



# Winter Grazing in Dairy Cows: Welfare Implications and Best Practices

## Introduction

Winter grazing is the practice of grazing cows on pasture or forage crops during the winter months, rather than keeping them indoors and feeding them stored feed like silage or hay. There are significant welfare benefits of longer pasture access through the year compared to fully confined, indoor systems, including increased space and a more complex environment offering opportunities to express normal behaviours such as grazing and locomotion. However, these welfare benefits will vary depending on the type of winter grazing system used. Likewise, different winter grazing systems offer varying environmental benefits.

The different wintering systems are:

- **Intensive Winter Grazing (IWG)**, where cows are grazed on annual fodder crops, usually brassicas, in fenced off paddocks;
- **On-off grazing using a stand-off area**, where cows are rotated between crops or pasture and a hard-surfaced stand-off area, minimizing pasture damage;
- **Rotational grazing**, where cows are rotated between smaller paddocks of pasture and the pasture is rested in between each grazing period.

Surveys estimate that 60% of New Zealand dairy cows are wintered on pasture with supplemental forage, 30% on crop forage, and 10% in off-paddock stand-off areas (summarised in Schütz et al., 2025).

Winter grazing is practiced in countries where the climate is temperate enough to support winter grazing, such as New Zealand, southeast Australia and Ireland. In New Zealand and southeast Australia, typically dairy cows are outwintered for the whole of winter and early spring. Seasonal (or block) calving is usually practiced, meaning that cows are outwintered while heavily pregnant and may calve early in the paddock, or are moved into calving facilities while heavily pregnant (Proudfoot, 2023). In Ireland, dairy cows are housed for four months on average (range: two to seven months) and calve indoors (Teagasc, 2018).



Breeds of dairy cows which are typically farmed in systems which use winter grazing are hardier breeds (as opposed to extremely high yielding dairy breeds) that are better adapted for outdoor systems, such as Jerseys and British Friesians. Winter grazing is carried out as it can reduce the costs of feed (particularly brassica crops are a relatively low-cost feed) and housing (as cows are not housed), extending the grazing season and improving farm efficiency. However, winter grazing can come with a number of welfare challenges for cows, including cold stress, inadequate nutrition and reduced cow comfort, and environmental issues associated with poaching, such as nitrogen leaching and reduced soil health.

## Overview of the main winter grazing systems and management practices

### Intensive winter grazing (IWG)

- IWG can happen on pasture or more commonly on specially grown annual crops, such as kale, fodder beet, swedes, and turnips. Small paddocks or sections of a larger field are used, and are usually strip grazed by moving electric fencing back to give cows access to a fresh section of pasture or crop e.g. once a day. The cows will remain on the paddock until they have eaten off the crop, leaving bare soil. This results in significant poaching of the soil. Typically, no shelter (artificial or natural) is provided in each paddock unless there is some natural shelter such as trees or hedges. Stocking densities are typically high as the herd is grazed in small sections of the larger field.





## On-off grazing using a stand-off area

- Cows spend periods of time grazing on crop or pasture, similarly to IWG, where cows are most commonly strip grazed in small paddocks. The difference is cows are then moved to a stand-off area (e.g., pads with woodchips or concrete) for stretches of time. Cows can be moved onto stand-off areas when poor weather is forecast, reducing the risk of poaching paddocks. Stand-off areas can include a covered area, providing shelter for cows. While in the stand-off area, cows will be fed with feed such as silage and haylage. See [DairyNZ's advice](#) on designing stand-off pads.



