ACHIEVING WINTERING TARGETS – CRITICAL SUCCESS FACTORS FOR DIFFERENT WINTERING SYSTEMS IN SOUTHLAND

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Summary

A successful wintering system will:

- Be profitable
- Have healthy cows achieving body condition score targets of 5.0 for mixed age cows and 5.5 for first and second calvers
- Ensure happy staff are working sustainable hours and
- Meet the demands on safeguarding the environment

To be successfully implemented all wintering systems require attention to detail with:

- Feed budgeting and planning
- Stock management
- Risk management
- Staff skill development and relationship management and
- Environmental protection.

Why is wintering important?

Dairy farming in Southland and Otago has grown in the past 20 years to 600,748 cows on 1164 farms producing 15% of New Zealands milk solids in 2008-09 (2008-09 NZ Dairy Statistics). Winter is an important period in the set up of the farm and cows for the following lactation and when traditionally dairy farmers have taken time off the farm. For Southern South Island farmers winter provides a number of challenges not encountered in other dairy regions of New Zealand.

Feed supply

The main wintering issue for the Southern South Island is the inability to grow sufficient pasture during winter to meet the requirements of current dairy farms. Pasture growth in winter is usually less than 10 kg DM/ha/day, which makes grass/grass silage feeding an impractical option due to the area of land required to accumulate sufficient pasture to meet the herd requirements during the dry period. This is also a period when the heavy southern soils become waterlogged making grazing difficult and costly on subsequent pasture production.

Cost

Wintering is a large contributor to farm working expenses (FWE) in Southland. While it is difficult to get accurate data as winter grazing often gets recorded with young stock grazing, bought in feed, freight and run off costs. The following provides an example;

Cows grazed off for 10 weeks at $26 per cow per week, plus $17 freight each way to and from grazing, gives a total wintering cost per cow of $294. At an average production of 400 kg of milk solids, this equates to an average cost of 73.5 cents per kg of milk solids. At $3.90 FWE this results in winter grazing contributing 19% of FWE.

Production in the next season

Both animal and feed factors can have a large impact on the ability of the herd to achieve a successful lactation.

1. Body condition score (BCS)

General recommendations for BCS at calving are 5.0 for mixed age cows and 5.5 for first and second calvers (Roche et al. 2004). The BCS in which a cow calves, the amount of BCS she loses post calving and the BCS she falls to before starting to gain condition (nadir BCS) are all associated with milk production, reproduction and health.

a. Milk production

Effect of calving BCS on milk yield (annual 270 day lactation) (Roche et al. 2007a)

- A BCS increase from 3.0 to 4.0 at calving, milk yield increased by 17.7 kg MS (209 kg milk)
- A BCS increase of 4.0 to 5.0 at calving, milk yield increased by 12 kg MS (144 kg milk)
- A BCS increase of 5.5 to 6.5 at calving only resulting in the milk yield increase of 3.8 kg MS (45 kg milk)

Effect of BCS loss in early lactation on milk yield.

- Cows that lost 1 BCS unit from calving to when BCS gain commenced produced 94.5 kg milk (approx 8 kg MS) more in 270 days than cows that did not lose any body condition (Roche et al. 2007a). Under conditioned cows have limited opportunity to mobilise body condition to support milk production in early lactation.

b. Fertility

BCS loss between calving and planned start of mating and the BCS at which cows start gaining condition affect pregnancy rates (Roche et al. 2007b)

- A 0.5 unit lower BCS when cows start gaining condition results in a 6, 8 and 5% lower pregnancy rate to first service, at 6 weeks and at 12 weeks after planned start of mating, respectively.

- For a 500 cow herd this would mean 25 less cows in calf after 12 weeks of mating therefore reduced opportunity to cull for production, animal heath etc OR
- 40 cows with up to 42 days less days in milk (approx. 40-60 kg MS/cow) in the subsequent lactation

It is important to note that feeding levels in early lactation are unable to influence the rate of BCS lost in the first 1-4 weeks post-calving (Roche et al. 2009). The key method of controlling the level to which BCS falls post calving and therefore the fertility outcomes of the herd is through managing BCS at calving.

c. Health

The odds of a cow succumbing to milk fever are related to BCS at calving. Relative to cows calving at BCS 5

- BCS <3 results in 13 % or 65 more cows in a herd of 500 at risk of milk fever
- BCS>6.5 results in 30% or 150 more cows in a herd of 500 at risk of milk fever

In general, over-conditioning, not low BCS, predisposes cows to increased risk of metabolic disorders at calving.

d. Welfare

Herd average BCS can mask underlying issues with individual cows in the herd. For example at the beginning of July in both 2008 and 2009 a 720 cow herd had an average BCS of 4.65 however the distribution of cows across the BCS range differed significantly

- in 2008 the herd had 20% or 146 cows in BCS ≤4 and 5.4% or 39 cows in BCS ≥ 6.
- in 2009 only 14 % or 101 cows had a BCS ≤4 and 0.4% or 3 cows in BCS ≥ 6
- In 2009 a higher proportion of the herd were in BCS 4.5 to 5 one month prior to calving.

