Weathering the future:

Resilience to weather events, sustainable systems and decision rules

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Summary

- Have a clear strategy for the future and understand what the business needs to achieve it
- Develop a farm policy and set of decision rules based on sound knowledge
- Ensure that the farm policy and systems on farm minimise the environmental foot print
- Excellence in execution has a greater influence on results than the initial strategy
- Put systems in place/create the farm infrastructure to reduce the number of decisions needed allowing time to focus on the key activities i.e. grazing management; mating, financial analysis of the business
- Condition score 5.0 for mixed age cows and 5.5 for first and second calvers is not negotiable and critical for managing adverse weather
- Do a sensitivity analysis on the key factors that affect the viability of the business – production, interest rates, FWE and payout – take the rose tinted spectacles off
- Base decisions on fact not intuition
- Have a plan to manage the worst case scenario

What are the farm business risks that dairy farmers face?

The key farm business risks faced by dairy farmers are:

- Cashflow and viability
  - Milksolids production – weather and management capability
  - Payout
  - Farm working expenses, Plant replacement
  - Debt servicing
  - Routine drawings
- Compliance
  - Effluent use, fertiliser use, water, food safety standards
  - Community perception and animal welfare
  - People

To manage the risks these factors place on the business requires implementing a farm policy and a set of decision rules for each factor. A key tool to manage risk is "knowledge" as it allows development of a robust farm policy and decision rules – a farm plan. However, implementation and execution of a farm plan are more important than the initial strategy (Penno, 2003). Knowledge can be learned or expertise employed.

"The great end of knowledge is not knowledge but action" T H Huxley

A set of decision rules for running a well stocked farm has been developed from research conducted at DairyNZ (Macdonald & Penno, 1998). These rules allow repeatable and sustainable production, and profit, between years (see appendix for a brief summary). This is the same for any commercial operation, not only to attain high profitability, but to ensure that the profitability is repeatable over time.

Cashflow and viability

Milksolids production

Dairy farming is a relatively simple farming process with total milk production determined by the amount of feed available and by the proportion of that feed that is utilised or eaten by the milking herd (Penno, 2003). Therefore, achieving good milk production requires management and utilisation of the variation in pasture supply and feed inputs offered to the herd.

The major risks in achieving the target MS production are adverse weather and management capability. Both these can be managed by having a farm policy suited to the farm's resources e.g. farm dairy, race system, water supply, availability and cost of supplements, labour structure of the farm, and systems and processes on farm that result in excellence in implementation of the farm policy.

Management Capability

Regardless of the policy and written decision rules, unless the farm has the management capability, the business is very much at risk. The management capability required depends on:

1. The number of judgement decisions required on a daily/weekly basis and
2. Systems and farm infrastructure

With a feed surplus, the manager is faced with balancing feeding the cows well every day and having high quality feed to offer next time the cows graze the paddock. High supplement and low stocked systems are in this position everyday – how much supplement to feed and pasture to allocate. For high stocked systems the decision is how to best allocate the feed on hand rather than how to manage a surplus.

Systems and infrastructure can also affect the number of judgement decisions. Farms that have a lot of paddocks eg from 1-5 ha, are much harder to manage than a farm with 30, similar sized paddocks. Routine, processes and discipline also help. For example, grazing in a block rather than going all over the farm.

Farmers that spend a lot of time in the cowshed are often behind on other jobs and grazing management is not given the time and thought it deserves.

Having clear decision rules and systems/processes that can be easily communicated and executed will result in more consistent and repeatable production. This involves the discipline of regular monitoring and planning of grazing management.

Farm Policy: System

High input systems tend to be more difficult to run as they require more management decisions and are generally better suited to owner operators where the skill and motivation are high. Risk areas that need to be managed in these systems are controlling the input price of feed (contracting feed; have own feed supply) and achieving high utilisation of the supplements and pasture grown.