Example of a stand-off pad, Richmond Downs Farm, Waikato. © Dairying by Design, accessed from <https://smartselters.co.nz/case-studies/richmond-downs>

## Rotational grazing

- Cows are moved between paddocks on a regular schedule, which can be adapted for winter and particularly poor weather by using a combination of grazing and rest periods. This can be done with either pasture or crops, but pasture is recommended. The amount of time cows spend on each paddock depends on weather conditions and management factors such as the milking schedule.
- This system can allow for a more regenerative approach to be taken, by using **adaptive multi-paddock grazing (AMP or holistic planned grazing)**. This is where fencing is moved regularly around a larger paddock, allowing for shorter periods of grazing and longer periods of recovery for the pasture. This mimics the natural grazing patterns of large wild herbivores, reducing how much time cows continuously graze in one location. This approach has environmental benefits including improved carbon sequestration, biodiversity and soil health. There are also animal welfare benefits: cows spend less time on heavily poached ground, can meet their nutrient needs, and graze more naturally.
- **Bale grazing** is a regenerative farming technique which can be implemented in rotational grazing systems and has a number of benefits. Hay bales are provided in



the paddocks - as cows eat the bale, some hay is not eaten and falls onto the ground, creating a patch of hay covering the pasture. This hay litter creates a drier, warmer lying surface for cows to rest and ruminate. The hay litter also protects the ground, reducing poaching. As poor weather comes in, cows can be moved onto the next paddock and be moved back to the unfinished paddock once it has dried out, reducing poaching and loss of pasture.



Bale grazing at Scarlett Farm, Mid Canterbury New Zealand. © Quorum Sense, accessed from <https://www.quorumsense.org.nz/news/hay-bale-grazing-a-best-practice-guide>

### Costs of bale grazing

- FAI Farms found that by moving to outwintering with bale grazing as part of their AMP grazing project for their beef cattle in the UK, the costs per head for housing, feed and labour halved, from ~£2.40 per day to £1.04 in 2021 – equating to saving over £24,000 in 2021. See [FAI Farms' case study](#) for more information.
- Quorum sense carried out a comparison of wintering costs between hay bale grazing, kale grazing and off-farm grazing in Southland, New Zealand. The study found that off-farm grazing was the most expensive (\$144,00). Total costs for bale grazing (hay bales provided on pasture) was \$96,826. Total costs for kale grazing (kale crop with supplemental baleage) was \$91,332. Kale grazing is slightly more cost effective, until the costs of the pasture resowing in spring on the ex-kale paddocks are factored in. Including these costs comes to \$127,332. See [Quorum Sense's case study](#) for more information.



## Other systems

- **Hybrid systems** are where cows are provided with both housing and access to an outdoor area. When given a choice between housing and being outdoors during cold and wet weather, cows choose to be indoors (Arnott et al., 2017; Mee and Boyle, 2020). They are highly motivated to access pasture, although this motivation is subject to a number of different variables and individual preference (von Keyserlingk et al., 2017). Giving cows the opportunity to choose between housing with deep bedding and plenty of space, and pasture where they can graze, browse, explore and have more space presents the best welfare potential.
- **Silvopastoral agroforestry** is the practice of integrating trees, pasture forage and grazing livestock in a mutually beneficial system. By combining tree planting with livestock grazing, carbon emission mitigation can be achieved while not losing grazing land for livestock and increasing farm resilience to climate change impacts. Other environmental benefits include improved water quality, soil health and integrity, carbon sequestration and biodiversity. Animal health and welfare benefits include more varied diets better able to meet nutritional needs, allowing browsing behaviour, provision of shade and shelter to better thermoregulate and express behaviours such as resting, grooming and hiding, increasing the amount of time livestock can be grazed outdoors in more natural conditions. The associated improved productivity and dual income from both livestock or pasture crop and tree crop can lead to economic gains.



