
reflection of his uncertainty regarding farm	Over the previous six months it had been dry again and Lachlan was starting to wonder if he should really be farming. He had considered selling the farm and moving into town.	12.14			x								

Narrative 13

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goal leads to decision to buy farm	he wanted to change from his pre-war career in the railroads to farming, as his family was from a farming background.	13.1			x								
pursuing goal to get into agriculture	bought a 72-acre block	13.1	x	x		x							
changing emphasis toward dairy and away from fruit based on market prices	orchard was removed in the mid-1950s	13.2	x	x		x							
Change in enterprise based on identified opportunity in dairy over fruit	because the market price his father was getting for the fruit was low. As well, farm emphasis had shifted into focusing on cow numbers and the production of butter fat.	13.2											
having children leads to decision go into pig production	Matt's father was seeking out ways to support his growing family.	13.3											
response to need to grow business, using by-product from dairy production	decided to build a piggery so that he could use the surplus skim milk himself rather than give it away.	13.3	x		x	x	x						
building bull paddock associated with growing business	One acre of the dead area was used to create a bull paddock	13.3	x	x				x					
infrastructure to enable pig production to grow business	built a piggery on about two acres of this dead area.	13.3	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
infrastructure to enable pig production to grow business	built very simple yards with water troughs	13.3	x	x			x						
expanding piggery as business grows	built a big brick piggery.	13.3	x	x			x						
no more skim milk available, shifting away from enterprise that relies on it	got out of pigs	13.4		x		x							
Change in output for farm imposed by factory, changes requirements for production system and eliminates skim milk as by-product = goal to focus on building dairy business	the factories started taking whole milk rather than just cream	13.4											
focusing on dairy and need to increase capacity of milking infrastructure	increased the dairy to a four unit walk-through shed	13.4	x	x			x						
practices used with greater emphasis on dairy	harvest a small amount of the pasture for hay.	13.4	x	x							x		
buying in hay needed, indicating feed gap with current farm set up	bought hay.	13.4		x					x				
reduction of stock pressure to feed available	relied on agistment	13.4		x		x					x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
managing pasture production needs on growing farm	brought in contractors	13.4	x	x				x			x		
infrastructure needed for pasture management to enable growth of dairy business	buy an old tractor	13.4	x	x			x						
infrastructure needed for pasture management to enable growth of dairy business	mower	13.4	x	x			x						
children taking on a little of labour load regarding pasture management	Matt and his brothers were helping mow as a part of hay harvest	13.4	x	x				x					
increasing land area to support further pasture production	bought an adjoining 15-acre block	13.4	x	x		x							
pasture production associated with purchased land	maintained this as perennial pasture.	13.4	x	x							x		
increasing land area to support further pasture production	bought a 58-acre block back	13.4	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Threat to business identified associated with having a low water allocation	The water right was low because the block was a section of a 155-acre farm that had been subdivided into three blocks of 58, 37, and 60 acres. When water rights were originally allocated to land, larger blocks had less water per acre of land than smaller blocks. While the farm had been subdivided into smaller parcels of land it was not possible to increase the amount of water beyond the combined total in the original allocation.	13.5											
seeking access to more water for business through pump license	drainage pumping licence from G-MW	13.5	x	x		x			x				
use of land purchased to grow business	planted the 58 acres to annual subclover pasture	13.4	x	x							x		
infrastructure to enable access to increase area that could be milked off of.	built a wooden bridge across the irrigation channel	13.4	x	x			x						
improving water access	set up a siphon and pump system to move water	13.5	x	x			x						
more water led to putting in more perennial pasture	put into perennial pasture.	13.5	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
opportunity arises to buy land right next to farm, continuing to grow business	bought a second 15 acres of land	13.4	x	x		x							
identified opportunity associated with setting up a Jersey stud	started the process of setting up a Jersey stud	13.6	x	x		x							
as a part of establishing Jersey stud	keeping meticulous breeding records	13.6	x	x		x							
as a part of establishing Jersey stud	had a few cows classified as purebred Jersey.	13.6	x	x		x							
as a part of establishing Jersey stud	herd tested	13.6	x	x				x					
Identified opportunity to alter herd genetics	after the factories started taking bulk milk, more breeds of dairy cows became available through the use of artificial insemination (AI). Matt's father realised that he could get semen of different breeds from different places around the world. He began to question his use of bulls and the Jersey stud.	13.7											
response to opportunity to try different breed varieties	dropped the Jersey stud	13.7	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
response to opportunity to try different breed varieties	use of AI in his breeding	13.7	x	x			x						
response to opportunity to try different breed varieties	started to produce cross-bred cows	13.7	x	x			x						
response to opportunity to try different breed varieties	bought some Friesian cows once 'just because they were handy and cheap and available'	13.7	x	x			x						
Opportunity identified to build a new milking shed to manage increased herd size	milking 80 cows and decided to put in an eight-a-side herringbone dairy with zigzag rails	13.8	x	x			x						
Opportunity identified to increase the milking capacity in the milking shed	extended the dairy to make it a 12-a-side herringbone with zigzag rails.	13.9	x	x			x						
Opportunity identified to alter dairy shed to accommodate larger cows and to milk more cows	to accommodate the larger crossbred cows and enable them to milk more cows at a time	13.10											
changes to dairy in response to changing cow size	converted the zigzag rails to straight rails	13.10	x	x			x						
changes to dairy in response to changing cow size	16 double-up.	13.10	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
changes to dairy in response to changing cow size	had to move the breast rail and knock out some posts.	13.10	x	x			x						
Change in family labour units available on farm	Martin came back to the farm in about 1965, after training to be a mechanic.	13.11											
changing management set up in response to changing labour units	Martin would be a share farmer	13.11			x			x					
changing management set up in response to changing labour units	managed the farm and was paid a percentage of the profit. Martin also paid some of the farm expenses.	13.11			x	x							
changing management set up in response to changing labour units	Matt's parents and the four remaining children, all moved into the nearby town. Matt's father still travelled out to the farm every day to help with the day-to-day operations.	13.11			x			x					
Change in family labour units available on farm	Mark, came to work on the farm in the very late 1960s, after being retrenched from his job as a mechanic.	13.12			x			x					
changing labour on farm	This increased the farm's labour units to three.	13.12	x	x				x					
growing herd possible with increased labour	continued to increase the number of cows they were milking	13.12	x	x		x							
Change in family labour units available on farm	Mark left the farm to pursue other interests overseas.	13.13			x			x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
responding to need to another labour unit	They needed Matt to come back and help with what had become a three-person operation. Matt came to work on the farm in 1973.	13.13	x	x				x					
Marriage means a change in personal /family goals	Matt got married to Marie in 1975	13.14			x								
changing family context response	subdivide a half an acre of the 58-acre block, upon which he built a house for himself and his wife	13.14	x		x	x							
buying land to continue to grow business	bought a 60-acre block	13.14	x	x		x							
buying land to continue to grow business	bought the last 37 acres	13.14	x	x		x							
leasing more land to continue growing business	took up a lease on a 50-acre block across the road	13.14	x	x		x							
use of newly leased and purchased land	set up the block as perennial pasture for the dairy cows.	13.14	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reflections on farm business strategy as it relates to debt for buying land to grow business	Matt's father was always willing to borrow money to buy more land for the farm and 'always owed money'. Prior to the advent of salinity loans in the 1970s, farm infrastructure and machinery were always paid for with the farm overdraft. At the time that Matt came back to work on the farm, the farm probably had about 25 to 35 per cent of its value in debt. Matt thinks that the proportion of farm debt continued to grow.	13.14			x	x							
changing family context response, house and subdivision	had to take out a \$15,000 home loan to build their '16 to 18 square' house	13.14				x	x						
Threat identified due to reduced margins and high debt	huge drop in milk prices in 1975. The price 'dived' when Matt and Marie had loan repayments equalling \$4000 a year; the same amount of money they were making from the farm in wages.	13.15											
seeking additional income to manage increased risk	Matt and Marie got off-farm work,	13.15	x	x		x		x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified through policy change that offered low rate loans	there were reduced-interest rate salinity loans available to do infrastructure upgrades. The loans were three to four per cent below the average interest rate. At around the same time laser grading was introduced, which 'absolutely transformed irrigation'. Matt's family started looking around to see what they could do to improve their farm. At that time the farm irrigation comprised little bays and 'mud stops with shovels'.	13.16											
infrastructure work done via salinity loans	build a dam, laser grade and reconfigure some of the farm irrigation system including recycle systems	13.16	x	x			x						
needed for infrastructure work done via salinity loans	generate a farm plan	13.16		x		x							
infrastructure work done via salinity loans	build a 40 to 50-ML dam	13.16	x	x			x						
infrastructure work done via salinity loans	put in a 30-metre long, 600ml steel pipe	13.16	x	x			x						
infrastructure work done via salinity loans	had to install 'ex-Melbourne gas works valves' to regulate the flow	13.16	x	x			x						
infrastructure work done via salinity loans	installed the large pipe for the dam across the spur channel, over into the 58-acre block.	13.16	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to business of on farm irrigation changes	the faster flow of water 'just about blew out the channels'.	13.17											
response to unintended consequences of infrastructure work	decided to 'put in high channels and wider channels and bigger structures'.	13.17	x	x			x						
Identified threat to business of on farm irrigation changes	The faster flow because of the dam meant that they 'were running around every two hours shutting off bays'. 'It was just almost hopeless' for Matt and Martin to manage and would end up with a 'flood down the end like a lake' because they missed shutting off a bay.	13.18											
response to unintended consequences of infrastructure work	To help manage the fast-flow irrigation, Matt and Martin 'started talking pretty quickly' about automating the irrigation system.	13.18	x	x			x						
changing technology in response to infrastructure upgrade	simple pneumatic system	13.18	x	x			x						
changing technology in response to infrastructure upgrade	hydraulic system with a water pressure pump	13.18	x	x			x						
later converted automation to a new system based on new technology	shifted to an electronic system	13.18	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
other work done with salinity loans	reconfigured the irrigation system on the two 15-acre blocks.	13.16	x	x			x						
other work done with salinity loans	reconfigured the most recently purchased 60-acre block	13.16	x	x			x						
other work done with salinity loans	laser grading and converting the block from annual to perennial pasture	13.16	x	x			x						
other work done with salinity loans	converted the annual pasture over to perennial pasture	13.16	x	x							x		
Identified threat to business of poor market prices and drought	The early 1980s 'were tough times' for the farm. There was a downturn in the industry: 'milk prices were terrible' and farmers were 'shooting cows' because 'they were worthless'. In the early 1980s there was also a drought.	13.19											
response to drought threat	put in a groundwater bore to obtain supplementary irrigation water.	13.19	x	x			x		x				
response to drought threat	dug a second groundwater bore	13.19	x	x			x		x				
Change in family labour units available on farm	Martin left the farm for private reasons.	13.20			x								
labour gap filled, farm management shifts	Matt had to take on the day-to-day management of the farm. Mark immediately came back to work on the farm, filling the labour gap left by Martin.	13.20	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
change in farm manager leads to new practice, rotational grazing	rotational grazing	13.20	x	x			x						
consequence of Martin leaving, changes to debt, HRM	When Martin left the farm in the 1980s he had to be paid out his share. This added to the farm debt, which was 'pretty high' already. After Martin left, Matt continued to be paid a wage, as a percentage of the milk cheque, rather than switched over to being a share farmer.	13.20		x		x		x					
Identified threat to business due to farm layout	The 307-acre farm (including the 50-acre leased block) was narrow and a mile long. Matt and his family had redeveloped areas of the farm that were at the farthest point away from the dairy. This meant a longer walk for the cows to come in for milking. Walking longer distances used more energy and reduced milk production. The region was experiencing wet winters in the late 1980s. In wet weather cows were getting stuck in the mud, getting mastitis, and it was taking even longer to move them down to the dairy shed for milking. Overall, milking was taking too long.	13.21											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
built new dairy in new location that worked with new farm layout	build a new dairy in the middle of the farm, to reduce walking time for the cows and increase the speed at which they could milk the cows.	13.21	x	x			x						
costs associated with dairy changes	Matt's family had to borrow around \$250,000 for the project.	13.21		x		x							
herd size when built new dairy	milking 300 cows	13.21	x	x		x							
feeders installed with new dairy	started feeding grain in the dairy	13.21	x	x			x						
infrastructure added to store feed for new dairy	put in grain silos	13.21	x	x			x						
increased herd size with new dairy and new feeders	quickly jumped up to milking 350 or 400 cows.	13.21	x	x		x							
Identified threat to business due to salinity	the farm developed a 'rising salt problem' which was leading to tree deaths.	13.22											
installed bore to manage problem	put in a third groundwater bore so that they could pump down the groundwater table and disperse the saline water in a 'fan paddock'	13.22	x	x			x						
taken opportunity to change companies	Matt and Marie changed to Tatura Milk Company.	13.23		x		x							x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified to change factory for more money	While Matt and Marie were not on the waiting list, they got into Tatura Milk because they milk a large number of cows.	13.23											
changed calving to increased money	Matt and Marie decided to try split calving,	13.24	x	x			x						
Opportunity identified to increase price received for milk	Tatura Milk was paying 'very high milk payments' for autumn and winter milk.	13.24											
found split calving didn't work well for them and converted back	returned to spring calving.	13.24	x	x							x		
continuing to grow business, have bigger dairy so can milk more cows	continue building up the herd	13.21	x	x		x							
buying more land so can continue to grow herd	bought a 500-acre mixed dryland and irrigated outblock	13.21	x	x		x							
labour management on hew land	Using a contractor, Matt did a bit of cropping when they were feeding grain	13.21	x	x			x	x					
use of new land bought to enable him to continue to grow herd	dryland lucerne.	13.21	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to business associated with irrigation on new block	Matt found the irrigation system to be 'terrible'. The pump was expensive plus he had to 'go out there three and four times a night sometimes'. After using it for a couple of seasons Matt decided to find an alternative.	13.25											
altering irrigation system to address problems	setting the block up to take on extra water through a high flow diversion would work well, given this natural depression.	13.25	x	x			x						
built dam as a part of altering irrigation system on new block	built a 220-ML dam	13.25	x	x			x						
costs associated with irrigation system changes	The dam cost \$250,000, though they did receive the \$20,000 grant. With the new dam, the 500-acre block had increased in value to about a million dollars.	13.25		x			x						
use of new block, once irrigation system changes are made. Inclusion of agistment enterprise, more feed to keep growing the dairy herd	started using it for hay production and agistment while he still had the dairy farm.	13.26	x	x							x		
Opportunity identified with new block	He 'saw the potential and the productivity gains' that could be made with the land, given the new infrastructure.	13.26											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
adding an agistment enterprise	With the agistment, Matt was paid by the weight that the animals put on while at his property and thought that he 'probably made \$80 -100,000 each year on grazing other peoples' stock'.	13.26			x								x
herd still growing with increased feed available	they were milking 500 cows.	13.26	x		x								
transitioning farm management	Matt's father passed on managing the farm bookkeeping to Marie	13.27			x								
Change in family context influencing farm ownership	Mark and his wife announced that they wanted to be bought out eventually, as their children were not interested in farming. This was 'a bit of a bombshell' for Matt and Marie	13.27											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
transition in farm ownership	They agreed to a one million dollar payout with a low interest rate and bought out Mark and his wife in 2003. Matt and Marie were able to refinance their farm loans, borrow an extra \$400,000 and pay Mark the \$400,000 up front. They then paid him the other \$600,000 gradually over time. Matt and Marie had loans equalling two-thirds of the value of the farm. This was actually not an increase in percentage of debt as it was based on the value of the entire farm.	13.27		x		x							
transition in farm ownership	With their share of the compensation Matt and Marie were able to balance out their finances a bit after buying out Mark.	13.27		x		x							
transition in farm ownership	changed all of the land deeds that were not already in Matt's name over to 'Miller Family' rather than individual names.	13.27		x		x							
transition in farm ownership	Mark worked on the farm as a waged employee.	13.27	x	x				x					
son adds labour unit to farm	son Merv was also working as an apprentice on the farm.	13.27	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Drought as threat to business	Just as Matt and Marie were negotiating taking on full responsibility of the family farm, the region was settling into a number of years of drought. 'It was really an emotional, tough time' for the whole family.	13.28											
reduced access to water as an input during drought	Typically, Matt's dairy farm needed about 1000 ML a year to maintain the existing pasture. This was about 40 per cent more than his entitlement. When the farm used to get 'sales' water, this was not an issue. In the late 1990s sales water declined and disappeared as water became scarcer.	13.28			x				x				
increasing access to water in priority areas of farm	amalgamated the dairy farm and the 500-acre outblock. This enabled him to transfer the water between the two properties.	13.28	x		x		x		x				
buying water in response to drought	bought more temporary water. During the first major drought year they bought 200 ML for \$200/ML. From that point on the price of water increased to a thousand dollars. Matt and Marie continued to buy some water. The most they paid was \$600/ML one year, 'just to keep some green on the farm'.	13.28			x				x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
linking farm decisions to personal health and wellbeing	Marie described this as 'a mental health insurance policy' for Matt as 'it was awful living in this brown farm' when they were used to 'lush' green pasture.	13.28			x				x				
dropping stock numbers to reduce feed pressure	culled heavily and got their numbers back to 460 cows.	13.28	x	x		x							
feeding during drought	Matt fed out more hay and grain to supplement the decline in pasture. He had a good relationship with the hay and grain producers and didn't have a hard time getting hay or grain for a price that he was happy with.	13.28		x					x				
feeding pattern during drought	set a rotation which included some grazing time as well as some time in a dry paddock with hay. Matt sacrificed paddocks for feeding out the hay.	13.28	x	x							x		
farm debt during drought	During the drought the farm debt level increased. However, Matt and Marie 'lost less than most people'.	13.28		x		x							
changing family context, money available to farm	Matt's father died in 2008 and left some money in his will to the farm.	13.28		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified threat to business emerged from open herd practices associated with bringing in outside cows for periods of time	had a couple of bad experiences with bringing outside cows onto the farm that led them to becoming a 'closed herd'.	13.29											
seeking to get milk production up over a threshold to get bonus payment	took in 80 cows	13.30	x	x		x							
Opportunity identified to increasing milk solid production	Tatura Milk was offering a 'considerable incentive' to farmers who were producing over 300,000 kilograms of milk solids. Taking in the extra 80 cows would boost cow numbers to qualify for the incentive.	13.30											
anthrax brought into herd, stock management in response	had to slaughter all of the bull calves, which was 'mentally frustrating'.	13.29	x	x		x							
selling water enabled debt reduction so that they could look at slowing down for retirement	decided to sell a third of the farm's 615 ML of permanent water entitlement in 2010,	13.31	x	x		x			x				
Change in personal goals	used the money to reduce their debt and refinance their loan. In 2011 Matt was in his early 60s and didn't want to 'keep going flat out'.	13.31			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals of son to take over and build the business	Matt's son was motivated to continue building the business	13.32											
changes in farm management as parents get closer to retirement	Merv had started taking on more management of the dairy farm	13.31	x	x				x					
changes in farm management as parents get closer to retirement, son managing dairy	was milking 600 cows.	13.31	x	x		x							
changes in farm management as parents get closer to retirement, father managing outblock	Matt was managing the 500-acre outblock.	13.31		x				x					
son driving some farm changes given altering farm management	buy a 150-acre block just near the farm	13.32	x	x		x							
altering dairy to align with changes in farm management	made some changes to the dairy to turn it into 'a one-man shed'.	13.32	x	x				x					
altering dairy to align with changes in farm management	automatic teat cup removers and sprayers, as well as an automatic feed system. They extended the yard and installed an undercover automatic drafting yard.	13.32	x	x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
altering dairy to align with changes in farm management	The dairy improvement cost \$100,000.	13.32		x		x							
Change in family labour available as well as succession planning	Matt and Marie's son announced that he was leaving the farm for personal reasons.	13.33											
selling farm now that son is gone	sold the 400-acre dairy farm with 800 ML of temporary water,	13.33	x		x	x							
removing debt with change in family and farm	sold off all of their permanent water, the 410 ML from the dairy and the 200 ML from the 500-acre outblock	13.33	x	x		x			x				
new business plan entails running agistment enterprise on outblock	keep the 500-acre outblock and continue to run it as an agistment enterprise.	13.33			x								
having to sell water reduces access to water for his new enterprise	After selling the 200 ML of permanent water that came with the block he relied on the dam as his main source of irrigation water.	13.33	x	x		x			x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
future based on new enterprise	Matt and Marie no longer had any debt after selling the farm and the water. This meant that Matt wasn't under any pressure to make the 500-acre block profitable. Making a bit of money was nice but not a necessity. Running the agistment enterprise was a way for Matt to 'slow down' at his own pace rather than just get out of farming. Selling the farm was 'traumatic' and the agistment enterprise was something Matt enjoyed.	13.33			x								