Farm Policy: Stocking Rate:

Stocking rate **(SR)** is a key driver of feed utilisation. There is no one answer for SR given the variability in climate and the seasonality of annual pasture production (Fig. 1). This shows the 15-year average (and standard deviation) monthly growth (kg DM/ha/day) indicating how much it can vary. There is a huge variation on a Waikato dairy farm in annual pasture production between years. The summer is the most variable season, contributing the most to differences in annual DM production.

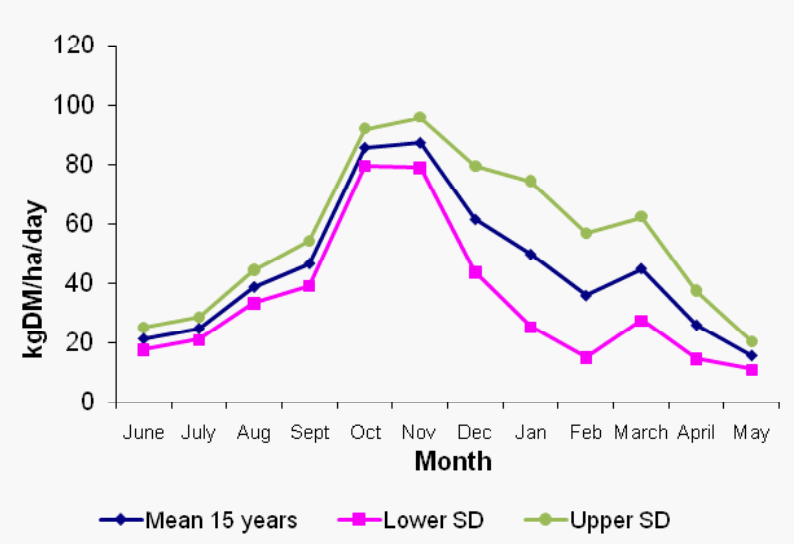

Figure 1. Mean pasture growth (with SD: standard deviations) for 15 years on a Waikato dairy farm

In a recent study (Macdonald et al., 2008) the operating profit from a range of SRs (fed largely pasture) was modelled using marginal analysis for all costs (either per cow, per ha or a combination). Fig. 2 shows that the optimum operating profit was attained at a SR of 3.1 cows/ha, the mid-point in the SR in the trial. Note that the operating profit was evenly distributed either side of the optimum SR.

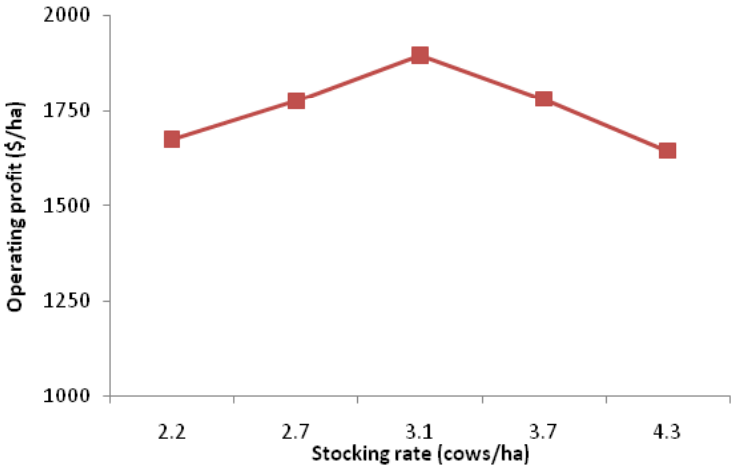

Figure 2. Operating profit for a range of stocking rates (adapted from Macdonald et al. 2008).

These results indicate that a range of SR exist where profit can be optimised. Optimum profit will only be achieved where the farm is managed under a set of decision rules that ensure pasture is utilised to best advantage within the grazing system. This means that the SR is relatively unimportant; what is important is how the system is operated.