Agroforestry at Howemill Farm, Scotland © Soil Association, accessed from <https://www.soilassociation.org/blogs/2021/august/3/pairing-agroforestry-with-livestock-the-major-benefits/>

**Table 1. Pros and cons of the different winter grazing systems.**

Winter grazing system	Pros	Cons
<p><b>Intensive Winter Grazing (IWG)</b></p>	<ul style="list-style-type: none"> <li>• It is generally cheaper for the farmer than other systems (but not always, see text box: costs of bale grazing for examples).</li> <li>• It requires less land than pasture grazing.</li> <li>• Crops are sown in the spring and store nutrients through the autumn, giving a feed source over winter when grass is not growing.</li> </ul>	<p><i>Welfare:</i></p> <ul style="list-style-type: none"> <li>• Due to the severe poaching and lack of shelter that is typical in IWG, cows are at a considerable risk of cold stress and poor comfort from exposure and lack of dry lying areas.</li> <li>• Insufficient quantity of feed, cold stress and reduced lying times due to poaching can result in low body condition and nutrient deficiencies.</li> <li>• High energy crops can result in metabolic disease if the transition onto them is not managed well.</li> <li>• Early calving risks calves being born into mud and succumbing to exposure. Dams may not receive sufficient feed and supplemental requirements following birth. Cows may be transported to calving facilities while heavily pregnant.</li> </ul> <p><i>Environment:</i></p> <ul style="list-style-type: none"> <li>• Poaching leads to increased carbon and nitrogen emissions, contaminated ground water (due to waste runoff) and soil degradation.</li> </ul>
<p><b>On-off grazing using a stand-off area</b></p>	<p><i>Welfare:</i></p> <ul style="list-style-type: none"> <li>• If shelter and a soft lying surface is provided, cows are less vulnerable to cold stress and can lie down more comfortably than they might be able to at pasture.</li> </ul> <p><i>Environment:</i></p> <ul style="list-style-type: none"> <li>• Reduces poaching during poor weather events.</li> <li>• Reduces leaching of contaminants into the ground water.</li> </ul>	<p><i>Welfare:</i></p> <ul style="list-style-type: none"> <li>• Not all stand-off pads will provide shelter, so cows are still exposed to poor weather and are at risk of cold stress.</li> <li>• Stocking densities may be high while in the stand-off area, restricting cows from lying down, accessing water and feed, and carrying out normal social behaviours (such as avoiding aggressors).</li> <li>• The flooring may be concrete, which can become slippery, dirty and doesn't provide a comfortable lying surface for cows to rest.</li> </ul>

		<ul style="list-style-type: none"> <li>• Transitioning quickly between different feed sources can lead to metabolic (e.g. acidosis) or digestive issues.</li> </ul> <p><i>Other:</i></p> <ul style="list-style-type: none"> <li>• There is an initial infrastructure cost for building the stand-off area.</li> <li>• - Cows may be grazed far away from the stand-off area depending on availability of grazing land, and so will need to be transported to the stand-off area during poor weather.</li> </ul>
<p><b>Rotational grazing (hay bale winter grazing)</b></p>	<p><i>Welfare:</i></p> <ul style="list-style-type: none"> <li>• Cows spend more time lying and ruminating, show greater thermal comfort, have cleaner coats, can maintain body condition.</li> <li>• No transitioning between different feed sources, reducing the risk of metabolic disorders.</li> <li>• Cows can better meet their nutrition and energy requirements and maintain body condition.</li> <li>• Provides a comfortable lying surface - the bale litter helps to insulate the cows, keeping them warmer.</li> <li>• Bale litter can provide an area for cows to calve on, with calves being insulated from the cold ground and are not in mud, decreasing calf mortality.</li> </ul> <p><i>Environment:</i></p> <ul style="list-style-type: none"> <li>• Lower nitrogen emissions, preserving the integrity of the topsoil, improving nutrient availability and water infiltration, maintaining soil health and carbon sequestration, reducing sediment runoff.</li> <li>• - As a result of the improved soil health, the hay litter insulating the soil and seeds from the bale sowing into the paddock, the pasture regrows quickly and with better quality.</li> </ul>	<ul style="list-style-type: none"> <li>• Some paddocks will not be appropriate, for example those on steep ground.</li> <li>• It requires more land than intensive grazing systems.</li> <li>• Hay may not be readily available or is expensive depending on location and each year's harvest.</li> <li>• - More labour required to move cows between paddocks regularly and set out the bales on new paddocks.</li> </ul>