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Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Policy change lead to a need to find alternative income for existing tobacco farm	This meant that the quota assigned to the farm was too small to support both Neil's father and uncle.	14.1											
alternative income identified in dairy farming	bought a dairy farm	14.1	x		x	x							
building new dairy farm	bought other parcels of land	14.1	x	x		x							
building new dairy farm	increase pasture production and cow numbers on the farm.	14.1	x	x		x							
building new dairy farm	bought '40-odd acres'	14.1	x	x		x							
articulation of goal relating to building dairy business	With a growing family, being able to increase productive land and cow numbers was important.	14.1							x				
Threat to business margin identified in drop in milk price	there was one year in which the 'milk price was terrible'	14.2											
alternative income identified	grew a paddock of cabbages that he sold.	14.2	x	x			x						
buying land as a part of building business	bought a 100-acre farm 'up the road'	14.1	x	x		x							
use of land bought as a part of building business	used as an outblock, to run young stock.	14.1	x	x							x		
Change in family labour available	Then Neil's older brother came back to work on the family dairy farm.	14.3											
buying land to grow business	bought a 400-acre outblock	14.3	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
title in son's name implies goals/plans of intergenerational farm business.	block was put into Neil's brother's name 'to make him feel part of the farm'	14.3		x		x		x					
managing growing business	100-acre outblock bought in the 1970s was sold to help pay for the 400-acre block.	14.3	x	x		x							
developing land bought as part of growing business	developed the block, including laser grading	14.3	x	x			x						
use of land bought as a part of growing business	run replacement stock, produce hay and occasionally produce a crop	14.3	x	x							x		
use of land bought as a part of growing business	they put in a crop of sunflowers that 'didn't go that crash hot'.	14.3	x	x			x						
increasing cow numbers as a part of growing business	built up their numbers	14.3	x	x		x							
developing original dairy farm as part of growing business	laser graded the paddocks and reconfigured the irrigation system on the dairy farm.	14.3	x	x			x						
family tragedy leads to questioning of business goals	Neil, who was 14 at the time, was in a motorbike accident which put him in hospital for a while. Shortly after this, Neil's older brother was tragically killed in a car accident.	14.4											
questioning of business goals	Neil's father was considering selling the farm.	14.4			x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Neil says he is going to work on farm so father decides to run on own until he can help	two year period after Neil's brother died where Neil's father was managing the farm on his own	14.4/ 14.5	x	x				x					
managing labour shortage, until Neil can come work on farm	hired a worker to help out	14.4/ 14.5	x	x				x					
reduced stock numbers to make farm manageable until Neil can come to help	sold 100 cows,	14.4/ 14.5	x	x		x							
Change in family labour available	Neil came back to work on the farm when he left school in 1988.	14.5			x			x					
change in farm labour	Neil and his father started to run the business together and Neil was paid a share of the milk cheque (rather than a wage)	14.5	x		x			x					
buying land as a part of growing business	bought 100 acres	14.5	x	x		x							
buying land as a part of growing business	bought a nearby 50 acres and a couple of 'bits and pieces' that took the dairy farm up to around 300 acres in total,	14.5	x	x		x							
breeding practices associated with imperative to increase productivity	used artificial insemination (AI) and stud bulls to 'mop up'.	?	x	x				x					
Identified threat to business - fertility	They'd had some fertility problems on the farm and through the years they found it 'harder and harder to get the cows in calf'	14.6											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
split calving in response to emerging fertility issue	The fertility problem 'was one of the main reasons, at the start' that Neil and his father began split calving.	14.6	x	x			x						
split calving in response to emerging fertility issue	As cow numbers increased on the farm the number of cows milked over the winter increased.	14.6	x	x							x		
Identified threat to business in feeding cows over wet winters	In very wet winters Neil's father found feeding hay out to the cows in the paddocks difficult.	14.7											
new infrastructure built to manage problem	built a 'double-storey hay shed'	14.7	x	x			x						
use of new infrastructure built to manage problem	The cows would come in during wet weather and eat in the shed.	14.7	x	x							x		
as herd size increased use of infrastructure changed as couldn't fit herd in the shed	used for calves,	14.7	x	x							x		
further constraint on shed use as square bales no longer made for use in shed.	switched from square bales of hay to round bales	14.7	x	x			x						
identified opportunity for alternative feed	saw relatives growing corn.	14.8											
growing new feed identified	started growing a bit of corn	14.8	x	x			x						
growing new feed identified	harvested the grain and fed it to the cows in the dairy. While 'there were a lot of people feeding in the bail then'	14.8	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified opportunity to increase dairy size as herd increased	he original walkthrough dairy was changed over to a 'five or six double-up herringbone'	14.9	x	x			x						
Identified opportunity to increase dairy size as herd increased	extended to milk 12 cows	14.10	x	x			x						
Identified opportunity to increase dairy size as herd increased	then 26 cows	14.11	x	x			x						
Identified threat to business when increased cow size meant he could not fit as many cows in dairy	he couldn't fit as many cows as before. For example, instead of fitting 26 cows in the dairy he could only fit 23 or 24 cows.	14.12											
changed rails to enable bigger cows to fit	changed the rails in the dairy, from zigzag rails to straight rails,	14.12	x	x			x						
Opportunity identified to build whole new dairy	While the 26 cow herringbone dairy was big, it 'had a terrible yard set-up'. By the mid- 1990s Neil and his father were milking almost 300 cows and decided to look at building a new yard for the dairy. Changing the yard to the dairy ended up being difficult because there was a dam that impeded the changes they wanted to make.	14.13											
build new dairy to match farm business needs	put in a rotary dairy.	14.13	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Change in farm ownership, tragedy	In 1998 things changed for Neil and his family. Neil's father was diagnosed with cancer and ended up 'in and out of hospital all the time'. He died in 2000 at the age of 63.	14.14											
change in family context leads to changes in farm size	left 80 acres from the outblock to Neil's sister. The subdivision of that block out of the farm reduced the outblock to 320 acres.	14.14			x	x							
changes in farm management	took on all of the farm management decisions	14.14	x	x		x		x					
Drought	Neil described the period of time from when his father got ill and then through a protracted drought as 'a challenging decade'.	14.15											
bought temp water in response to drought	The first time Neil had to buy temporary water was in 1996 or 1997. He bought 200 ML of temporary water because there had been 'a few dry years'	14.15	x	x					x				
bought temp water in response to drought	As the drought progressed and the price dropped, Neil did buy some temporary water.	14.15		x					x				
changing feeding practices in response to drought	dried off most of the paddocks and fed out to the cows in a dry 'sacrifice paddock'.	14.15	x	x							x		
changing feed production in response to drought	converted 60 acres to sub-surface drip irrigation and sowed it to lucerne.	14.15	x	x			x						
management of new feed planted in response to drought	cut the lucerne and fed it out to the cows through a mixer.	14.15	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
reduced stock numbers to reduce feed pressure in response to drought	'scaled back' to about 220 cows.	14.15	x	x		x							
bought this land just prior to drought as a part of growing business	bought a 120-acre farm 'up the road' with 300 ML of water.	14.16	x	x		x							
cost of buying the land as a part of growing the business	They bought the farm for \$600,000, borrowing the full amount to pay for it.	14.16				x							
use of new land bought as a part of growing the business	parents moved onto the new block and began leasing it from Neil and Nancy.	14.16		x		x							
farm debt due to drought	Through the drought the \$600,000 farm debt increased to around \$700,000 or \$750,000.	14.15		x		x							
selling water to reduce debt that has increased due to drought	sold the 300 ML of permanent water off the 120-acre block.	14.15	x	x		x			x				
selling land to reduce debt that has increased due to drought	sold the 120-acre block to Nancy's parents	14.15		x		x							
finances after selling land and water	After selling the water and land they 'were pretty even' financially.	14.15				x							
farm pasture changes as a response to drought	put in more annuals on his farm and oversowed some of it with millet to get a 'double crop' for grazing	14.15	x	x				x					
change in pasture mix post drought	post drought the pasture mix was 65 per cent perennial pasture and 35 per cent annual and lucerne pasture.	14.15	x	x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
labour management associated with changing farm feed management due to drought	hired a contractor to wrap the round bales for silage.	14.15	x	x			x	x					
labour management associated with changing farm feed management due to drought	bought a silage wrapper and was doing it himself;	14.15	x	x			x						
changing technology to enable changes to labour needed for new practices adopted due to drought	built a silage wrapper that could be run by one person.	14.15	x	x			x	x					
farm pasture changes as a response to drought	bought a second-hand forage harvester and started making pit silage.	14.15	x	x			x						
buying land to enable increased farm size sufficient for hiring a share farmer to reduce Neil's time on farm	bought a 160-acre block,	14.17	x	x		x							
use of newly bought land	they were able to incorporate it into the dairy farm's grazing rotation.	14.17	x	x							x		
farm debt with recent changes	With the new 160-acre block Neil and Nancy had nearly a \$900,000 debt. While the debt was high, Neil thought that their equity had increased as well. Even so, Neil was focused on managing the farm over the coming years to reduce the level of debt.	14.17		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
farm plan to better meet personal goals	Neil and Nancy bought the 160 acres to increase the farm size sufficiently to enable them to put on a share farmer.	14.17	x	x				x					
Personal and family goals lead to a need to make changes in farm	they wanted to decrease the amount of time that Neil was putting into the farm so that he could 'spend a bit more time at home with the kids'.	14.17			x								
changing farm management with use of share farmers	their third share-farmer and thought that they had 'found a really good person', after the first two hadn't worked out well.	14.17	x	x				x					
Opportunity to change calving identified through recent farm changes	With the new pasture mix, Neil was finding that the amount of feed he could grow through the autumn, winter and spring was 'a hell of a lot more with a lot less water' than he could grow through the summer. While Neil historically needed 1200 ML to irrigate, he thought that with the new pasture mix he could 'get away with 800 ML'. As well, the new 160-acre block had 'a fair bit of undulation' which meant that there were more options for where to put cows during wet winters.	14.18											
altered calving pattern to enable greater proportion of cows milking over winter in response to opportunity	altering the calving pattern to increase the proportion of autumn calves.	14.18	x	x								x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
identified change option identified when linking farm history of problems in wet weather with the decision to increase milking cows through winter	considering putting in a feed pad, as a 'backup' in the wet	14.18	x	x			x						
Identified opportunity to increase cow numbers quickly	Neil was trying to build up cow numbers again since the drought. He was trying to do it quickly to increase income because he had bought the extra 160 acres. He was also 'trying to push share farming' which meant he needed enough cows to 'sustain things at a reasonable level'.	14.19											
approach to rapid herd increase entails selling heifers and buying crossbred cows, loss of herd genetics with this change	sell his replacement heifer calves and use the money to buy in dairy cows.	14.19	x	x									x
approach to rapid herd increase entails selling heifers and buying crossbred cows, loss of herd genetics with this change	had bought 130 dairy cows.	14.19	x	x		x							
approach to rapid herd increase entails selling heifers and buying crossbred cows, loss of herd genetics with this change	buying more economical crossbred cows.	14.19	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
approach to rapid herd increase entails selling heifers and buying crossbred cows, loss of herd genetics with this change	changed his breeding program.	14.19	x	x							x		
didn't see benefit of AI when genetics have changed	stopped using AI and went to using stud bulls.	14.19	x	x							x		
opportunity available to achieve family goal through on-farm grant	applied to convert the whole dairy farm to a pipes and risers system.	14.20	x	x				x					
Identified opportunity to use policy change (grants) to achieve family goals	A major reason that Neil was interested in pipes and risers was 'for the lifestyle'. Growing feed and irrigation were the biggest jobs on his dairy farm, alongside milking the cows. He hoped to make those jobs easier to make dairy farming 'quite a reasonable lifestyle'.	14.20			x								
automation is a key factor in conversion as it enables achievement of personal goal	automating the irrigation system. While Neil could automate his existing flood irrigation system, pipes and risers would mean less maintenance.	14.20	x	x				x					