In practice few farmers achieve the modelled profit operating a low SR due to the increase in the number of judgement decisions required to maximise cow intake of high quality feed per cow (round length, harvesting of surplus, topping) As SR is set in the winter the feed available for some farms can vary greatly between seasons (Figure 1). Plans are required to minimise and manage these fluctuations in feed available. A high SR farm will possibly need to dry-off early but a low SR farmer will need to ensure maximum days in milk and this will require harvesting high quality pasture surpluses for use in late lactation.

The risks for any farm system need to be identified and minimised. For a low stocked farm, the risk is not achieving high MS per cow; in a high stocked farm the risks are around maximising pasture grown through sound grazing management and no soil damage.

Farm Policy: Calving Date

Calving date is important to match feed supply to demand. As shown in Figure 1 pasture production in the Waikato in the spring is relatively consistent. Therefore, production before Christmas is important to minimise the risk from dry summers. High MS production to Christmas can be achieved through a high SR, or moderate SR and early calving. For either system there needs to be a plan to manage a wet spring and/or a dry summer.

Rules of thumb for calving date are:

High stocked farms, all grass in the spring

- Calving date 50 days before balance date
  (when feed supply meets demand)

Moderately stocked

- Calving date 55-60 days before balance date

Low stocked or feeding high amounts of supplement in the spring

- Calving date 60-70 days before balance date

Feed supply

Macdonald et al. (2008), in a SR trial, demonstrated how climate affects the feed supply and also management. They found that the amount of pasture grown increased with increasing SR, and the quality of the pasture on offer increased linearly. Milk production/cow declined linearly with increasing SR primarily because of a lower peak yield and less persistent milk profile and a shorter lactation. However milk production/ha increased linearly, and there was only a small decline in the efficiency of converting feed energy into milk energy as SR increased. Stocking rate did not affect reproductive success because a proactive approach was taken to anoestrous cows.

Management can influence the amount of pasture grown by manipulating average pasture cover (APC). Average pasture cover affects pasture growth rate (Fig. 3). As low APC is usually the result of a fast rotation, managing rotation length is key to meeting APC and residual targets. Table 1 has decision rules on rotation length and pasture cover. Use of the DairyNZ spring rotation planner will ensure that grazing interval does not get too fast too early. Thus pasture growth should not be restricted by grazings being too frequent.

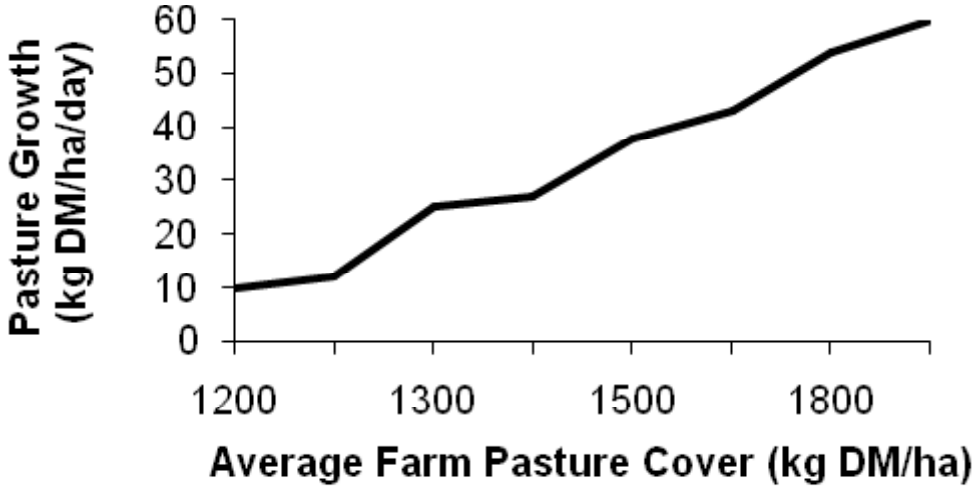

Figure 3. Average pasture cover and pasture growth rates in spring.