<p><b>Hybrid systems</b></p>	<p><i>Welfare:</i></p> <ul style="list-style-type: none"> <li>- Cows can choose between housing with deep bedding and plenty of space, and pasture where they can graze, browse, explore and have more space presenting the best welfare potential.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires specific infrastructure (housing, tracks etc) and field set up to work.</li> <li>• - Initial investment in infrastructure.</li> </ul>
<p><b>Silvopastural agroforestry</b></p>	<p><i>Welfare:</i></p> <ul style="list-style-type: none"> <li>• Animal health and welfare benefits include more varied diets better able to meet nutritional needs, allowing browsing behaviour, provision of shade and shelter to better thermoregulate and express behaviours such as resting, grooming and hiding, increasing the amount of time livestock can be grazed outdoors in more natural conditions.</li> </ul> <p><i>Environment:</i></p> <ul style="list-style-type: none"> <li>• Carbon emission mitigation can be achieved while not losing grazing land for livestock and increasing farm resilience to climate change impacts.</li> <li>• Improved water quality, soil health and integrity, carbon sequestration and biodiversity.</li> </ul> <p><i>Other:</i></p> <ul style="list-style-type: none"> <li>• - Potential for improved productivity and dual income from both livestock or pasture crop and tree crop.</li> </ul>	<ul style="list-style-type: none"> <li>• More farms practicing silvopastural agroforestry are needed to understand the economic gains.</li> <li>• - Not all land will be appropriate for this practice, and land will need to be converted e.g. time for pasture regrowth and trees to become established to receive the full benefits of the system.</li> </ul>

## Advantages of good wintering systems

### Animals:

- Providing comfortable, dry lying areas means cows spend more time lying and ruminating, show greater thermal comfort and have cleaner coats
- Reduces the risk of metabolic disorders
- Cows can better meet their nutrition and energy requirements and maintain body condition.
- Providing a warm, dry place to calve, decreasing calf mortality
- Hybrid systems provide cows with choice of being indoors or outdoors, offering individual preferences

### Environment:

- Lower nitrogen emissions
- Preserving the integrity of the topsoil
- Improving nutrient availability and water infiltration
- Maintaining soil health and carbon sequestration
- Reducing sediment runoff
- Quicker pasture regrowth, with higher quality

### Farmers:

- Lower costs when outwintering on pasture compared to indoor housing
- Increasing worker satisfaction (despite potential higher labour demands) when cows and calves have better health and welfare



### Case study: Bale Grazing at Freedom Acres Dairy Farm, New Zealand

- Freedom Acres has been operating a regenerative system for several years.
- They have ~500 crossbred cows, on 163 hectares.
- They have transitioned from kale to hay bale grazing.
- In the first winter season, they started trialling three paddocks. By the second season, they wintered half of their herd on hay bale grazing. They are currently in their fifth season.
- To set up for bale grazing, they ensure the paddocks have a pre-grazing cover of 3500-400 kgDM / ha.
- Hay bales are set out in a grid, approximately 30 bales / ha, spaced 18-20 m apart.
- Half a hectare is allocated for every 100 cows over three days.
- They chose their paddocks carefully, avoiding steep slopes, any ponding areas, choosing well-draining soils, and move cows to the next paddock as wet weather arrives, returning to the original paddock once conditions are drier.
- Quality hay that contains seeds is a crucial aspect to lead to natural reseeding.
- To trial bale grazing, they recommend starting with one paddock or a few hectares. Place hay bales in a grid at 30 bales / ha, and use any size of mob, adjusting the paddock sizes accordingly.
- They quantified welfare outcomes (ruminating and lying times, coat cleanliness) and found that cows on bale grazing spent more time ruminating and lying compared to cows on kale crop. Cows on bale grazing also had higher skin temperatures indicating improved thermal comfort. Cows on bale grazing had cleaner coats.
- They also quantified environmental outcomes and found improvements in treading pressure and consequential soil damage, grass cover, soil erosion, pasture regrowth and Nitrogen (N) leaching in bale grazing compared to kale grazing. They found that N leaching was 0.90 kg N / cow in kale grazing compared to 0.24 kg N / cow in bale grazing. This means a 75% reduction in nitrogen loss compared to crop-based grazing.
- See [Southern Dairy Hub](#) and [Ditchfield et al. \(2024\)](#) for more information.