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Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals drive decision to initially buy farm	father bought an existing dairy farm	15.1			x								
Changing family labour available on farm	Owen's older brother went to work on the farm full-time when he left school in 1960. In the mid-1960s Owen also returned to work on the farm.	15.2											
refers to when first started building business	second irrigated block	15.1	x	x		x							
use of this early second block	an outblock for young stock	15.1	x	x							x		
infrastructure development on the second block	built a dairy on the block and brought in a share farmer who they had on the block 'for a number of years'	15.1	x	x			x	x					
selling second block	sold it'	15.1	x	x									
building business still	leased some land that he could use as an outblock	15.1	x	x		x							
bought new land to support increased labour units	bought another dairy farm	15.2	x	x		x							
enabling transition of this new land in future, implies there may be a need to split farm in the future	bought for Owen's brother	15.2											x

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
use of the two blocks with three labour units	family ran the two blocks together as one farm for a number of years.	15.2	x	x		x							
consequence of the two farms, had to move milking infrastructure seasonally, depending on what farm they milked on (determined by pasture)	'pretty complicated system'	15.2	x	x							x		
Change in family and personal goals	Owen's brother got married and he moved onto his farm with his wife	15.3											
due to changing family circumstances	farm business split in two.	15.3	x		x	x							
consequence of farm business split	built up their herd again.	15.3	x	x		x							
change in feed available due to farm split leads to feed management change	cutting a lot of hay and, eventually, a lot of silage.	15.3	x	x				x					
buying land to access more feed for the farm since farm split	bought a 600-acre outblock	15.3	x	x		x							
use of land bought to access more feed	run dry stock and grow hay.	15.3	x	x							x		
accessing water to increase productive capacity of land bought	applied for a water right for the property and were allocated 160 ML	15.3		x		x						x	
development of new block	laser graded and set up irrigation infrastructure	15.3	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
response to buying new outblock.	discontinued the lease on the other outblock	15.3	x	x		x							
breed selection based on compatibility with beef production	converting the herd over to Friesians'	15.4	x	x			x						
Opportunity identified to diversify business through the introduction beef production	The decision to convert to Friesians related mainly to their interest in using the outblock to start a beef enterprise. They had a considerable amount of land away from the dairy farm that they wanted to utilise.	15.4											
breeding practices with dairy and beef production	used to artificially inseminate (AI) all of the cows with Friesian semen for three to four weeks and then 'run a Hereford bull with the herd after that'. Any Friesian/Hereford cross bull-calves were reared as steers and the heifer cross calves were sold as bobby calves.	15.4	x	x			x						
emerging fertility problem, early farm emphasis in spring calving transitioned into year round calving	As time went on it got harder to get cows in calf, and the reality was that they 'had cows calving all the time' in the later years.	15.4	x	x							x		
Change in farm ownership due to changing family circumstances, marriage	In 1974 Owen got married to Olivia. Owen and Olivia had four children over the years, starting in the mid-1970s. The day that Owen was married the farm was signed over to his name.	15.5											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
transitioning farm ownership	Owen's father moved into town and stepped out of the dairy side of the farm business, though he did come out and help on the dairy farm.	15.5	x		x			x					
transitioning farm ownership	Owen bought the farm from his father. He paid him about \$200,000 through a payment plan that was organised through a solicitor. Owen acknowledged that 'we were fairly lucky in the fact that I owed the debt to my father, not the bank, so it was always reasonably flexible'. While the debt was at least 80 per cent of the value of the farm, 'there was no risk at all really'.	15.5			x	x							
continuing to build business after changing farm ownership	building up the herd	15.6	x	x		x							
Identified threat to business associated with insufficient feed availability	Owen described how they 'were always struggling' to have enough feed when they had 180 cows. However, the farm had to be heavily stocked to be profitable.	15.6											
response to feed availability	started producing silage	15.6	x	x			x						
Identified opportunity to extend dairy when building up herd size early in the farm family farm history	extended to a 10-cow walk through.	15.7	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Identified opportunity to increase rate of milking. Built when run with brother's dairy block (1960s)	built a 10 swing-over herringbone dairy	15.8	x	x			x						
this change occurred at time they were needed high stocking rate for profit.	converted the dairy into an 8-cow double-up dairy.	15.6	x	x			x						
when new dairy installed	installed automatic cup removers to make it easier on himself as a 'single man operation'.	15.6	x	x			x	x					
Drought reduces already struggling feed availability	There was a drought over the 1976-1977 season. It was the first in which Owen didn't get his full water right.	15.9											
change to increase feed available during drought	introduce bail feeding	15.9	x	x			x						
post drought benefits, enabled herd increase	able to milk an extra 20 to 25 cows	15.9	x	x		x							
Opportunity identified to increase productive capacity of existing farm	Owen wanted to redevelop the farm and in the 1980s	15.10											
starting the farm improvement process	had a WFP designed.	15.10		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
constraint on implementing WFP identified	He realised very quickly that he needed to increase the size of his farm if he was going to redevelop it. Without expansion, taking 'land out of production for any period of time to do any major renovation was going to destroy the whole set-up'.	15.10			x		x						
Change in family labour available to the farm	Owen's son came back to work on the farm in the early 1990s.	15.11											
the role of the beef enterprise in the farm	The beef cattle enterprise was 'a good sideline' to the dairy.	15.4	x		x		x						
the role of the beef enterprise in the farm	Owen estimated that the beef cattle were about 30 per cent of the farm income.	15.4			x		x						
the role of the beef enterprise in the farm	'The trick was to have the right amount of cattle at the right time' so that, 'if the prices were good', they did well.	15.4			x								x
change in policy increases flexibility to move water between properties	water rules changed	15.12											
policy change enabled Owen to change where he used water based on farm needs	which allowed water rights to be amalgamated. This enabled Owen to use the water wherever he needed it most.	15.12	x		x		x						x
Drought reduced access to water and puts pressure on the farm business	A prolonged drought started in 2001.	15.13											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
water use during drought	Owen ensured that most of his irrigation water was used on the dairy farm.	15.13		x					x	x			
response to drought	'spent an awful lot of money' buying fodder that first year, thinking they could 'afford to do that for one year'	15.13		x		x			x				
impacts of responding to drought	Owen and Olivia ended up using close to \$100,000 of their personal savings in one season.	15.13		x									
changing practices in response to pressure caused by drought	cutting the use of herd testing and AI.	15.13	x	x							x		
business at risk, not viable as two-person operation	After three to four years of the same pattern, 'it started to get a bit much'. The farm was not bringing in enough income to pay for both Owen and his son. Owen offered the business to his son, as Owen had 'had enough'. Owen's son didn't want to take over the business and took a part-time off-farm job that quickly turned full-time.	15.13	x		x	x			x				
Family and personal goals, succession planning changes	When Owen's son decided to leave the farm 'it made life a lot simpler' for Owen. Early in the drought Owen could tell that his son 'wasn't 100 per cent keen' on farming. After his son's decision to leave, Owen could make decisions without having to worry about his son's future on the farm.	15.14											

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals drive farm business goals	Owen and Olivia decided that they no longer wanted to run the dairy farm	15.15											
transitioning farm to a new plan that aligns with personal goals	sold the dairy herd.	15.15	x		x								
transitioning farm to a new plan that aligns with personal goals	started working towards building up a beef cattle herd	15.15	x		x								
transitioning farm to a new plan that aligns with personal goals	decided to rear every Friesian/Hereford heifer that he produced	15.15	x		x								
transitioning farm to a new plan that aligns with personal goals	sold the Friesian/Hereford heifers that he had been rearing	15.15			x								
transitioning farm to a new plan that aligns with personal goals	kept the Friesian/Hereford heifers that he produced. This enabled Owen to have 'a readymade beef herd to take over' when he sold the dairy cows.	15.15	x		x								
transitioning to beef cattle	In the first year that Owen transitioned the farm out of dairy and over to beef cattle they lived off the money that they made from selling the dairy cows and Olivia's nursing income. After 12 months, they had their 'first lot of veal for market'. The transition 'didn't seem to be a hassle' to Owen.	15.15			x								
transitioning to beef cattle	heifer offspring were sold at nine months as 'milk vealers'	15.15	x		x								

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
transitioning to beef cattle	steers were kept on the old dairy farm for an additional 18 months and then sold.	15.15	x	x		x							
transitioning to beef cattle	got up to carrying 400 head of stock	15.15	x	x		x							
transitioning to beef cattle	back down to about 200	15.15	x	x							x		
reflection of how personal goals are driving changing business goals	He knew that he could do a lot more with his farm but wasn't motivated to do so as he had 'bought a caravan, unfortunately'. He described the beef-cattle as 'a totally different lifestyle'. He had even taken up lawn bowls.	15.15							x				
financial implications of change	Owen acknowledged that his and Olivia's income had dropped 'fairly dramatically' but felt lucky because they didn't have any debt. Olivia's income was enough for their day-to-day household expenses. Owen ran the farm with the hope of making enough money 'to have a certain amount of improvements every year'. While Owen was 'not making huge amounts of money', it was enough and it kept him occupied.	15.15				x				x			
policy change regarding modernisation has had little impact	irrigation outlets were converted from Dethridge wheels to Magflow meters.	?	x	x							x		
Identified threat to business	Owen had been having 'quite a few issues' with his Herefords	15.16											