2. Target pasture cover at calving start

In addition to body condition score, drying off decisions are often based on average pasture cover estimates. Achieving farm average pasture cover targets at drying off and calving will enable intake targets to be met in early lactation thereby minimising the period of BCS loss in early lactation and the associated negative impacts on production and reproduction. To ensure high quality pasture is available through the first round of grazing the farm should be managed in such a way during late autumn/winter to create a feed wedge in spring rather than all paddocks being at a similar pasture mass.

Wintering is complex

Wintering decisions need to take into account:

1. Costs and risks

- Profitability of brassica systems is highly dependent on crop yields which vary greatly depending on crop management, soil condition, and climate.
- Stand-off pads and housed systems need a guaranteed source of supplementary feed and bedding materials at affordable prices.
- Housed systems can have the advantage of increased days in milk and lower feed requirements during the winter.
- Significant capital cost can be associated with building standoff and housed systems

2. Feed supply, utilisation and quality

Supply

- All systems require a robust feed budget and the provision of sufficient high quality feed to achieve calving BCS targets
- Low BCS cows will require more energy and therefore feed to keep warm than higher conditioned animals
- Cows standing in mud require 5 MJME/cow/day more for maintenance
- Achieving consistent crop yields is important in successful forage wintering systems

Utilisation

- Judson and Edwards (2008) reported an average 80% utilisation of kale in Canterbury suggesting utilisation is not a major factor in poor winter performance.
- In contrast, De Wolde (2006) estimated utilisation in a Southland brassica system to be in the order of 50 to 75%
- Utilisation will be dependent on soil and climatic conditions and feed allocation methods.
- Utilisation is higher in standoff and housed systems.

Allocation

- Correct crop allocation is critical. Judson and Edwards (2008) reported that cows on 66% of farms surveyed consumed at least 1 kg DM kale/cow/day less than target intake with one herd being short by 8 kg DM/cow/day.
- Correct allocation requires accurate estimation of crop yield, paddock size, break width and available supplement (Dalley et al. 2008).

Quality

- Kale ME declines from 12.7 MJ ME/kg DM for leaf material to 6.6 MJ ME/kg DM for lower stem material (Judson and Edwards, 2008).
- A higher allocation leading to lower utilisation and higher grazing residuals may be a valid option for improving diet quality but at a cost of increased crop area required.

- Despite adequate crude protein in kale, high rates of intake and rapid digestion result in rumen ammonia levels below those considered optimum for microbial protein synthesis for 16 hours of the day (Gibbs SJ, unpublished data)
- Cereal silage contains insufficient protein to meet cow requirements through the winter so should not be fed as a sole diet or as the only fibre source with fodder beet.
- Fodder beet should not exceed 60% of the diet to avoid rumen acidosis

3. Sustainability of the system for the environment, animals and people

Environment

- Most N losses from forage crops come from leaching rather than overland flow
- Nitrate leaching losses from winter forage crops are high relative to losses measured under pasture
- Some improved management practices such minimum and no-tillage to establish crops (ex grass pasture) and the use of nitrification inhibitors can help to reduce these losses.
- High densities of cows on forage crops can result in considerable soil physical damage, because it typically coincides with a period of high soil water content (Monaghan & Beare, 2009).
- Back-fencing does not appear to reduce damage to soil structure but will reduce energy expenditure of cows by minimizing pacing of the paddock in cold, wet and muddy conditions.
- Housed and standoff systems eliminate soil damage but require a good nutrient management plan and facilities for collecting, storing and spreading effluent/slurry/sludges

Animal Welfare

The general perception of society is that animals wintered outdoors on forage crops have a lower standard of welfare than those housed indoors. This is not substantiated through trial work to date

- Cattle are physiologically well adapted to maintain body heat even during very cold conditions, provided it is dry (Kadzere et al. 2002) but conditions of wind and rain will accelerate heat loss.
- Any facility or system that decreases lying time is likely to have a negative impact on cow welfare (Fisher et al. 2002).
- Although crop paddocks can become muddy, cows are observed to lie close to the crop itself, where the surface is drier than the rest of the paddock, and may be more comfortable to lie on (Stewart et al. 2002).
- Stewart et al. (2002) reported that cows wintered on crop in Southland spent 11.2 hours/day lying (range 8.3-14.3 hours) and this time was not different from cows wintered on covered or uncovered sawdust pads.
- If the pad or shed is being used permanently with no on-off grazing then a minimum of 9 m^2/cow plus a 1 m^2 feeding area must be provided (Anonymous, 1998).