Weather

Drought

Dry summer management is well documented (Farmfacts 1.30 – 1.35). A huge variation exists between farms on the impact a dry period has on profitability. This variation relates directly to the planning leading up to a dry period and how proactive the farmer is in making decisions to balance the feed budget through to calving. Having a plan is particularly important for high stocked farms as it is a costly exercise to use cow condition to balance the feed budget. This can affect future MS production and reproductive performance. It also increases the risk to the business of not meeting the animal welfare standards.

Systems must be in place to allow for an early response to the changing situation. The aim must be to milk as many cows for as long as possible, but this should not be at the expense of lowering herd condition or APC to the extent that all the cows need to be dried off at the same time. The easiest way to reduce herd demand is by removal of the cull cows. Upon removing the 20% from the herd the remaining cows individually have 25% more to eat. On a well-managed high stocked farm, up to 80% of the annual MS production has been produced by the end of January. Thus, after January some high SR farms have already produced close to 1000 kg MS/ha and the emphasis should be on protecting next season's production - this may mean drying off cows to ensure they are at BCS 5.0 at the next calving.

On high SR farms there will be only a minimal amount of silage made so it is important not to squander this feed early on. It should be kept until after the autumn rains and enough saved for winter. There is very little that can be done to improve this year's production and it is essential that systems are in place to ensure that cow condition and feed supply are adequate at the start of next season. On lower stocked farms the aim will be to ensure that days in milk are maximised. Thus there may be a need to supplement the cows with silage or a bought-in feed. Whatever is used, it has to be part of the system. Normally the feed should be organised before the drought starts to avoid buying feed at a premium price.

Wet weather

The spring can be very stressful for farmers when the anticipated pasture growth does not occur due to extremely wet conditions. This has occurred in the Waikato several times in the last 10 years. The farmers who managed to get through with minimal lost production and pasture damage were those who had planned by

having the infrastructure or system to prevent pugging damage, monitored APC and cow condition against defined targets for the farm over the winter and took action early to improve the situation. Cow condition at calving is not negotiable for any system and is the key to managing a poor spring (cows at BCS 5.0 at calving, first and second calvers BCS 5.5). Having quality feed (10.5 ME or better) either on hand or that can be purchased at 5% of milk payout or less should be part of the farm plan for farms prone to the wet, particularly those that are highly stocked and/or early calving.

DO NOT speed up the rotation in an attempt to feed the herd fully or reduce pugging. It may initially allow better feeding of the herd but will only exacerbate the lack of feed by reducing pasture growth through too short a grazing interval. Instead have areas to which the cows can be moved (stand-off areas) to reduce soil damage. Recent DairyNZ research (Clark et. al, 2010) has shown that cows can get 80% of their required intake in 2 – 4 hour grazings. So cows can be fed reasonably well if removed from pasture to reduce pugging, but the area must comply with environmental requirements.

Summary of risks to milk production

- There is a range of SRs where profit can be maximised, provided that a set of decision rules are applied to achieve the target MS production for both the current and next season and the farm has the management capability and systems in place to implement these decision rules.
- Attaining BCS at calving of 5.0 for cows and 5.5 for heifers and second calvers is critical in all systems to maintain a tight calving pattern with minimal intervention.
- The other key areas where seasonal rules need to be adhered to are APC pre and post grazing covers. Rotation length is a key driver of APC and residuals.

Payout

Because payout cannot be controlled, the farm business needs to be viable at a low payout. This requires doing a sensitivity analysis and having a realistic plan to deal with a low payout, poor season and higher interest rates. Before the $4.55 payout announcement in 2009 many farmers thought they had a strong business that was not at risk as they did not consider the downside aspect of payout. Even at $6.00 there are businesses at risk due to land purchases based on overly optimistic budgeting of payout, farm costs and/or milk production.

Farm working expenses and plant replacement

Regardless of the system, having control of farm working expenses (FWE) is critical. In times of good payout or production, plant replacement and capital work can be done to set the farm up well to weather a poor season. Often in the good times costs creep into the system that are hard to cut out in hard times. High input systems need to control or manage the purchase price of feed. Feed prices tend to track payout and feed deficits. Having the capacity to purchase feed when it is well priced rather than when it is needed and keeping it stored so it doesn't lose quality (and pukekos and rats don't eat it all!) can help manage this risk.