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Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Personal goals drive decision to buy farm	bought a 220 acre block in an area that had been earmarked for irrigation	16.1											
how land first used	used the block for mixed farming	16.1	x		x								
how land first used	cropped wheat and grazed sheep and cattle.	16.1	x	x			x						
Change in farm ownership	great-grandfather died and his grandfather, through inheritance, took over full ownership and management of the farm	16.2											
building business after changing ownership	bought an adjoining 160 acre property upon which he built a house.	16.2	x	x		x							
water on land just purchased as a part of building business	had about 160 acre-feet (200 ML) of water across the two blocks	16.2		x					x				
changing family living location and sold other property to focus on irrigated farming	sold the family's original dryland farm and moved his family to the irrigated farm	16.2	x		x	x							
building business	bought another adjacent block comprising 200 acres and a "huge water right" because it had an irrigation entitlement and it also had creek access	16.2	x	x		x			x				
building business	did some share farming, where they cropped	16.2	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Change in family labour available to the farm (at same time as below)	Peter came to work on the farm when he left school in 1956	16.3											
Identified opportunity to change enterprises (at same time as above)	here had been serious floods "which destroyed large areas of stone fruit trees"	16.4											
Response to identified opportunity to start fruit production	plant 20 acres of their best land to peaches and apricots	16.3/16.4	x		x		x						
Response to identified opportunity to start fruit production	gave them an extra 20 acre-feet of water.	16.3/16.4			x				x				
Outcome of decision to go into fruit production	The orchard didn't last long however, as changes in the market reduced profitability of fruit production.	16.3/16.4	x		x							x	
Change in family and personal goals	In the 1960s Peter was married. He and his wife built a house on the 160 acre portion of the farm.	16.5			x	x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Policy change identified as major influence on ability to keep growing business	Peter said that the amendment of the Water Act in 1964 was “a critical point for the farm”. Up until then the allocations were “unrealistically low”. The act “had a massive impact on what happened” on the farm. Given the farm had four allotments, they received enough water with the changes that they “became serious irrigation farmers” while before they were “just dryland farmers with some irrigation”.	16.6											
becoming serious irrigated agriculture producers	Peter bought the block	16.6	x	x		x							
becoming serious irrigated agriculture producers	sold the “poor” 200 acre block and a small subdivided house block off the 160 acre block	16.6	x	x		x							
becoming serious irrigated agriculture producers	proceeds from these sales were used to pay for the 525 acre block.	16.6		x		x							
new land as a part of growing business as serious irrigated agriculture producers	525 acre block was adjacent to a creek and had access to a considerable amount of water	16.6		x					x				
new land as a part of growing business as serious irrigated agriculture producers	The 525 acres had a 280 ML irrigation water entitlement and a 160 ML creek pumping licence.	16.6	x	x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
new land as a part of growing business as serious irrigated agriculture producers	incorporated the new block into the mixed farming business	16.6	x	x		x							
Identified threat to business due to market prices	In the early 1970s there was “a major crisis in the cattle sector”. Producers were “shooting cattle and livestock were at give-away prices”. Peter started “looking for an alternative” to cattle	16.7											
response to livestock industry decline	Peter decided to go into sunflowers	16.7	x		x		x						
response to livestock industry decline	beef production “dwindled” on-farm to where “the livestock didn't get any money invested in it at all”	16.7	x	x							x		
response to livestock industry decline	Over a five to six year period, sunflowers took over emphasis in the farm production system, bringing in 60 to 70 per cent of the farm’s income	16.7	x	x							x		
response to livestock industry decline	There were costs associated with putting half of the farm into sunflowers	16.7	x	x		x	x						
response to livestock industry decline	Peter had to purchase four to five row cropping machines	16.7	x	x			x						
response to livestock industry decline	convert half of the farm from border check flood irrigation to 30 inch spacing furrow irrigation.	16.7	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
response to livestock industry decline	he had to modify the infrastructure by “abandoning the bays and putting furrows across the whole field”.	16.7	x	x			x						
response to issues with sunflowers	after five or six years, Paul's father got out of sunflowers for three reasons.	16.8	x		x						x		
Identified threat to the business associated with sunflowers	the price he received for the crop dropped significantly. In Peter's last crop of sunflowers he produced 150 tonnes and made a total of \$200 profit. Second, a serious root disease called sclerotinia began affecting the sunflowers making them more difficult to grow. And third, he had “terrible trouble” with bird pests (i.e. cockatoos) causing significant damage to the crops. After these things Peter decided, “blow that for a joke”, sunflowers were not worth growing.	16.8											
in relation to a later expansion phase - maize grown as extra feed	laser grading led to a dramatic increase in furrow irrigated maize production, which was beneficial for the farm.	16.13	x	x			x						
Change in farm ownership/ succession planning	Peter and his wife took over a soldier settlement block that belonged to Paul's mother's parents.	16.9	x		x	x							
management of inherited property	had share farmers on the dairy property	16.9	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
management of inherited property	They maintained their investment in the dairy property until the late 1970s, as which point they sold the block.	16.9	x		x	x							
Identified opportunity to buy land and go into dairy ALSO strongly linked to change in family labour units available to the farm (3 sons coming)	After being out of dairy farming for two years, Paul's parent bought a 200 acre dairy property near the 380 acre home block.	16.10	x		x	x							
buying land to set up dairy farm for sons	property had 170 ML of irrigation water	16.10		x					x				
setting up dairy farm for sons	decided to combine the 200 acres with the rest of the home farm and establish a larger dairy enterprise	16.10	x	x							x		
setting up dairy farm for sons	"decided that his boys would come home and run it" as he had no interest in milking cows himself.	16.10		x				x					
setting up dairy farm for sons	he bought it under "vendor finance", which meant that "the previous owner agreed to leave money in the farm, and become a mortgage holder". The vendor finance taken up for the property was "a pretty generous deal".	16.10				x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
general statement about his off farm income and the farm.	Peter found that his off farm businesses were his main sources of income and provided resources for the farm	16.10			x	x							
relates to decision to set up a dairy enterprise	This first thing that Peter did when pursuing the dairy enterprise was to purchase more cows so that he could increase production.	16.10	x	x		x							
relates to decision to set up a dairy enterprise	“went straight for Friesians” because Friesians were seen as “the more robust option”.	16.10	x	x			x						
relates to decision to set up a dairy enterprise	started using Friesian semen through artificial insemination (AI).	16.10	x	x			x						
relates to decision to set up a dairy enterprise	milked out of the old dairy for the first year-to-18 months running the dairy	16.10	x	x							x		
relates to decision to set up a dairy enterprise	put in a rotary dairy,	16.10	x	x			x						
relates to decision to set up a dairy enterprise	he was able to pay for in its entirety using money from an off-farm business.	16.10		x		x							
relates to decision to set up a dairy enterprise. Building up business	“had a vision as to what the farm would look like” and designed how the farm would be laid out.	16.10		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
relates to decision to set up a dairy enterprise. Building up business	Given much of the block was set up for cropping, Paul's father had to make a lot of changes to the farm to make it work for dairy.	16.10	x	x			x						
relates to decision to set up a dairy enterprise. Building up business	changed the layout of the farm, irrigation channels and the fencing	16.10	x	x			x						
relates to decision to set up a dairy enterprise. Building up business	the proportion of perennial pasture was a "moving target" because it grew each year	16.10	x	x							x		
relates to decision to set up a dairy enterprise. Building up business	eventually the pasture on the dairy farm was all perennial pasture	16.10	x	x							x		
relates to decision to set up a dairy enterprise. Building up business	fact that they could work on the redevelopment themselves was "a bit of an advantage" for the farm business.	16.10		x		x							
transition to boys coming home - reflects the time dimension of the change decision - buy farm for sons but sons not ready for a few year to work on farm	the dairy farm was run by share farmers	16.10		x				x					
description of farm performance during transition	the "financial performance of the dairy operation was woeful"	16.10		x		x							

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
finally boys take over	Peter had come home to work on the farm his father, Paul's grandfather, had let him take over	16.10			x			x					
description of sons taking over	Paul never worked for his father when he was on the farm. He worked with his brother and his father.	16.10			x			x					
relates to sons taking over	younger brother to Paul, also returned to help on the dairy farm for a while	16.10		x				x					
relates to sons taking over	This son then decided to work for Peter in one of the off-farm businesses.	16.10		x				x					
Change in family labour units available, change in farm ownership	Paul paid his brother out by paying a stock mortgage owed to his mother (Peter's wife) to this brother. Peter described how Paul was "very generous" in the arrangement to his younger brother.	16.11			x	x							
still in relation to setting up the dairy farm, describes out it was set up in relation to the other property	the other 525 acres was returned to a separate mixed farming block. The two blocks were run as "standalone" blocks.	16.10	x		x	x							
linking other block after sunflowers for use with dairy block	took a year or two to "phase out of sunflowers" on the 525 acre block.	16.8/16.10	x	x							x		
linking other block after sunflowers for use with dairy block	converted the 525 acre block into an outblock for the dairy farm	16.8/16.10	x	x				x					

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
focus on dairy	The farm “focus was all about dairy” and the outblock was used for “really only feed and water”. By 1987, “the only income that came in the gate was through milk sales”.	16.10			x	x							
brother left, two now in charge, divide farm management between the two	managed the farm by managing each, the outblock and the dairy block, separately	16.11			x				x				
how farm management divided	Paul’s brother managed the outblock, with one employee	16.11			x				x				
how farm management divided	Paul managed the dairy farm, with a few employees	16.11			x				x				
how farm set up and used for dairy focus	grew extra feed for the milking cows on the outblock	16.10	x		x							x	
how farm set up and used for dairy focus	small amount of perennial pasture	16.10	x		x							x	
how farm set up and used for dairy focus	ran young stock	16.10	x		x							x	
how farm set up and used for dairy focus	transferred water from the outblock to the dairy	16.10			x					x			
how farm set up and used for dairy focus	used the outblock for dryland cropping	16.10	x		x							x	
building dairy business	focused on steadily increasing the number of cows that they were milking	16.10	x		x							x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
building dairy business	went from 180 to 600 cows	16.10	x	x		x							
building dairy business	They were “heavily supplementary-feeding” the cows	16.10	x	x							x		
building dairy business, getting more constrained	they were purchasing 40 to 50 per cent of the feed they needed.	16.10		x		x			x				
dairy business still growing, new ways of feeding to meet needs	started feeding cows in the dairy in 1989	16.10	x	x			x						
feed to meet needs of cows in growing business	started using some of the outblock to produce maize, to feed to the cows.	16.10	x	x			x						
feed to meet needs of cows in growing business	they primarily grew hay on the outblock	16.10	x	x							x		
feed to meet needs of cows in growing business	started “getting into silage properly” when they started growing maize.	16.10	x	x			x						
feed to meet needs of cows in growing business	“silaged” some of the maize grain	16.10	x	x			x						
calving pattern when started managing dairy business	When Paul and his brother first started with dairy farming they calved in the spring	16.10	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
calving pattern when started managing dairy business	join all of the cows and at the end of joining season, any cow that was not in calf "you'd just cut her head off".	16.10	x	x			x						
emerging problem that led to next CJ	tried "every conceivable idea" to improve their calving percentage but nothing worked.	16.10	x	x			x						
Identified threat to business associated with fertility	The proportion of empty cows "ended up being too high a proportion" for Paul and his brother to continue to "wear the losses" associated with sticking to spring calving.	16.12											
managing fertility issue with herd through split calving	they started autumn calving. This meant that the cows had "two opportunities" to get into calf.	16.12	x	x			x						
managing fertility issue with herd through split calving	meant that Paul and his brother received a better price for their milk when milking over the winter	16.12		x		x							
managing fertility issue - but not successfully	continued to alter the calving pattern in response to the capacity to get cows in calf, which Paul referred to as "the tail wagging the dog".	16.12	x	x							x		
end up three times a year calving due to fertility problem - never fixed it, just kept altering calving to manage it	ended up calving three times a year; in January, May and September.	16.12	x	x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Opportunity identified to expand	Paul and his brother decided to “go through another expansion phase”.	16.13											
buying land as a part of expansion	bought an adjacent 100 acre block with 120 ML of water	16.13	x	x		x							
buying land as a part of expansion	they were able to easily fit into their pasture rotation	16.13	x	x							x		
more cows as a part of expansion	bought another 400 Friesian cows, which they bought in batches over a one year period	16.13	x	x		x							
feed pad to enable them to feed growing herd	built a feed pad “at vast expense”	16.13	x	x			x						
feeding system change toward more intensive system as a part of expansion	finishing the conversion of the entire dairy block to perennial pasture and supplementary feeding of cows as they came out of the dairy on their way to the paddock after they were milked. This was to “ensure that the cows were fully fed”	16.13	x	x							x		
supporting feeding system change	bought a mixer wagon	16.13	x	x			x						
Threat to margin identified through current land use of cropping block	“applied a lot more scrutiny to the cropping operation” on the outblock in 1998. The realised that they “couldn’t make it economically work” to continue growing maize on the block	16.14											
transition from maize to other feed production	stopping maize production	16.14	x	x							x		

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
transition from maize to other feed production	increased the proportion of feed that he had to purchase for the farm.	16.14		x					x				
transition from maize to other feed production	started growing annual pasture on the outblock instead of maize	16.14	x	x							x		
Change in farm management and ownership	Paul and his brother started managing the dairy farm together but Paul's brother wasn't interested in dairy farming and decided to pursue other interests in mid-1999.	16.15			x			x					
response to brother leaving	Paul and his wife, Patricia, bought the farm	16.15			x	x		x					
response to brother leaving	had to borrow money from the bank to pay them out. The mortgage was for about 60 per cent of the value of the farm.	16.15		x		x							
still expanding/building business	bought another 500 acre farm	16.13	x	x		x							
still expanding/building business	had a 369 ML irrigation entitlement.	16.13		x					x				
Policy change regarding water rules which reduce water available	This wasn't a problem for them up until about 1997, when water rules changed.	16.16											
started having to buy water - a new thing	Paul and his brother started having to buy temporary water regularly to ensure they had enough	16.16		x					x				

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan Goal	Infrast Tech HRM Proc	In Oper Out M&S
started having to buy water - a new thing	they had to buy in two-thirds of their irrigation water needs in a year when they received a 100 per cent allocation.	16.16		x	x	
Drought	In the 2002 season, Paul didn't get his full entitlement of irrigation water. He described 2002 as "a real shock" because they had "treated water as if it was always going to be there". It was the first drought-affected year that Paul and Patricia experienced and their "world came crashing down from the point of view of water availability, and a combination of low milk price and high feed price".	16.17				
response to drought	converted a lot of his perennial pasture to annual pasture,	16.17	x	x		x
response to drought	It was "completely unaffordable" to buy extra water to make up for the shortfall in his allocation. The combination of low milk prices, high feed costs and low water availability was "a recipe to lose money hand over fist". Paul "didn't want to change the structure of the business" and decided to "wear the costs". He lost \$500,000 in that year.	16.17			x	

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
post drought response	He was able to rebound and made back the \$500,000 loss over those next few years.	16.17				x							
post drought response	converted "pretty near 100 per cent" of his dairy block back to perennial pasture	16.17	x	x							x		
Drought	2006 drought returned with another low allocation, though the "price equation wasn't quite as dramatic" as it had been in 2002.	16.18											
response to drought 2	shifted quickly back into annuals	16.18	x	x							x		
response to drought 2	selling some of his water	16.18		x		x							
response to drought 2	bought in feed	16.18		x					x				
response to drought 2	fed the cows on the feed pad.	16.18	x	x							x		
response to drought 2	used a lot of "bi-product feeds" (e.g. waste lollies, brewers grain)	16.18	x	x			x		x				
response to drought 2	bought grain for a fraction of the typical price by buying it from someone who "had a contract for taking away the grain cleanings from around bunkers"	16.18		x			x		x				
response to drought 2	agisted heifers to Tasmania.	16.18		x			x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
Threat to business identified if change is not made	By the mid-2000s Paul was very aware that “the farm needed a huge new investment in infrastructure and enthusiasm”. Neither Paul, nor Patricia was prepared to give it. The biggest infrastructure problem was the dairy. The existing dairy was old, which meant high maintenance requirements. Its small size meant that milking was time consuming, generating high staffing requirements.	16.19											
tried to sell	had two separate marketing campaigns to sell the farm	16.19			x								
Family and personal goals lead to change in enterprise	Over that period, Paul and Patricia were just “marking time” and by 2008 they’d “had a complete gutfull”.	16.20											
when couldn't sell, decided to convert to cropping	modified their plans, sold the herd and went into cropping.	16.20	x		x		x						
selling cows to convert to cropping	sold them from Tasmania	16.20	x		x		x						
selling cows to convert to cropping	cows that were on the dairy farm were sold through a two-day auction	16.20	x		x		x						