- The design of cubicles, their length, floor surface and iron work influence lying time, ease of standing and lying and comfort (O'Connell et al. 1992). An inability to stand up or lie down easily and a surface which allows slipping make cows wary of lying down in cubicles.

People

The type of wintering system utilised will dictate the knowledge and skill base required by farm staff, and it also creates a working environment which may be deemed desirable or undesirable by future employees.

- All grass wintering systems are generally considered 'people friendly' utilising similar feed and labour management skills to those that are used during the lactation period (Greig, 2004).
- Brassica systems require sufficient technical knowledge and skill to produce consistently high yielding crops and the work associated with the feeding of this is perceived as hard on people and machinery.
- Housed systems appear to have a low labour requirement compared to other wintering systems and they create a favourable working environment for staff.

4. Fit with the whole farm system

Activities and planning relating to wintering in Southland/Otago can occur for 10 months of the year therefore it is important that these activities are well integrated into the operation of the whole farm system. Decisions made around wintering can have an impact on the stocking rate, calving date, supplementary feed and labour requirement of the milking platform. Often when a capital expenditure is made for wintering it influences the system that is adopted on the farm. For example building a cubicle wintering barn may result in milking longer into winter to maximise days in milk, or a switch to split calving and winter milking. A survey of Herd Home® owners (Longhurst et al. 2007) identified that supplement use during the lactation period increased following the installation of the Herd Homes® thus moving these farms to a higher input and potentially more costly system.

Key principles of wintering

To be successfully implemented all wintering systems require attention to detail with:

- Feed budgeting and planning
- Stock management
- Risk management
- Staff skill development and relationship management and
- Environmental protection.

Wintering systems and their critical success factors

Wintering systems have evolved to meet the needs of the industry and now span the range from pasture grazing supplemented with silage through to fully housed systems. Which system a farmer selects will be determined by their own particular set of circumstances with all systems having an equal opportunity for success or failure. A series of workshops held throughout Southland in 2009 identified the opportunities and challenges or risks associated with the different wintering systems enabling the development of critical success factors for each system. These critical success factors need to be considered when reviewing the implementation of the current wintering system or when investigating alternative wintering options. It is important to note that there is an increasing trend to "multiple wintering systems" (a mixture of systems, rather than dependence on one) on some properties. These multiple systems allow an increase in flexibility, particularly in the shoulders of the season and the ability to move cows to alternative systems should they not adapt to a particular system.

1. Grass Wintering

All grass wintering was the main wintering option in the 1980s when cows were dried off about 10 May and calving started on 1 September. This system had low stocking rates of approximately 2 cows/ha. Current Southland dairy farms are stocked at 2.5 to 3.2 cows/ha with a lactation period from early August to mid/late May.

Opportunities	**Constraints/Risks**
No diet changes for cows	Limited land of suitable soil type to support all of Southland's wintering needs
Easier to achieve BCS targets	Consistent feed supply challenges especially on lighter soils further north
Simple system to implement	Good management required to prevent soil damage over time
Easier to shift fences on grass	High requirement for conserved feed or large land requirement
	May require a standoff area/pad
	Land cost a key driver of profit
	Need to manage milk fever risks
	Staff need to be available during the day to move stock if weather conditions change

Critical success factors

Financial	
	True cost of wintering determined

	Key performance indicators for wintering success established
	Cost per cow minimised
Feed	
	Feed budget complete
	Contingency for dry autumn and low pasture accumulation
	Management system to minimise soil and pasture damage
	Regrassing programme established
	Provision of water through troughs
Environmental	
	Awareness of catchment sensitivity to nutrient loss
	Knowledge of soil classification for structural compaction, nutrient leaching and waterlogging
	Standoff facilities meet environmental requirements
	Environmental mitigation technologies considered eg nitrification inhibitors
Animal Welfare	
	Mineral supplementation plan implemented
	Condition score targets established
	Facilities available to treat animals
	Animal movement plan implemented
People	
	Responsibilities clear between staff members
	Good pasture management skills
	Available throughout the day to monitor stock and conditions

2. Forage crop wintering

A large percentage of cow wintering in Southland/Otago occurs on forage crops and/or silage, hay and straw. The popularity of brassicas and more recently fodder beet reflects the crops' ability to produce large tonnages of high quality dry matter per unit area as a standing crop that can be 'carried' forward for in situ grazing during the winter period. Although other crops such as short-term ryegrasses and greenfeed cereals can be used in a similar manner to brassicas and fodder beet, they don't typically offer the same DM yields and only have limited ability to carry through the winter without senescence and lodging. Forage crops can be grown on the milking platform in self contained systems, on owned or leased runoff blocks or with graziers.