Debt Servicing

As with the production system, the business needs to have a set of decision rules for its financial structure. Target levels for equity and debt servicing should provide criteria for decisions around any new opportunities such as the purchase or sale of assets. It is also useful to develop a view on the range of payouts under which

the business will need to operate. Do a sensitivity analysis to quantify the effects changes in interest rates, payout and production have on the business. External advice is valuable in providing a dispassionate view of the business and any new proposals. Those involved in the business often find it hard to remove emotions from their decisions particularly when it comes to purchasing land.

It is often said when purchasing land that it is always too expensive at the time but cheap in the long run. However, the business needs to be robust enough to weather the changes in payout, climate or interest rates that may occur in the short to medium term.

Interest rates are currently at historical lows and will increase over time. Farmers need to assess how a 2-3% increase in their interest rate will affect their business and start planning now to deal with this increased cost.

As discussed above, having the capacity to purchase feed when well priced can be an effective strategy to manage risk. However, it requires having financial funding arrangements in place to take advantage of these opportunities. The most cost effective way to do this is usually in the form of an available overdraft facility. Financial discipline is required to ensure this extra facility is utilised to take advantage of genuine opportunities rather than simply allowing loose cost control.

Drawings

Personal drawings seem to be a taboo subject. However, in tough times this is an aspect of the business the bank and you will need to focus on. Bankers often quote "very rarely do drawings go down". Know what your drawings are and the impact they have on you achieving your goal. In the good times remember the saying: "this too, shall pass", which means the good or bad times will not last forever. So plan using the best information you have.

Compliance

Effluent, fertiliser, water

Increased attention, both locally and internationally, is being focussed on the sustainability of modern agricultural production systems, including New Zealand's dairy industry. To ensure New Zealand retains its present 'clean green' image, it is essential that effluent, nitrogen and phosphate use on dairy pastures and the grazing of stock have minimal detrimental effects on the wider environment. In most dairying areas of New Zealand concern has been expressed about the impact of dairy cows on ground and surface water quality, particularly in relation to elevated levels of nitrogen or phosphate.

In evaluating the performance of the current farm system and any changes in farm policy the environmental impact needs to be considered. For nutrients this can be done by using Overseer. Changes in farm system need to maintain or improve the environmental foot print to the farm to remain viable.

Farmers need to have systems in place to ensure that water use, effluent, fertiliser and soil management comply with environmental rules, now and in the future. Unfortunately this is new ground and currently it can be difficult to get good advice as to what is the best option as the rules are changing regarding effluent, standing cows off, acceptable nitrogen applications etc.

The first step to managing this risk is being aware of what is required, not just currently but requirements likely in the future. If you are not aware of impending compliance issue, or choose to put your head in the sand, the risk to your business is greater. Farms with higher SRs may be more at risk especially when wintering cows.

Community Perception and Animal Welfare

There has been increasing concern about the perceived 'thinness" of NZ dairy cows. There is no doubt that today's cow is bred to milk for longer at the expense of body condition. As there is a range of condition scores within a herd, the average herd BCS should not go below 3.5 to ensure that there are no cows less than BCS 3.0 in the herd. The key way to address this is to calve mixed cows at BCS 5.0 and first and second calvers at BCS 5.5. This recommendation has been around for 30 years. Farmers often achieve the optimum herd BCS in June but fail to remember that in the last month of pregnancy the unborn calf requires 3-4 kg DM/day. If the cow allowance is not increased to accommodate this, the calf effectively becomes a parasite, causing the cow to mobilise energy to meet demands and therefore will lose condition. Farmers need to manage their farm to achieve this.