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal					In	Oper	Out	M&S	
						Infrast	Tech	HRM	Proc					
converting to grains	With grain production, "if the market circumstances didn't suit, you didn't have to sell, because you could store it." Paul could time the sale of his grain when it suited and the buyers "were being more reasonable with you".	16.20			x									x
converting to grains	it reduced his dependence on staff.	16.20			x									
converting to grains	With cropping, Paul only needed to manage two employees.	16.20			x									
converting to grains	only had to buy two implements, an air-seeder for sowing the crops and a boom spray.	16.20	x		x									
converting to grains	used a storage contractor rather than buying silos for their grain	16.20			x									x
growing cropping business	"for economic reasons", they put in their own storage.	16.20	x		x									
growing cropping business	bought more land.	16.20	x		x									
growing cropping business	"changed a lot of things" regarding how the farm's water was structured	16.20	x		x									
growing cropping business	grew his crops in a rotation: wheat, barley, faba beans and canola in the winter; soya beans in the summer.	16.20	x		x									

Rationale for linkage identification between CJs and reinforcing decisions	Coded data	CJ	Adapt	Plan	Goal	Infrast	Tech	HRM	Proc	In	Oper	Out	M&S
		growing cropping business	selling the herd generated “a big income source” that they could use to get through the short-term income lag associated with converting to cropping.	16.20	x	x		x					
growing cropping business	Financially the shift was positive for Paul and Patricia; generally they were “doing better” than with dairy.	16.20			x	x							

Appendix F: Classifying sources of critical junctures

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
1	1.1	Personal/family goals	grandfather started out as a share farmer on the property				✓		
1	1.2	Marriage and changing ownership	Albert and his wife took over the farm in 1978, after they were married				✓		
1	1.3	Herd genetic quality impeding goal of building business	When Albert came to work on the farm in 1965 he told his father that they needed to try and do something to sort out the mixed-breed 'motley group of cows'.						✓
1	1.4	Identified opportunity to improve value of herd in policy change	the Jersey Society opened the books to register Jersey cows with sufficient records					✓	
1	1.5	Identified opportunity seen in increasing dairy size	allowed him to milk 16 cows at a time, while in the old dairy he could only milk six.					✓	
1	1.6	Drought means the farm is struggling to feed cows	In the early 80s there were 'some dry years'. Once water got scarcer Albert needed to find another way to get the water.	✓					
1	1.7	Change in farm ownership	In 2000, Albert's father passed away. Before his father passed away, farm debt would have been at about \$100,000. With his father's passing Albert needed to buy out his two sisters from the farm, at a significant, though reasonable, cost. To pay the costs, Albert had to take on a bit more debt. Albert reflected that things have worked out with regard to the farm business ownership.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
1	1.8	Drought means farm is struggling to feed cows	As the drought continued he realised that he couldn't keep borrowing and just feeding out. All of his income was going to feed the cows. He had to get a lot smarter if he was going to maintain the business.	✓					
1	1.9	Opportunity identified in a changed policy context	He was successful in acquiring funding through two state and federal programs that are providing him considerable funding towards \$225,000 worth of on-farm improvements. He never could have afforded this kind of upgrade without the funding.		✓				
1	1.10	Change in personal goals	Albert has retired from his off-farm artificial breeding work and he has stepped back from some other long-term volunteer community work he has been involved in. He plans on spending some time focusing on doing a few more things around the farm.				✓		
2	2.1	Personal goals	bought the original 80-acre farm block				✓		
2	2.2	Having children leads to change in family context, reduced time on farm	When they started having children they stopped using these practices.				✓		
2	2.3	Change in family labour units	Ben left school in 1981 and became an apprentice on the farm.				✓		
2	2.4	Threat identified with current herd genetics	actively trying to build up the herd numbers, given the recent doubling of the farm size. The cows at that time were a mix of cross-breeds. It was like 'liquorice all sorts.' Ben's parents had started with a Jersey herd and over time had tried different crosses with Guernseys and Friesians to try and breed good cows.						✓

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
2	2.5	Drought reduced access to irrigation water and required change to farm	couple of years after Ben came to work on the farm, there was a drought that led the family to start feeding cows 'in the bail'	✓					
2	2.6	Opportunity to increase herd size in alignment with increasing productivity imperative	herd-size increased to about 180 cows					✓	
2	2.7	Threat identified to farm if changes to dairy were not made	They need to be able to milk more cows, as they had just bought 160 acres, doubling the farm size.						✓
2	2.8	Family goals change with marriage	In 1989, Ben got engaged to Betty, and they were married in 1990. In 1989, Ben and his parents knew that there were going to be 'two families trying to make a living' from the farm. An extra house had to be built and, while Betty did work off-farm, there was a 'push to try and milk more cows'.				✓		
2	2.9	Change in family context, farm management and finances	In 1995 there were significant changes in the family; Ben and Betty had their first baby, a daughter, and in late 1995 Ben's mother died of cancer. This increased the pressure on Ben to do more on the farm as Ben's father decided that it was time to transition away from owning and managing the farm.				✓		
2	2.10	Implied that an opportunity has been identified in purchase of land to increase productivity	bought a 100-acre block of land					✓	
2	2.11	Drought reduced access to irrigation water and farm is struggling to feed	When the drought hit and there was not enough water to water the perennial pasture	✓					

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
		cows							
2	2.12	Switch to annuals due to drought led to a need to change calving pattern	drought helped to 'force' the move regarding split calving. They had no summer pasture during the drought and had a lot of autumn and winter pasture. If they wanted to make the most of what they had, they needed to milk more cows through the winter, to make use of that grass.	✓					
2	2.13	Opportunity to increase productive capacity of pasture through buying new block	They bought the new irrigated block because they needed to be able to run more young stock than they could carry on the dry block.					✓	
2	2.14	Opportunity identified in policy change and associated funding	help of a recent federal government water efficiency grant.		✓				
3	3.1	Farm ownership/management change	farm was split into two 150-acre blocks and given to Colin's father and uncle who ran them as two separate businesses.				✓		
3	3.2	Opportunity identified to increase milking capacity	Colin's father built a six-a-side double-up dairy which meant that 12 cows could be milked at a time.					✓	
3	3.3	Change in farm ownership/management	Colin took over his father's farm in 1993.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
3	3.4	Identified threat to the business -the land is bad in wet weather	A persistent problem on the farm is that it 'isn't a good farm in a wet year'. Historically, they had trouble getting water off the paddocks because they are a bit 'landlocked' and the water had nowhere to go. For 20 years, from 1973, there were a few weeks each year in which half the farm was underwater 'except for the odd drought'. They used to 'dread the wet weather' and had to plan for it: make sure the drains were clean, getting pumps and fuel ready and figure out where they could put the cows.						✓
3	3.5	Identified threat to business stemming from fertility, calving and paddock issues associated with current breed choice	He was having some fertility issues with the Friesians. While he had some 'really nice Friesian heifers,' many of them were not going into calf. The Friesians were also problematic during calving. There were times when it was like Colin was 'pulling every second calf'. It was stressful and time consuming. This is especially true as Colin has set up his business as 'a one man operation' and keeping that side of the labour down is important. Another impact of Friesians was that they are bigger cows and tended to pug out the paddocks in wet weather. Colin had 'an awful lot of wet years' when he had a real problem with pugging because of the Friesians.						✓
3	3.6	Opportunity to increase productive capacity of cows - because the farm was now all laser graded and issue in wet weather had lessened.	He was looking for more milk and bigger cows.					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
3	3.7	Drought reduced access to irrigation water	Then for nine years from the early 2000s it was enough to just make it through the year. The drought really slowed Colin down; all of his 'ambitions just were put to the side'.	✓					
3	3.8	Policy change	During the modernisation process NVIRP put in five mechanised gates.		✓				
3	3.9	Family issue - change in available labour	his wife is no longer interested in working in the dairy				✓		
4	4.1	Personal goals lead to purchase of farm	The farm was already a fully functioning dairy farm when they bought it in a 'walk in walk out' arrangement.				✓		
4	4.2	Identified threat due to lack of access to sufficient feed quality and quantity	They did not get the nutrition right to begin with and it was 'fairly hard on the animals'; some of the cows 'got a bit skinny' and a few died.						✓
4	4.3	Flooding - reduced available feed	The flooding meant that the cows couldn't get enough grass and it was hard to get hay as everyone else needed it. Subsequently, the cows' nutrition wasn't good enough during joining and they ended up with 'a lot of empty cows'.	✓					
4	4.4	Identified opportunity for the business	The intention was to make it easier to check on the cows when they are close to calving. It also enabled Dennis and Donna to have more feed control up until calving, to 'lead feed for milk fever' and get the cow's 'gut ready for pasture' after calving.					✓	
4	4.5	Identified threat in using calving pad	While they used the calving pad for a few years they found that it led to more problems than benefits						✓
4	4.6	Identified threat in herd genetics	But the Friesians were having increasing fertility problems.						✓
4	4.7	Identified problem with Kiwi cross	the bigger the gap between the best and worst heifers.						✓

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
		current genetic choice							
4	4.8	Identified opportunity to increase dairy size	The new dairy suits 200 cows					✓	
4	4.9	Drought leads to reduced access to irrigation was and a need to change farm practices	During the drought Dennis and Donna managed the reduction in irrigation water broadly in three ways: changing how they fed their cows, irrigating a reduced amount of pasture and reducing cow numbers.	✓					
4	4.10	Identified threat due to location of feed pad	Having the feed pad in the laneway to the dairy 'was a mistake'. Cows would come in for milking, 'leaking milk and they're getting muddy and dirty and manure on them'.						✓
4	4.11	Identified threat associated with practice of sacrificing paddock	had the same problem when they tried to sacrifice a paddock. 'It just filled up full of shit'. Cows were getting mastitis and when they tried to re-sow at the end of the season, 'there was just so much stuff that you couldn't get rid of it'						✓
4	4.12	Identified threat associated with the use of sorghum	Dennis and Donna had a couple of cows that stabbed their milk vein on the sorghum stalks when they went to sit down. The cows just bled to death. 'It just poured out like a tap.' That just put Dennis and Donna 'right off' growing sorghum again.						✓

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
4	4.13	Identified increased benefits associated with spring calving over autumn calving	Dennis and Donna sat down and worked out all of the costs and premiums associated with split calving. They figured out that they would be better off financially going back to spring calving. The difference was due, in part, to the fact that the cows were dried off earlier for autumn calving so they had a shorter lactation and a lower overall milk production throughout the year.					✓	
4	4.14	Fertility problem is threat to business	The cows started to develop fertility problems again after they had converted back to spring calving.						✓
4	4.15	Policy change stalled plans to plant lucerne	They stopped what they were doing, never put in the lucerne because they thought the system was going to change 'anytime'. Of course, 'eight years down the track they still haven't done anything'.		✓				
4	4.16	Identified opportunity for the business. Driven by proximity to existing farm	Dennis and Donna acknowledge that it is a bit of a risk, because it, too, is not on the backbone. However, Donna laughingly stated 'it's just next door and they don't make land next door'.					✓	
4	4.17	Personal/family goals influenced by family tragedy	Dennis and Donna lost their son in an accident three years ago. At the time they had been 'thinking about moving on maybe to another farm or out of farming'. However, when they lost their son they just 'weren't ready to move'.				✓		
5	5.1	Personal goals drive decision to buy farm	Edward's grandfather bought the farm				✓		
5	5.2	Change in farm ownership	In 1978 Edward's father purchased the farm				✓		
5	5.3	Change in family labour available for the farm business	As a youth he worked on the farm, though most of this work was unpaid.... he told his father not to worry about paying him.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
5	5.4	Personal goals drive decision to return to family farm	But he would come home after being on the road for a couple of weeks and his children wouldn't know who he was. That changed things for Edward				✓		
5	5.5	Identified threat to farm from salinity	The bore was installed to help reduce salinity and was unregulated						✓
5	5.6	Change in farm management	discovered that he and his father couldn't work together very well as 'two bosses just don't go down'.				✓		
5	5.7	Opportunity identified to change milking	enabled them to milk out of one shed.					✓	
5	5.8	Infertility problem with Holsteins a threat to business	He could see that he was constantly struggling to maintain his Holstein breeding, mostly through infertility.						✓
5	5.9	Drought leads to decreased access to irrigation water	The prolonged drought starting in the early 2000s didn't affect Edward and Ellen's farm much to begin with, as they had sufficient water to manage. After a while though, their groundwater 'started to peter out'.	✓					
5	5.10	Tragedy influences family labour and personal/family goals	Edward and Ellen had a family tragedy in December 2008 that impacted on their capacity to manage the farm for a few months. Their three children were involved in an automobile accident and one daughter died. The other two children were also injured. Edward broke his leg at the scene of the accident and Ellen had broken her arm in the dairy a week earlier. It was obviously quite traumatic for the family; Ellen said, 'If it wasn't so sad, it was hilarious'.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
5	5.11	Threat identified in current farm land area on development	However, he couldn't do the development work he wanted done on the home block to help achieve this. The ageing infrastructure really needed upgrading but the layout meant that the work needed to be done in 'serious chunks' which would have taken too much of the farm out of production at a time. Because of this barrier to making changes to his existing land Edward could 'see some advantages with buying' other blocks, so that he could then start redeveloping the home block.						✓
5	5.12	Opportunity identified to improve irrigation system with the aid of policy change which offered grant funding	At the time of the interview Edward was in the process of doing some irrigation development work that was funded through Round Two of the Catchment Management Authority's on-farm irrigation efficiency program		✓				
5	5.13	Opportunity identified in to change calving pattern	With the combination of the surety of water in carryover and the added 93 acres of perennial pasture under the centre pivot,					✓	
5	5.14	Changing personal/family goals	Edward and Ellen are now talking about 'stepping back' from the dairy farm a bit more. Ellen wants to get out of working in the dairy. Edward and Ellen's children are not interested in the farm				✓		
6	6.1	Personal goals drive decision to buy farm	Frank's father and his father's uncle bought a 150-acre property with a 170-ML water entitlement in 1967.				✓		
6	6.2	Family goals lead to moving locations	eventually Frank's father, along with his wife and children, moved to the farm in 1969.				✓		
6	6.3	Drought leads to insufficient water access	There was a dry period in around 1974-75 and Frank's father started looking for more water for the farm.	✓					