Opportunities	**Constraints/Risks**
Economically it works	Potential environmental impact • nitrate leaching • soil compaction • overland nutrient flow
Fits with regrassing programmes	Weed and disease impacts on subsequent crop yields. Poor crops are expensive to grow
Cropping sequences important for longterm sustainability	Working conditions for staff
Good high quality feed supply grazed in situ	Large seasonal variation in crop yield due to climatic variability, weeds and pests
Good utilisation on lighter soils	Nutritional transition required to minimise animal health issues
Runoff: Surplus feed (pasture for silage) can be brought back from runoff to milking platform if close enough	Public perception of animal welfare
Runoff: leasing to minimise cost vs owning for capital gain	Nutritional disorders – nitrates, SMCO's, minerals, soil ingestion
Milking platform: easier to transition on and off crop	Common sense required with daily allocation
Graziers: successful contracts have strong relationships and clear expectations	Some cows don't adjust to crops
	Time commitment of staff during the winter period
	Runoff: Seldom large enough to be managed in a sustainable way when cropping
	Runoff: Milking platform activities take priority over runoff unless resourced separately e.g. mating on milking platform at the same time as crop establishment on runoff
	Runoff: travel time between blocks
	Milking platform: lower stocking rate to accommodate regrassing programme
	Milking platform: vehicle traffic on laneways in wet conditions
	Grazier: Sometimes limited infrastructure i.e yards, reticulated water etc
	Grazier: loss of control – cows coming back early
	Grazier: Cost driven by supply and demand and milk payout

Critical success factors

Financial	
	True cost of wintering determined
	Key performance indicators for wintering success established
	Cost per cow minimised
Feed	
	Feed budget completed including pasture/silage for transition period
	Procedure for identifying poor performing paddocks to renovate
	Cropping rotations established
	Crop yield monitoring implemented
	Supplement/fibre source inventory complete
	Contingency for crop failure, poor yields and cows coming home early
	Grazing plan to minimise chances of breakouts – graze paddock towards the south so if cows driven by rain they head away from the crop
	Provision of water through troughs

Environmental	
	Awareness of catchment sensitivity to nutrient loss
	Knowledge of soil classification for structural compaction, nutrient leaching and waterlogging
	Environmental mitigation technologies considered eg nitrification inhibitors
	Crop established to suit the terrain Ridging in same direction as the creek not towards it Buffer zones at the bottom of slopes
	3 metre rule implemented (more if sloping land)
	Tiles and swales mapped and avoided when cropping
	Management strategy to minimise overland flow and soil damage - graze from top of sloping land
Animal Welfare	
	Plan for transitioning cows on and off crop implemented
	Mineral supplementation plan implemented
	Condition score targets established
	Mob sizes and structure planned
	Strategy for dealing with animals that don't adapt to the system
	Diet balance to control rate of intake and minimise nutritional disorders
	Backfencing implemented
	Facilities available to treat animals
	Animal movement plan implemented

People	
	Responsibilities clear between staff members
	Technical knowledge within the team or contracted in to grow winter crops
	Priorities between winter activities and milking platform activities determined
	Staff have skills to accurately allocate forage crops
	Provision made for time off during the winter period
	Price negotiated with grazier (if applicable)
	Responsibilities clear between grazier and owner (if applicable)
	Schedule for checking stock with graziers – how much control are you prepared to relinquish?
	Skills within the team to manage the relationship with the grazier
	Plan to resolve differences in expectation between parties (if applicable)
	Skills to identify cows not coping

Loafing/Standoff pads

A loafing or stand-off pad is a holding area with a soft surface which cows can stay on for 2-24 hours per day. Traditionally the primary purpose of a standoff pad was to protect soils and pasture from pugging damage during the winter and early spring. More recently, standoff pads are being used to accommodate cows off pasture 24 hours per day, 7 days per week during winter. Purpose built pads enable effluent to be captured and returned to the soil when conditions minimise the risk of environmental impact. These pads may have feeding areas or self feed silage stacks associated with them.