The recent issue of extremely thin cows at a number of saleyards highlights the fact that farmers are mismanaging the situation and this has to change. DairyNZ produced a booklet "Fit for Transport" (2009) which is designed to help farmers decide if a cull cow is fit for transport. In the introduction it states "making bad decisions about when to send cull animals for processing puts you and your transport operator at risk of prosecution." So the onus is on you the farmer to ensure that this does not happen. If farmers ignore the recommendations they will breach their animal welfare obligations and the resulting poor publicity affects the credibility of the dairy industry.

People – Staff

Increasingly, employers are at risk if they do not comply with employment legislation, health and safety requirements on farm or provide a good work environment that retains employees. Being a good employer is important if the farm is to attract and retain capable staff.

The farm business also needs to invest in its own capability. As farming becomes more complex (compliance, staff etc) it will be increasingly important to "work on the business" and not just "in the business". This will require continued investment in the capability of all involved in the business.

Summary

For farms to succeed in the future, be resilient to adverse weather events, and have sustainable systems, they need to:

- have the infrastructure and systems to minimise the daily/weekly judgement decisions and carry out the work efficiently, and
- there must be sets of decision rules.

These are rules that govern basic farm management as well as finances. Having systems in place reduces the risk to any business. It is all about planning and knowing what you want to achieve and having the ability to get there. Remember the old adage: Failing to plan is planning to fail.

Table 1. Management to achieve high performance from a range of stocking rates (decision rules).

	Stocking Rate		
	Low	**Medium**	**High**
System Focus	Quality Cows offered quality feed and able to maximise intake	Quality and quantity Cows offered quality feed and intake optimised	Quantity (quality looks after itself) Cows offered sufficient feed to meet their requirements
Topography	Flat (as need to top or have dry stock to follow)	Flat – rolling	Flat – hills
Climate	Not summer dry		
Grazing Residuals Milking cows	Cows offered quality feed and well fed by - selective grazing - topping - conservation - fast rotation lengths (used to suppress growth at peak growing times)	Cows graze to a consistent and even residual. If left uneven for one grazing can restore quality by bringing cows back sooner, or top/conserve (if necessary)	Need to leave no more than 7-8 clicks 1500 -1600 kg DM/ha to prevent pre-grazing cover being too high and canopy closure
Pre-Graze Cover	2100-2400 kg DM/ha	2500-2800	3000-3100
Wintering	Low	Moderate	High demand for grazing off and/ or conservation
Rotation Length	Fast rotations 'from when pasture growth gets ahead of herd demand (balance date) to autumn; 10 days peak growth Early Spring – fully feeding cows is the driver, not rotation length Winter –faster rotation than conventionally stocked systems	Min rotation length 18 days Use spring rotation planner (SRP) to allocate feed	Minimum rotation length 21-23 days Autumn – round length rules e.g. 40 day by 15th March Spring -Need to use SRP Winter – most cows off as need bank of feed
Planned Start of Calving to magic day (when pasture growth gets ahead of herd demand-balance date)	55-60 days	55-60 days	50-55 days
Cover at calving	Keep less than 2200 kg DM/ha to ensure that pre-graze cover not too high	22-2300 kgDM/ha	2400-2500 kg DM/ha plus some supplement for poor spring
Harvesting supplement – length of closure	Max 40 days	Max 40 days	Harvest at time taken out of round and no more than a week out of the round
Supplements		Need spare supplement for adverse events	Need spare supplement for adverse events
Culling	Minimal culling, low producers only to maximise DIM	Summer dry – cull early	Summer dry – cull early; all culls gone early autumn
Drying off	Production per cow and days to calving	Cow condition and feed cover Need to have clear decision rules especially if summer dry	Cow condition and feed cover Need to have clear decision rules especially. if summer dry

	Stocking Rate		
	Low	**Medium**	**High**
Environment	Milking later into autumn and winter. Risk of pugging.		Higher risk as more cows wintered and prone to pugging damage More effluent to manage Grazing residual and effluent application
Adverse weather	Medium	Medium	High
Financial risk	Need to achieve production targets Cost control	Cost control	Cost control Poor season flows onto following season
Skill	Hardest time to manage a farm is in a feed surplus; farm in feed surplus for at least 50% of the season Anticipation of spring pasture surpluses		Sticking to management rules and not pugging Prediction of deficits and acting early e.g. drying off autumn
Reproduction	Need tight calving spread to maximise DIM Top reproduction management – high stockmanship		Cows not CS 5.0 at calving; poor allocation of spring feed cows < CS 4.0 at mating

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Appendix:

A brief summary of a set of decision rules (adapted from Macdonald & Penno, 1998).