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
6	6.4	Change in family labour units	As Frank had just left school to work on the farm, Frank's father decided to purchase the block so that they could increase the farm size and milk more cows.				✓		
6	6.5	Opportunity identified to develop farm	It was all a part of a plan to 'modernise' the farm with wider bays that would enable easier management of irrigation and use less water.					✓	
6	6.6	Family and personal goals, change in farm labour/management	after Frank's father had a heart attack				✓		
6	6.7	Opportunity identified to increase dairy size to match bigger cows on farm	Bigger dairies and faster milking'; it was what others were doing					✓	
6	6.8	Change in family labour units	In 1991 Frank's younger brother finished school and returned to work on the farm.				✓		
6	6.9	Threat identified in land not being good in wet - Reduces farm capacity to graze cows over winter.	Frank's farm didn't cope very well with really wet winters. Frank remembers in the 1980s putting cows into paddocks during wet winters in order to feed them out hay. The cows would end up pushing all of the hay down into the mud underfoot: 'in a day or two the paddock is brown' and in the spring they would end up with no pasture. As well, the wet winters were not good for the cows. The cows would get mastitis because they would be 'lying in the wet all the time'.						✓

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
6	6.10	Opportunity identified with winter milk prices. Problems with wet winters reduced with access to new outblock, plus they need money to pay for increased debt associated with the outblock	They did it to increase cash flow over the winter to help with their loan repayments for the new property.					✓	
6	6.11	Threat identified in fertility issues	He is doing it because of fertility issues.						✓
6	6.12	Threat to farm identified when redevelopment of outblock led to more irrigable land and the need for more irrigation water.	Since then they have developed the outblock so that now the 405 ML of water that came with it is not enough to irrigate it fully.						✓
6	6.13	Drought leads to inadequate access to irrigation water	There was a drought over a number of years which really started affecting Frank's farm in 2007.	✓					
6	6.14	Change in family labour units available	In 2008 Frank's younger brother decided to leave the farm.				✓		
6	6.15	Farm ownership/ management decision - they were considering selling the farm	Frank's father passed away in 2010.				✓		
6	6.16	Personal goals drive decision to stay on farm - change in ownership. (Closely linked to CJ above)	he has now decided that he is going to stay.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
6	6.17	Opportunity identified to alter farm irrigation through accessing funding for farm works and negotiations relating to policy change regarding the public irrigation system.	NVIRP wants to get rid of the spurs on the irrigation system as a part of an irrigation modernisation program. As well, there are government incentives (round two) for water-use efficiency upgrades. Frank has put these two things together to redevelop his dairy property.		✓				
7	7.1	Personal goals drive decision to buy farm	parents bought an 80-acre dairy farm				✓		
7	7.2	Change in available family labour	came home to work on the farm in the early 1980s.				✓		
7	7.3	Identified threat to business in terms of risks associated with current technology being used	After a couple of years they'd 'had enough of it'. They didn't enjoy putting together the square bales. As well, feeding it out to the cows was difficult. It required two people to feed it out safely as doing it by yourself 'was a bit dangerous' (i.e. it required jumping in and out of a slow moving tractor).						✓
7	7.4	Identified opportunity to increase dairy size	that it could hold close to 200 cows so that they could milk a lot of cows.					✓	
7	7.5	Opportunity identified to select productive herd genetics	When the partnership was established the home farm was milking Jerseys. Gary's farm was milking Friesians at the time of purchase.					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
7	7.6	Identified threat associated with calving issues from the conversion process of Jersey to Friesian	After that they did have some calving problems because they started getting little Jersey cows having big Friesian calves. When a cow's calf was too big it could sometimes lead to nerve damage in the hips and paralysis. If this happened then the cow would have to be put down. Geoff and Gary were losing anywhere from four to ten cows a year because of this.						✓
7	7.7	Identified threat to business if they couldn't distinguish cows from the different property. Ear tags failing.	They were finding identification of cows difficult because ear tags were dropping out						✓
7	7.8	Personal goals lead to changes in farm ownership and management	Geoff and Gini wanted to get out on their own and run their farm as they wanted to.				✓		
7	7.9	Threat to business associated with fertility issue	discovered that 24 (20 per cent) of his 120 cows were not in calf						✓
7	7.10	Drought is threat to business, drove changes to feeding	the drought 'sort of pushed'	✓					
7	7.11	Opportunity identified to change enterprising enterprise	Geoff sees the decision to sell grain in 2010 as 'one of those stepping stones'. He was still planning on milking at that stage and wasn't sure what to do with the cereal. Geoff's father-in-law encouraged him to sell the cereal because at least he would get some money out of it. While it was a wet year and everything was wet, the price for grain 'was still reasonably good' and Geoff ended up getting \$220 a tonne for it. This experience gave him 'the taste of it' and increased his confidence for cropping.					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
7	7.12	Personal/family goals drive farm management approach	The last four or five years that Geoff and Gini ran the farm as a dairy they really focused on keeping a 'great life balance'.				✓		
7	7.13	Opportunity identified to build cropping business	Increasing storage capacity is one of Geoff's main aims for the farm now. This should enable him to 'ride the good with the bad'.					✓	
7	7.14	Policy change regarding the public irrigation system has instigated consideration of water access	Geoff's farm is 1.5 to 2 kilometres from the backbone on a spur channel. At the time of the interview he was 'in the middle of discussions' regarding his farm's access to irrigation water.		✓				
8	8.1	Personal goals, marriage drive decision to get into farming	In 1956 Harry was thinking about getting married and knew that he needed to find somewhere to live and 'get a job or do something'.				✓		
8	8.2	Personal and family goals led to changes in enterprise as he was looking for a more consistent income to support a family	Harry had a growing family and was looking to expand his farm business so that he could support his wife and children. The problem with the orchard was that 'if you get a hailstorm on your fruit you've got no income'. There were times that 'things were tough to get through' because of this.				✓		
8	8.3	Threat identified to business - market price drop + debt load lead to bank freezing his accounts.	the money that Harry was getting for his milk decreased as price for butter fat dropped. He was 'broke'. Harry got a letter from the bank that told him to stop writing cheques from the farm account until he came up with some money.			✓			✓
8	8.4	Change in farm family labour available	One son started working on the farm in the 1970s				✓		
8	8.5	Change in farm family labour available	chose a different career path				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
8	8.6	Change in farm family labour available	other son came back to work on the farm in the early 1980s and has been on the farm ever since.				✓		
8	8.7	Identified opportunity given location of land	owned property between some of Harry's blocks sold 120 acres to Harry					✓	
8	8.8	Drought reduced access to irrigation water	there was a drought and Harry 'was out of water'.	✓					
8	8.9	Opportunity identified to increase herd size	building up a herd					✓	
8	8.10	Buying land led to increasing herd size again and an identified opportunity to again increase milking capacity of dairy	When he bought the 120 acres and leased 100 acres in the early 1970s					✓	
8	8.11	Identified threat to business if they did not change dairy to manage larger sized and larger number of cows.	With the increased number of larger cows it was taking too long to milk. Harry knew that converting to a Friesian herd meant bigger cows and that they would have to make provision for them. Harry considered 'knocking a hole in the side of the wall, like the cows come in and their heads could stick out of the side'. He also started looking at other options.						✓
8	8.12	Market change offers opportunity for him to alter herd genetics to increase the money he got for his milk	Harry decided to go with Friesians because the milk payments changed. Previously he was paid based on butter fat and a proportion of 'city milk' (fresh milk). These payments changed to focus on protein, which meant that increasing the amount of milk became more important than butter fat. Friesians were better cows for volume			✓			

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
8	8.13	Identified opportunity to increase income by altering calving pattern	he decided to start calving some cows in the autumn so that he could get the better pay that comes with winter milk. 'It pays you to milk all the year round.'					✓	
8	8.14	Identified threat to business led to enterprise change	Harry pulled out the fruit trees on his orchard in 1999. The birds were eating the fruit and he 'couldn't get labour to pick it'. As well, the local fruit processing factories shut down and Harry had to cart his fruit a 'blood long way' to the nearest factory.						✓
8	8.15	Drought leads to decreased access to irrigation water	almost 10 years of drought	✓					
8	8.16	Identified threat to farm business from debt and milk price drop that could have serious implications given he was close to retirement.	The year 2009 was 'the really bad year' for Harry. His property was mortgaged and he was 'battling to keep going'. Murray Goulburn dropped the milk price which put Harry and Helen under so much financial pressure that they considered getting completely out of dairy.						✓
8	8.17	Identified opportunity through policy change which offered water grants	After the drought Harry's son used an irrigation modernisation program and a water efficiency grant		✓				
8	8.18	Identified opportunity through policy change which offered water grants	planning on putting in an application for the next round of funding for water efficiency grants to get pipes and risers installed on the 345 acres of land that he owned. The next round of funding was due to open in about six months.		✓				

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
8	8.19	Changing personal/family goals, succession planning	When Harry turned 70 he decided that he was going to stop milking cows as he thought he had 'done enough'. At that time he had already bought a block of land in town so he could build a house for himself and Helen. Helen wasn't very interested in moving into town so Harry said to the builders 'whatever she wants she gets.' It took a long time, but they have transitioned to living comfortably and happily in town.				✓		
9	9.1	Personal / family goals drive decision to buy farm	father and uncle bought the original 240-acre flood irrigated farm in about 1960				✓		
9	9.2	Change on ownership	father bought out his brother and took on sole management				✓		
9	9.3	Change in family labour units available	he came back to work on the farm				✓		
9	9.4	Changing family goals associated with getting married and having children (concurrent with below)	Isaac got married in 1987. The first of his three children was born a year later. At the same time that Isaac's family was growing, Isaac and his father were increasing the size of their herd.				✓		
9	9.4	Change in family labour units available (concurrent with above)	As well, there were two of them working on the farm and they thought the 'farm could handle' increasing cow numbers, getting bigger.				✓		
9	9.5	Opportunity identified with regard to farm irrigation	The farm irrigation infrastructure was built to take advantage of this natural flow.					✓	
9	9.6	Opportunity identified to alter herd genetics for improved	'supposed to be the better milking cow'.					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
		production							
9	9.7	Opportunity identified to increase rate of milking for their increased herd/cow size - done by altering dairy	increased their herd size they wanted to be able to milk quicker; therefore, they increased the number of cows they could milk at a time. . . Friesians the cows increased in size. Straight rails meant they could 'squeeze more cows in' the dairy at a time given their larger size.					✓	
9	9.8	Change in farm ownership/succession planning	Isaac's father retired in about 2001-2002, just prior to the drought.				✓		
9	9.9	Drought reduced access to irrigation water	This meant that when the drought arrived it was 'stressful' and 'a traumatic time' for Isaac.	✓					
9	9.10	Policy change	In the middle of the drought Isaac's outlets to the public irrigation system were automated as a part of an irrigation modernisation program through G-MW. This included changing some bay outlets.		✓				
9	9.11	Identified threat in increasing fertility issue	last year he had an especially bad year with it. He got the cows in calf but 'they just seemed to be one or two cycles behind what the pregnancy test showed' (i.e. 20 to 40 days).						✓
10	10.1	Personal goal drives decision to start farming	The 80, 80 and 60 acres were combined and run as one farm of 220 acres.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
10	10.2	Policy change means the farm has more water	In around 1959 the rules regarding water changed so that water rights were determined by titles rather than acreage.		✓				
10	10.3	Change in available family labour	At about the same time a 15-year-old John came back to work on the farm full-time				✓		
10	10.4	Market change imposed by factory changing how they take output	A year later the factories started taking whole milk rather than just cream. This meant that there was no longer excess skim milk for the pigs.			✓			
10	10.5	Identified opportunity to develop land	Ever since laser grading emerged as an irrigation management practice in Australia John has been doing it.					✓	
10	10.6	Identified market threat to business margins	There was a downturn in the dairy industry starting around 1972-1973. At that time other farmers were 'shooting all the cows'. 'The cows were worth nothing. The milk was worth nothing.' Luckily John and Jacqui didn't have to shoot any of their cows though they did sell 'a few for nothing, just to get rid of them'			✓			
10	10.7	Family tragedy leads to change in farm management	John's father used to come out on the farm to help with things, such as baling hay, but had 'just lost interest' in the farm in the mid-1960s after the tragic death of one of John's sisters. Since that time John made the farm management decisions.				✓		
10	10.8	Identified threat to the farm - need for growth	With costs increasing John knew that he had to do more: 'get bigger or get out'.						✓
10	10.9	Threat to business identified regarding length of time spent in dairy	They were spending four hours in the morning doing the milking, which was too much time in the dairy						✓