© Environment Southland Regional Council, accessed from <https://www.es.govt.nz/about-us/envirosouth/2023-stories/august-2023/winter-bale-grazing-trial-success-backed-by-positive-data>



# Main welfare challenges associated with winter grazing

The main welfare concerns for dairy cows in outdoor grazing systems over winter are thermal comfort, cow comfort, nutrition and early calving. There are different mitigation solutions that can be implemented to reduce the impact of these welfare issues.

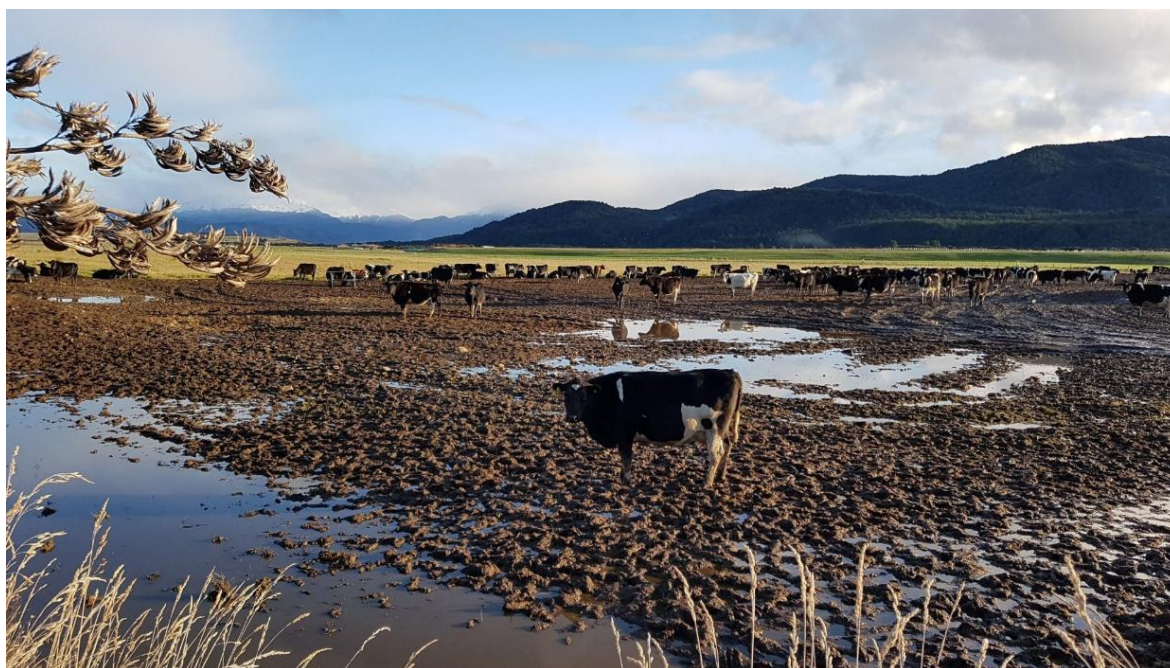
## Thermal comfort and shelter

In countries where winter grazing is practiced, winter weather can be severe, with cold temperatures and high rainfall, often for prolonged periods. Also, cows may not have access to shelter (artificial or natural).

Wind and rain reduce the natural insulative properties of the coat, causing an increased rate of heat loss. Cows with low body condition or are newly dried off are especially susceptible to cold stress. Cows with insufficient shelter (e.g. not effective or not enough for all cows to use at the same time) and no shelter are vulnerable to cold stress.

Wind and rain can also cause cows to reduce their feed intake and lying time (Schutz et al., 2024; Tucker et al., 2007). In addition, cold and wet weather can have a negative impact on milk production (Bryant et al., 2007).