Cow condition:

Cow condition provides a measure of the amount of energy stored as body fat on cows within the herd. Likewise, average herbage mass provides a measure of the amount of feed energy available within the farm systems at any given time. Meeting the required cow condition and average herbage mass targets is more important in spring than at any other time of the year as severe underfeeding at this time can impair herd performance for the remainder of the season. So, all management decisions need to be geared around these two points to ensure a profitable and sustainable system in used on the farm.

The target calving condition score for all cows is 5.0 (1 to 10 scale) for older cows, and 5.5 for 2 and 3 year old cows. An increase of one body condition score unit has been shown to increase production by 15 kg MS/cow and be worth approximately $40/cow in reproduction benefits.. Thus a decision has to be made on when to cease lactation to allow the cows adequate time to get back to BCS of 5.0. Rules on days required to allow for this and feeding levels to achieve this are needed.

Pasture management:

Autumn/winter management. – Set up the farm to achieve the desired pasture cover at calving. Target APC for calving is 2200-2400 kg DM/ha, depending on the comparative stocking rate and date of calving relative to when pasture growth will get ahead of herd requirements.

Winter grazing rotation length controls dry matter intake by altering the pasture allowance of the dry herd. Therefore, longer rotations result in more pasture being available at the end of winter.

Spring rotation planner - Feed requirements generally exceed pasture production for several weeks after calving. Therefore, the aim of spring grazing management must be the allocation of pasture to optimise pasture and milksolids production. This is done by ensuring the grazing interval does not get less than 20 days before growth exceeds herd requirements.

Spring management - From when pasture growth exceeds herd requirements in spring, surplus pasture must be removed from the grazing area to maintain appropriate post grazing herbage mass, pasture quality and subsequent milksolids production. At the same time the herd must be generously fed to maximise milksolids production, and meet reproductive performance objectives. To ensure pasture quality is maintained, and the herd properly fed, surplus pasture is identified and harvested according to a formula or set of decision rules.

Summer management - The key is to have a plan and to make timely decisions based on the best available information. Having no plan, coupled with indecision, leads to unnecessary stress and lower profit. Whatever the summer conditions, the first management rule is to use spring pasture fully and efficiently before dry and hot conditions reduce the growth and quality of pasture.

The use of supplements - Supplementary feeds are of greatest benefit when the carry-over effects of substituted pasture mass, and spared cow condition, are captured within the system or in severe feed deficits. In a seasonal dairying system the period of greatest feed deficit is invariably late autumn/early winter when pasture growth is declining, rotation length is being extended and the potential lactation length of many cows is unmet. Therefore, greatest benefits come from using supplements to extend the grazing rotation immediately after summer rains.

Reproduction - To achieve high pasture utilisation in early spring, a concentrated calving pattern is required before the onset of spring growth. The combined effect of an early planned start to calving and a concentrated calving period may add 25 more days in milk for each cow, right at the start of the season. The primary cause of poor fertility in NZ dairy herds are anoestrous cows and poor heat detection. Having MA cows calve at BCS 5.0, and first and second calvers at BCS 5.5 is the second greatest way to prevent anoeustrous cows other than a compact calving. Heat detection is a critical job and deserves the time and cost to ensure all cows on heat are mated. Training (showing not telling) of all staff needs to be done annually. The best results are achieved with paddock observations and use of aids – tail paint or heat/mounting detectors. To enable a compact calving spread (6 weeks) it is necessary to ensure that 95% of the herd is inseminated within 28 days of the PSM. Use the InCalf approach to plan how to improve reproductive performance on your farm.