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
10	10.10	Identified threat to farm due to increasing fertility problem	having problems getting cows in calf. While there were always some that didn't get in calf, the number started increasing. John described it as something that 'creeps up on you'. At first he noticed more cows were calving later. Then he started having an increasing number of empty cows.						✓
10	10.11	Identified opportunity associated with hiring a share farmer (not within family)	Having a share farmer meant that the farm could continue to increase cow numbers.					✓	
10	10.12	Threat to farm identified in relation to insufficient feed	'it must have been pretty tough times' producing enough feed for the cows						✓
10	10.13	Threat to farm business due to reduced labour when share farmer leaves	He bought his own farm and left in about 2006						✓
10	10.14	Threat to farm when second share farmer leaves and takes equipment needed for silage (labour and feed production)	The second share farmer had his own feed cart for the pit silage. When he left he asked for too much money for the feed cart and John just told him to take it with him.						✓
10	10.15	Drought reduces access to irrigation water	John and Jacqui learned 'a whole new way of farming' because of the drought.	✓					
11	11.1	Personal goals drive decision to buy farm	purchased the original 138-acre farm				✓		
11	11.2	Changing personal and family goals when married	Things started to change' on the farm when Karl got married to Katherine in 1949				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
11	11.3	Identified opportunity in enterprise selection	went into dairy production					✓	
11	11.4	Identified opportunity in enterprise selection	went into pig production					✓	
11	11.5	Identified opportunity to expand the business	Getting bigger					✓	
11	11.6	Identified opportunity to increase milk production by changing herd genetics	For Karl, a greater volume of milk meant more cream for the factory and more skim milk for the pigs.					✓	
11	11.7	Identified opportunity to make changes to dairy for larger number and sized cows	led Karl to make significant changes to his dairy					✓	
11	11.8	Policy change leads to identified opportunity to increase access to irrigation water	About a year after Karl took over the family farm Lake Eildon was enlarged to enable a greater regional storage capacity for water. Karl, and other irrigators were offered the chance to double their water use through 'sales' water. Karl 'never ran out of water'.		✓				
11	11.9	Identified opportunity to diversify as a part of aim to grow business	Karl bought the block to run a beef cattle enterprise as a part of the farm business.					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
11	11.10	Identified threat to the farm associated with accessing labour (Non-family)	Karl already had problems getting enough labour to help him on the farm. When he bought the 217-acre block this problem worsened. He continued to have a hard time finding workers. When he did find them he 'had headaches all the time' because the workers wanted to tell Karl what to do rather than taking on the tasks that needed completing. Fairly quickly Karl worked out that the extra block 'was too much' for him given the labour problems.						✓
11	11.11	Factories change how they accept farm output	factories started taking whole milk rather than just cream			✓			
11	11.12	Identified threat to business margin due to prices	As well, 'pig prices dropped'. 'Everything was going wrong' for Karl as the milk and cattle prices also fell with a downturn in the market. Karl recalled other farmers having to shoot their stock.			✓			
11	11.13	Cumulative impacts of reduced market prices and conflict with tanker driver over milk collection lead to changes regarding personal motivation/goals	Karl 'got discouraged'.			✓	✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
11	11.14	Change in farm management associated with family and personal goals.	Keith, Karl and Katherine's youngest child, came back to manage the farm in August 1991. Keith was 27 at the time. He had gone to university and worked in Melbourne for a number of years. Over those years he was living in Melbourne, Keith travelled home 'most weekends' and helped his father. Keith was married in 1990. He and his wife decided to move back to the farm because of 'a growing disinterest in the city'.				✓		
11	11.15	Identified threat to staying with current enterprise	In the first year Keith continued managing the farm as a beef cattle enterprise. He realised that they 'were going backwards fast staying in beef'. They couldn't 'sustain a decent income on beef'. The lack of income from beef meant they couldn't put fertiliser back on the pasture and that meant Keith couldn't grow enough grass. Keith decided to convert the 243 acres to dairying.						✓
11	11.16	Identified threat to business if pasture productivity could not be increased	With his increasing cow numbers, he needed to also increase his pasture productivity.						✓
11	11.17	Change in water policy alters access to irrigation water	Water started to become scarcer		✓				
11	11.18	Drought means reduced access to irrigation water	once the drought reached a peak in 2002	✓					
11	11.19	Policy change affecting public irrigation infrastructure which interacts with his farm	The public irrigation infrastructure had been upgraded and Keith thought that the new system 'works great'.		✓				

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
11	11.20	Personal and family goals lead to a need to make changes in the farm	About four years ago his wife's business was thriving and she was off the farm for an increasing amount of time. Keith took on the role of 'home dad'. This meant that he looked after the house and managed the children's needs. Keith did that over three years and it was difficult. The most challenging part was the evening milking as that same period was when he needed to be looking after the children and their needs and preparing the evening meal. Keith just couldn't be in two places at the same time and he was 'burning out'.				✓		
12	12.1	Changing farm ownership/ succession planning	grandfather had five sons and divided the 600 acres up into sections, giving a block to each son in the mid-1950s. When Lauchlin's father was given his 160-acre block				✓		
12	12.2	Misalignment between dairy farming and personal goals.	In 1989, Lachlan's father decided to stop dairy farming.				✓		
12	12.3	Identified threat to business with current enterprise mix	He realised pretty quickly that he was not going to make any money out of hay and beef.						✓
12	12.4	When first took over, implication that old dairy size not sufficient for growing business, linked to 20 year plan to have twice as much or twice as big as needed	demolished the old dairy (neutral sounding so put under opportunity)					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
12	12.5	Identified threat due to the farm's condition when he took over	Before Lachlan took it over, the family farm was 'an old-fashioned, old-style' farm with 'a lot of laneways and channels and little paddocks'.						✓
12	12.6	Identified threat due to salinity	the farm had a 20-acre block that had a salinity problem due to poor drainage on low-lying country.						✓
12	12.7	Identified threat to farm if more irrigation water is not acquired	Within a couple of years of taking over the farm Lachlan realised that he needed more water if he wanted to milk more cows.						✓
12	12.8	Conflicting personal and farm goals relating to work load on farm	He became increasingly aware that, as a one-person operation, he was working seven days a week with no time off.						✓
12	12.9	Identified threat to farm when partnership dissolves because partner cannot contribute required amount of water during drought (not family)	The partnership only lasted two to three years because, when the drought started, Lachlan's partner 'was really struggling'.						✓
12	12.10	Drought reduces his access to water	During that first year of the drought, when he got a 50 to 60 per cent allocation,	✓					
12	12.11	Reduction of time available for farm due to changing personal goals	While Lachlan had focused full-time on the farm between 1998 and 2005, in 2005 he became involved in another business off-farm that was essentially a seven-day-a-week business. This other business was not necessarily his 'passion' and he approached it the same way he did the farm. As long as the business was going well and making money he would stay in. If things were not going well, he would just move onto something else.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
12	12.12	Conflicting goals and time, drought and other stresses force a change	Lachlan was under a lot of stress. He was 'sick of working and not making money'. Lachlan decided that the time was right to sell the cows because things were starting to turn around and 'people started getting a bit of confidence'. Cattle prices and milk prices were improving as well. Lachlan made the decision to sell the cows with the idea that he may go back to farming again.				✓		
12	12.13	Identified opportunity seen in changes in weather patterns	After a while he could see that weather patterns were changing from El Niño to La Niña and he decided that it was a good time to get back into dairying					✓	
12	12.14	Personal goals intersecting with the farm business - current critical juncture	In considering the future of the dairy farm, Lachlan thought that it would either stay as it was or he would buy a neighbouring block and double the size. Lachlan was seriously thinking about increasing the size of the farm. His monthly milk cheque was 'worth a lot less' and getting bigger was the only way to improve that. As well, Lachlan thought that he was only going to stay in his off-farm business for another 12 months or so. If he did get out of that business, then he would focus on building up his farm business.				✓		
13	13.1	Personal goal leads to decision to buy farm	he wanted to change from his pre-war career in the railroads to farming, as his family was from a farming background.				✓		
13	13.2	Change in enterprise based on identified opportunity in dairy over fruit	because the market price his father was getting for the fruit was low. As well, farm emphasis had shifted into focusing on cow numbers and the production of butter fat.			✓		✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
13	13.3	Having children leads to decision to go into pig production	Matt's father was seeking out ways to support his growing family.				✓		
13	13.4	Change in output for farm imposed by factory, changes requirements for production system and eliminates skim milk as by-product = goal to focus on building dairy business	the factories started taking whole milk rather than just cream			✓			
13	13.5	Threat to business identified associated with having a low water allocation	The water right was low because the block was a section of a 155-acre farm that had been subdivided into three blocks of 58, 37, and 60 acres. When water rights were originally allocated to land, larger blocks had less water per acre of land than smaller blocks. While the farm had been subdivided into smaller parcels of land it was not possible to increase the amount of water beyond the combined total in the original allocation.						✓
13	13.6	Identified opportunity associated with setting up a Jersey stud	started the process of setting up a Jersey stud					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
13	13.7	Identified opportunity to alter herd genetics	after the factories started taking bulk milk, more breeds of dairy cows became available through the use of artificial insemination (AI). Matt's father realised that he could get semen of different breeds from different places around the world. He began to question his use of bulls and the Jersey stud.					✓	
13	13.8	Opportunity identified to build a new milking shed to manage increased herd size	milking 80 cows and decided to put in an eight-a-side					✓	
13	13.9	Opportunity identified to increase the milking capacity in the milking shed	extended the dairy					✓	
13	13.10	Opportunity identified to alter dairy shed to accommodate larger cows and to milk more cows	to accommodate the larger crossbred cows and enable them to milk more cows at a time					✓	
13	13.11	Change in family labour units available on farm	Martin came back to the farm in about 1965, after training to be a mechanic.				✓		
13	13.12	Change in family labour units available on farm	Mark, came to work on the farm in the very late 1960s, after being retrenched from his job as a mechanic.				✓		
13	13.13	Change in family labour units available on farm	Mark left the farm to pursue other interests overseas.				✓		
13	13.14	Marriage means a change in personal /family goals	Matt got married to Marie in 1975				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
13	13.15	Threat identified due to reduced margins and high debt	huge drop in milk prices in 1975. The price 'dived' when Matt and Marie had loan repayments equalling \$4000 a year; the same amount of money they were making from the farm in wages.			✓			✓
13	13.16	Opportunity identified through policy change that offered low rate loans	there were reduced-interest rate salinity loans available to do infrastructure upgrades. The loans were three to four per cent below the average interest rate. At around the same time laser grading was introduced, which 'absolutely transformed irrigation'. Matt's family started looking around to see what they could do to improve their farm. At that time the farm irrigation comprised little bays and 'mud stops with shovels'.		✓				
13	13.17	Identified threat to business of on-farm irrigation changes	the faster flow of water 'just about blew out the channels'.						✓
13	13.18	Identified threat to business of on-farm irrigation changes	The faster flow because of the dam meant that they 'were running around every two hours shutting off bays'. 'It was just almost hopeless' for Matt and Martin to manage and would end up with a 'flood down the end like a lake' because they missed shutting off a bay.						✓
13	13.19	Identified threat to business of poor market prices and drought	The early 1980s 'were tough times' for the farm. There was a downturn in the industry: 'milk prices were terrible' and farmers were 'shooting cows' because 'they were worthless'. In the early 1980s there was also a drought	✓		✓			
13	13.20	Change in family labour units available on farm	Martin left the farm for private reasons.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
13	13.21	Identified threat to business due to farm layout	The 307-acre farm (including the 50-acre leased block) was narrow and a mile long. Matt and his family had redeveloped areas of the farm that were at the farthest point away from the dairy. This meant a longer walk for the cows to come in for milking. Walking longer distances used more energy and reduced milk production. The region was experiencing wet winters in the late 1980s. In wet weather cows were getting stuck in the mud, getting mastitis, and it was taking even longer to move them down to the dairy shed for milking. Overall, milking was taking too long.						✓
13	13.22	Identified threat to business due to salinity	the farm developed a 'rising salt problem' which was leading to tree deaths.						✓
13	13.23	Opportunity identified to change factory for more money	While Matt and Marie were not on the waiting list, they got into Tatura Milk because they milk a large number of cows.					✓	
13	13.24	Opportunity identified to increase price received for milk	Tatura Milk was paying 'very high milk payments' for autumn and winter milk.					✓	
13	13.25	Identified threat to business associated with irrigation on new block	Matt found the irrigation system to be 'terrible'. The pump was expensive plus he had to 'go out there three and four times a night sometimes'. After using it for a couple of seasons Matt decided to find an alternative.						✓
13	13.26	Opportunity identified with new block	He 'saw the potential and the productivity gains' that could be made with the land, given the new infrastructure.					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
13	13.27	Change in family context influencing farm ownership	Mark and his wife announced that they wanted to be bought out eventually, as their children were not interested in farming. This was 'a bit of a bombshell' for Matt and Marie				✓		
13	13.28	Drought as threat to business	Just as Matt and Marie were negotiating taking on full responsibility of the family farm, the region was settling into a number of years of drought. 'It was really an emotional, tough time' for the whole family.	✓					
13	13.29	Identified threat to business emerged from open herd practices associated with bringing in outside cows for periods of time	had a couple of bad experiences with bringing outside cows onto the farm that led them to becoming a 'closed herd'.						✓
13	13.30	Opportunity identified to increasing milk solid production	Tatura Milk was offering a 'considerable incentive' to farmers who were producing over 300,000 kilograms of milk solids. Taking in the extra 80 cows would boost cow numbers to qualify for the incentive					✓	
13	13.31	Change in personal goals	reduce their debt and refinance their loan. In 2011 Matt was in his early 60s and didn't want to 'keep going flat out'				✓		
13	13.32	Personal goals of son to take over and build the business	Matt's son was motivated to continue building the business				✓		
13	13.33	Change in family labour available as well as succession planning	Matt and Marie's son announced that he was leaving the farm for personal reasons.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
14	14.1	Policy change lead to a need to find alternative income for existing tobacco farm	This meant that the quota assigned to the farm was too small to support both Neil's father and uncle.		✓				
14	14.2	Threat to business margin identified in drop in milk price	there was one year in which the 'milk price was terrible'			✓			
14	14.3	Change in family labour available	Then Neil's older brother came back to work on the family dairy farm.				✓		
14	14.4	Family tragedy leads to questioning of business goals	Neil, who was 14 at the time, was in a motorbike accident which put him in hospital for a while. Shortly after this, Neil's older brother was tragically killed in a car accident.				✓		
14	14.5	Change in family labour available	Neil came back to work on the farm when he left school in 1988.				✓		
14	14.6	Identified threat to business - fertility	They'd had some fertility problems on the farm and through the years they found it 'harder and harder to get the cows in calf'						✓
14	14.7	Identified threat to business in feeding cows over wet winters	In very wet winters Neil's father found feeding hay out to the cows in the paddocks difficult.						✓
14	14.8	Identified opportunity for alternative feed	saw relatives growing corn					✓	
14	14.9	Identified opportunity to increase dairy size as herd increased	he original walkthrough dairy was changed over to a 'five or six double-up herringbone'					✓	
14	14.10	Identified opportunity to increase dairy size as herd increased	extended to milk 12 cows					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
14	14.11	Identified opportunity to increase dairy size as herd increased	then 26 cows					✓	
14	14.12	Identified threat to business when increased cow size meant he could not fit as many cows in dairy	he couldn't fit as many cows as before. For example, instead of fitting 26 cows in the dairy he could only fit 23 or 24 cows.						✓
14	14.13	Opportunity identified to build whole new dairy	While the 26 cow herringbone dairy was big, it 'had a terrible yard set-up'. By the mid-1990s Neil and his father were milking almost 300 cows and decided to look at building a new yard for the dairy. Changing the yard to the dairy ended up being difficult because there was a dam that impeded the changes they wanted to make.					✓	
14	14.14	Change in farm ownership, tragedy	In 1998 things changed for Neil and his family. Neil's father was diagnosed with cancer and ended up 'in and out of hospital all the time'. He died in 2000 at the age of 63.				✓		
14	14.15	Drought	Neil described the period of time from when his father got ill and then through a protracted drought as 'a challenging decade'.	✓					
14	14.16	bought this land just prior to drought as a part of growing business	bought a 120-acre farm 'up the road' with 300 ML of water.					✓	
14	14.17	Personal and family goals lead to a need to make changes in farm	They wanted to decrease the amount of time that Neil was putting into the farm so that he could 'spend a bit more time at home with the kids'.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
14	14.18	Opportunity to change calving identified through recent farm changes	With the new pasture mix, Neil was finding that the amount of feed he could grow through the autumn, winter and spring was 'a hell of a lot more with a lot less water' than he could grow through the summer. While Neil historically needed 1200 ML to irrigate, he thought that with the new pasture mix he could 'get away with 800 ML'. As well, the new 160-acre block had 'a fair bit of undulation' which meant that there were more options for where to put cows during wet winters.					✓	
14	14.19	Identified opportunity to increase cow numbers quickly	Neil was trying to build up cow numbers again since the drought. He was trying to do it quickly to increase income because he had bought the extra 160 acres. He was also 'trying to push share farming' which meant he needed enough cows to 'sustain things at a reasonable level'.					✓	
14	14.20	Identified opportunity to use policy change (grants) to achieve family goals	A major reason that Neil was interested in pipes and risers was 'for the lifestyle'. Growing feed and irrigation were the biggest jobs on his dairy farm, alongside milking the cows. He hoped to make those jobs easier to make dairy farming 'quite a reasonable lifestyle'.		✓				
15	15.1	Personal goals drive decision to initially buy farm	father bought an existing dairy farm				✓		
15	15.2	Changing family labour available on farm	Owen's older brother went to work on the farm full-time when he left school in 1960. In the mid-1960s Owen also returned to work on the farm.				✓		
15	15.3	Change in family and personal goals	Owen's brother got married and he moved onto his farm with his wife				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
15	15.4	Opportunity identified to diversify business through the introduction beef production	The decision to convert to Friesians related mainly to their interest in using the outblock to start a beef enterprise. They had a considerable amount of land away from the dairy farm that they wanted to utilise.					✓	
15	15.5	Change in farm ownership due to changing family circumstances, marriage	In 1974 Owen got married to Olivia. Owen and Olivia had four children over the years, starting in the mid-1970s. The day that Owen was married the farm was signed over to his name.				✓		
15	15.6	Identified threat to business associated with insufficient feed availability	Owen described how they 'were always struggling' to have enough feed when they had 180 cows. However, the farm had to be heavily stocked to be profitable.						✓
15	15.7	Identified opportunity to extend dairy when building up herd size early in the farm family farm history	extended to a 10-cow walk through.					✓	
15	15.8	Identified opportunity to increase rate of milking. Built when run with brother's dairy block (1960s)	built a 10 swing-over herringbone dairy					✓	
15	15.9	Drought reduces already struggling feed availability	There was a drought over the 1976-1977 season. It was the first in which Owen didn't get his full water right.	✓					
15	15.10	Opportunity identified to increase productive capacity of existing farm	Owen wanted to redevelop the farm and in the 1980s					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
15	15.11	Change in family labour available to the farm	Owen's son came back to work on the farm in the early 1990s.				✓		
15	15.12	change in policy increases flexibility to move water between properties	water rules changed		✓				
15	15.13	Drought reduced access to water and puts pressure on the farm business	A prolonged drought started in 2001.	✓					
15	15.14	Family and personal goals, succession planning changes	When Owen's son decided to leave the farm 'it made life a lot simpler' for Owen. Early in the drought Owen could tell that his son 'wasn't 100 per cent keen' on farming. After his son's decision to leave, Owen could make decisions without having to worry about his son's future on the farm				✓		
15	15.15	Personal goals drive farm business goals	Owen and Olivia decided that they no longer wanted to run the dairy farm				✓		
15	15.16	Identified threat to business	Owen had been having 'quite a few issues' with his Herefords						✓
16	16.1	Personal goals drive decision to buy farm	bought a 220 acre block in an area that had been earmarked for irrigation				✓		
16	16.2	Change in farm ownership	great-grandfather died and his grandfather, through inheritance, took over full ownership and management of the farm				✓		
16	16.3	Change in family labour available to the farm	Peter came to work on the farm when he left school in 1956				✓		
16	16.4	Identified opportunity to change enterprises	here had been serious floods "which destroyed large areas of stone fruit trees"					✓	