Opportunities	**Constraints/Risks**
Solid disposal reduces the requirement for artificial fertiliser	Consents required for >100 cows and must capture effluent
Can be used for on-off grazing during the lactation period to protect pastures and soils	Requires solid manure disposal to land which has a cost
Good utilisation of silage if stored well	Capture a lot of water from rain increasing volume of effluent to be disposed of
Reduced maintenance requirements of cows	Vulnerable to conserved feed costs
More control of cows, easier to monitor	Capital involved; however a range of options are available at varying cost
Good cow comfort if shelter is provided and the appropriate space per cow is allocated	Mastitis at calving if pad surface is not adequately maintained

Opportunities	**Constraints/Risks**
Relationships important to guarantee feed supply	Reduced lying time if pad surface is not adequately maintained
Labour efficient system to implement	Health issues if regular monitoring is not undertaken
Reduced environmental impact	Availability and price of bedding material
No cultivation costs	
Better conditions for staff and equipment	

Critical success factors

Financial	
	True cost of wintering determined
	Key performance indicators for wintering success established
	Cost per cow minimised
	Reliable source bedding material available within budget
Feed	
	Feed budget completed
	Reliable source of good quality silage available
	Feed inventory completed
	Silage quality determined
Environmental	
	Consents in place for effluent/manure management
	Sufficient storage capacity for effluent, including rain water
	Leachate from silage pads contained

Animal Welfare	
	Area per cow meets recommendations – 8-10 m^2 per cow plus 1 m^2 for feeding
	Appropriate shelter provided
	Mineral supplementation plan implemented
	Condition score targets established
	Bedding management system established
	Weekly walk to assess cows for lameness
People	
	Animal management skills to minimise animal health issues ie lameness, mastitis
	Supplement management skills to provide high quality silage

Housed systems

Use of a housing facility for wintering dairy cows is a different philosophy to the traditional outdoor grazing system. The recent introduction of a range of housing options e.g. Herd Home, free stall cubicle barn and deep litter composting barn has presented Southland/Otago farmers with alternative wintering options. Increasing the options available for farm management appears to be the primary motivation for building a wintering shed (Care & Hedley, 2008; Longhurst et al. 2006).

Opportunities	**Constraints/Risks**
Reduced environmental impact	Slurry/manure disposal and timing, requires large storage facilities and consents
Slurry/manure reduces the requirement for artificial fertiliser	Odour from effluent/slurry storage ponds or from pasture when manure is being spread
Separating storm water from manure	Vulnerable to conserved feed costs/feed has to be grown somewhere
Good feed utilisation	Potential to overcapitalise the farm asset
Reduced DM intake requirements	Wind damage to roof depending on structure
Land available for silage production without periods out for cultivation and establishment	Lameness especially in year 1 as cows adapt
Easier to individualise feeding	Mastitis if lying surface is not kept clean
Reduced wear and tear on laneways	Movement to a higher input system
Facility for supplementary feeding during the lactation or on-off grazing	Insufficient space per cow to facilitate lying
Winter milk premiums	Some cows don't adapt

Opportunities	**Constraints/Risks**
Few transition issues	Availability and price of bedding material
Easier to observe cows	Requires animals to be walked once per week to check for lameness
Labour efficient system to implement	Hidden costs
Less tractor work in winter	
Attention to detail important	
No cultivation costs	
Better conditions for staff and equipment	

Critical success factors

Financial	
	True cost of wintering determined
	Key performance indicators for wintering success established
	Cost per cow minimised
	Reliable source bedding material available within budget (if applicable)
	Determination of what system the farm will operate under eg Winter milking, extended lactation, increased supplement input
Feed	
	Feed budget completed
	Reliable source of good quality silage available
	Feed inventory completed
	Silage quality determined

Environmental	
	Consents in place for effluent/manure management
	Sufficient storage capacity for effluent/slurry/sludge
	Leachate from silage pads contained
Animal Welfare	
	Area per cow meets recommendations – 8-10 m^2 per cow plus 1 m^2 for feeding
	Mineral supplementation plan implemented
	Condition score targets established
	Bedding management system established (if applicable)
	Weekly walk to assess cows for lameness
	Lactating and dry cow management procedures documented
People	
	Staff familiar with animal behaviour in housed systems
	Animal management skills to minimise animal health issues ie lameness, mastitis

Conclusions

A successful wintering system will:

- Be profitable
- Have healthy cows achieving body condition score targets of 5.0 for mixed age cows and 5.5 for first and second calvers
- Ensure happy staff are working sustainable hours and
- Meet the demands on safeguarding the environment

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