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
16	16.5	Change in family and personal goals	In the 1960s Peter was married. He and his wife built a house on the 160 acre portion of the farm.				✓		
16	16.6	Policy change identified as major influence on ability to keep growing business	Peter said that the amendment of the Water Act in 1964 was "a critical point for the farm". Up until then the allocations were "unrealistically low". The act "had a massive impact on what happened" on the farm. Given the farm had four allotments, they received enough water with the changes that they "became serious irrigation farmers" while before they were "just dryland farmers with some irrigation".		✓				
16	16.7	Identified threat to business due to market prices	In the early 1970s there was "a major crisis in the cattle sector". Producers were "shooting cattle and livestock were at give-away prices". Peter started "looking for an alternative" to cattle			✓			
16	16.8	Identified threat to the business associated with sunflowers	the price he received for the crop dropped significantly. In Peter's last crop of sunflowers he produced 150 tonnes and made a total of \$200 profit. Second, a serious root disease called sclerotinia began affecting the sunflowers making them more difficult to grow. And third, he had "terrible trouble" with bird pests (i.e. cockatoos) causing significant damage to the crops. After these things Peter decided, "blow that for a joke", sunflowers were not worth growing.						✓
16	16.9	Change in farm ownership/succession planning	Peter and his wife took over a soldier settlement block that belonged to Paul's mother's parents.				✓		

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
16	16.10	Identified opportunity to buy land and go into dairy ALSO strongly linked to change in family labour units available to the farm (3 sons coming)	After being out of dairy farming for two years, Paul's parent bought a 200 acre dairy property near the 380 acre home block.				✓	✓	
16	16.11	Change in family labour units available, change in farm ownership	Paul paid his brother out by paying a stock mortgage owed to his mother (Peter's wife) to this brother. Peter described how Paul was "very generous" in the arrangement to his younger brother.				✓		
16	16.12	Identified threat to business associated with fertility	The proportion of empty cows "ended up being too high a proportion" for Paul and his brother to continue to "wear the losses" associated with sticking to spring calving.						✓
16	16.13	Opportunity identified to expand	Paul and his brother decided to "go through another expansion phase".					✓	
16	16.14	Threat to margin identified through current land use of cropping block	"applied a lot more scrutiny to the cropping operation" on the outblock in 1998. They realised that they "couldn't make it economically work" to continue growing maize on the block						✓
16	16.15	Change in farm management and ownership	Paul and his brother started managing the dairy farm together but Paul's brother wasn't interested in dairy farming and decided to pursue other interests in mid-1999.				✓		
16	16.16	Policy change regarding water rules which reduce water available	This wasn't a problem for them up until about 1997, when water rules changed.		✓				

Farm	Critical juncture #	Sources of critical junctures	Data coded as indicating critical juncture	Extreme weather	Policy change	Market changes	Personal and farm family issues	Identified opportunities on-farm	Identified threats on-farm
16	16.17	Drought	In the 2002 season, Paul didn't get his full entitlement of irrigation water. He described 2002 as "a real shock" because they had "treated water as if it was always going to be there". It was the first drought-affected year that Paul and Patricia experienced and their "world came crashing down from the point of view of water availability, and a combination of low milk price and high feed price".	✓					
16	16.18	Drought	2006 drought returned with another low allocation, though the "price equation wasn't quite as dramatic" as it had been in 2002.	✓					
16	16.19	Threat to business identified if change is not made	By the mid-2000s Paul was very aware that "the farm needed a huge new investment in infrastructure and enthusiasm". Neither Paul, nor Patricia was prepared to give it. The biggest infrastructure problem was the dairy. The existing dairy was old, which meant high maintenance requirements. Its small size meant that milking was time consuming, generating high staffing requirements.						✓
16	16.20	Family and personal goals lead to change in enterprise	Over that period, Paul and Patricia were just "marking time" and by 2008 they'd "had a complete gutfull".				✓		
				25	20	13	90	63	59

There were a total of 264 critical junctures identified

Six of these were identified as relating to two sources, hence the total when adding the sources together is 270.

Appendix G: Identified linkages between critical junctures and reinforcing decisions

Farm	Critical juncture	Number of reinforcing decisions, list by source of critical juncture					
		Extreme weather	Policy change	Market changes	Personal & farm family issues	Identified opportunity on-farm	Identified threats on-farm
1	1.1				0		
1	1.2				0		
1	1.3						9
1	1.4					6	
1	1.5					3	
1	1.6	3					
1	1.7				1		
1	1.8	23					
1	1.9		13				
1	1.10				2		
2	2.1				4		
2	2.2				1		
2	2.3				1		
2	2.4						5
2	2.5	7					
2	2.6					1	
2	2.7						2
2	2.8				6		
2	2.9				7		
2	2.10					2	
2	2.11	26					
2	2.12	4					
2	2.13					7	
2	2.14		2				
3	3.1				0		
3	3.2					1	
3	3.3				4		
3	3.4						11
3	3.5						1
3	3.6					1	
3	3.7	13					
3	3.8		2				
3	3.9				1		
4	4.1				6		
4	4.2						3
4	4.3	10					
4	4.4					1	
4	4.5						1
4	4.6						1
4	4.7						1
4	4.8					1	
4	4.9	16					
4	4.10						3
4	4.11						1
4	4.12						0
4	4.13					3	
4	4.14						1
4	4.15		1				
4	4.16					4	
4	4.17				0		
5	5.1				0		
5	5.2				2		
5	5.3				1		
5	5.4				0		
5	5.5						1
5	5.6				13		

Number of reinforcing decisions, list by source of critical juncture							
Fa rm	Critical juncture	Extreme weather	Policy change	Market changes	Personal & farm family issues	Identified opportunity on-farm	Identified threats on-farm
5	5.7					6	
5	5.8						3
5	5.9	20					
5	5.10				6		
5	5.11						4
5	5.12		9				
5	5.13					2	
5	5.14				2		
6	6.1				0		
6	6.2				3		
6	6.3	3					
6	6.4				8		
6	6.5					6	
6	6.6				1		
6	6.7					1	
6	6.8				14		
6	6.9						2
6	6.10					2	
6	6.11						3
6	6.12						3
6	6.13	12					
6	6.14				3		
6	6.15				0		
6	6.16				3		
6	6.17		8				
7	7.1				0		
7	7.2				16		
7	7.3						2
7	7.4					2	
7	7.5					1	
7	7.6						2
7	7.7						2
7	7.8				4		
7	7.9						5
7	7.10	16					
7	7.11					15	
7	7.12				1		
7	7.13					3	
7	7.14		2				
8	8.1				5		
8	8.2				12		
8	8.3			2			2
8	8.4				0		
8	8.5				0		
8	8.6				5		
8	8.7					2	
8	8.8	3					
8	8.9					1	
8	8.10					1	
8	8.11						2
8	8.12			2			
8	8.13					3	
8	8.14						1
8	8.15	8					
8	8.16						5
8	8.17		7				
8	8.18		0				
8	8.19				4		
9	9.1				3		
9	9.2				0		

Number of reinforcing decisions, list by source of critical juncture							
Fa rm	Critical juncture	Extreme weather	Policy change	Market changes	Personal & farm family issues	Identified opportunity on-farm	Identified threats on-farm
9	9.3				0		
9	9.4				10		
9	9.4				10		
9	9.5					3	
9	9.6					4	
9	9.7					2	
9	9.8				3		
9	9.9	19					
9	9.10		1				
9	9.11						2
10	10.1				1		
10	10.2		1				
10	10.3				3		
10	10.4			8			
10	10.5					1	
10	10.6			5			
10	10.7				6		
10	10.8						3
10	10.9						1
10	10.10						1
10	10.11					8	
10	10.12						3
10	10.13						1
10	10.14						3
10	10.15	3					
11	11.1				0		
11	11.2				2		
11	11.3					7	
11	11.4					2	
11	11.5					7	
11	11.6					3	
11	11.7					2	
11	11.8		0				
11	11.9					1	
11	11.10						1
11	11.11			1			
11	11.12			0			
11	11.13			6	6		
11	11.14				2		
11	11.15						5
11	11.16						6
11	11.17		2				
11	11.18	9					
11	11.19		3				
11	11.20				2		
12	12.1				3		
12	12.2				4		
12	12.3						10
12	12.4					2	
12	12.5						2
12	12.6						1
12	12.7						2
12	12.8						7
12	12.9						1
12	12.10	9					
12	12.11				3		
12	12.12				1		
12	12.13					6	
12	12.14				1		
13	13.1				1		

Number of reinforcing decisions, list by source of critical juncture							
Fa rm	Critical juncture	Extreme weather	Policy change	Market changes	Personal & farm family issues	Identified opportunity on-farm	Identified threats on-farm
13	13.2			1		1	
13	13.3				5		
13	13.4			15			
13	13.5						3
13	13.6					3	
13	13.7					4	
13	13.8					0	
13	13.9					0	
13	13.10					3	
13	13.11				3		
13	13.12				2		
13	13.13				1		
13	13.14				7		
13	13.15			1			1
13	13.16		10				
13	13.17						1
13	13.18						4
13	13.19	2		2			
13	13.20				3		
13	13.21						10
13	13.22						1
13	13.23					1	
13	13.24					2	
13	13.25						3
13	13.26					3	
13	13.27				6		
13	13.28	9					
13	13.29						1
13	13.30					1	
13	13.31				4		
13	13.32				4		
13	13.33				5		
14	14.1		7				
14	14.2			1			
14	14.3				8		
14	14.4				4		
14	14.5				6		
14	14.6						2
14	14.7						4
14	14.8					2	
14	14.9					0	
14	14.10					0	
14	14.11					0	
14	14.12						1
14	14.13					1	
14	14.14				2		
14	14.15	16					
14	14.16					2	
14	14.17				5		
14	14.18					2	
14	14.19					5	
14	14.20		2				
15	15.1				5		
15	15.2				4		
15	15.3				8		
15	15.4					6	
15	15.5				2		
15	15.6						4
15	15.7					0	
15	15.8					0	

Number of reinforcing decisions, list by source of critical juncture							
Fa rm	Critical juncture	Extreme weather	Policy change	Market changes	Personal & farm family issues	Identified opportunity on-farm	Identified threats on-farm
15	15.9	2					
15	15.10					2	
15	15.11				0		
15	15.12		1				
15	15.13	5					
15	15.14				0		
15	15.15				12		
15	15.16						0
16	16.1				2		
16	16.2				5		
16	16.3				3		
16	16.4					3	
16	16.5				0		
16	16.6		6				
16	16.7			7			
16	16.8						3
16	16.9				2		
16	16.10				44	44	
16	16.11				3		
16	16.12						4
16	16.13					9	
16	16.14						3
16	16.15				2		
16	16.16		2				
16	16.17	4					
16	16.18	7					
16	16.19						1
16	16.20				14		
		25	20	13	90	63	59