Barriers to using shelters at pasture identified by farmers include infrastructure costs, return on investment, not owning the land used, time and a lack of knowledge of shelter initiatives and their success (Fisher et al., 2019).



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Best practice recommendation:

Cows should be provided with shelter which is accessible at all times and can be used by all of the cows at the same time. Paddocks with existing natural shelter (i.e. trees or large hedges) should be used during winter and planned for use during forecast poor weather. Artificial shelter can be provided in paddocks, although this poses an initial cost for farmers, and may not be possible if farmers are using paddocks owned by a third party.

Cows should have enough feed to meet their nutritional needs - supplementary feed should be provided during forecast poor weather. In particular, bale grazing can provide lying areas as cows can use the hay for lying if the paddocks become poached.

Cows can be moved off bare paddocks during forecast wet, windy and cold weather onto off-paddock areas that provide comfortable lying areas, shelter and sufficient feed. This requires infrastructure and moving cows which may not be feasible in all situations.

### **Cow comfort**

IWG in wet conditions that result in pugging and muddy soils affect the lying behaviour of cows. Managing dairy cows in muddy outdoor areas has been raised as an animal welfare concern among New Zealand dairy industry stakeholders (MPI, 2021).

Cows typically lie for 8-12 hours per day. However, during heavy rainfall or in severely wet and poached ground, cows have a large reduction in their lying time (Neave et al, 2022; Chen et al., 2017; Schütz et al, 2019).

Insufficient time spent lying results in poor welfare for cows, for example, cows deprived of lying for 4 hours exhibited leg stamping, repositioning, shifting weight between legs and butting, indicating a level of discomfort (Cooper et al., 2007; Cooper et al., 2008). In addition to affecting welfare, reduced lying has negative impacts on milk production (Munksgaard et al., 2005; Lovarelli et al., 2020).



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*Best practice recommendation:*

Cows should be moved onto new paddocks before severe poaching occurs. Rotational grazing and on-off grazing systems have a lower risk of poaching than intensive grazing systems, as long as they are well-managed.

Cows should have access to dry, comfortable lying areas, with enough space for all cows to lie down at the same time. Rotating between paddocks to reduce poaching and using drier paddocks during forecast wet weather can be carried out (e.g. using [a winter grazing plan](#); see [selecting paddocks](#)). Bale grazing can provide lying areas as the hay gets dragged out onto the ground. Well-designed stand off pads with comfortable lying areas (i.e. not just bare concrete) and shelter should be used where possible.



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## Nutrition and feed access

Energy requirements are generally higher over winter, especially in cold and wet conditions. As cows eat off the crop or pasture, they have less access to sufficient quantities of feed to meet those energy requirements if they are not provided with supplemental feed. Subordinate cows may be less able to access what little food is available as they are pushed off by dominant cows. This risks cows becoming thin, leaving them susceptible to illness and is a concern for pregnant cows (Chebel et al., 2018).

Winter grazing on crops can pose health issues such as bloat, nitrate poisoning, mineral deficiencies and insufficient dry matter intake with brassica crops (DairyNZ, 2014). For example, acidosis is common with fodder beet (DairyNZ, 2014).



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### Best practice recommendation:

Cows need to be given sufficient forage to meet their energy requirements. This can be done by rotating between paddocks and providing supplemental feed (e.g. hay or silage bales), for all cows to access simultaneously.

Cows should be monitored regularly, with body condition scored (ideally weekly) and any thin or ill cows treated immediately.

Transitioning on and off forage crops slowly and with regular checks is important to reduce health issues like metabolic disease.

## Calving during winter

There is a risk that cows may calve while on winter grazing, posing significant welfare concerns for the newborn calf from exposure and if they are born onto severely poached



ground. Also the dam may not receive sufficient nutrition in the last 3-4 weeks of pregnancy and following calving (DairyNZ guidance for farmers).



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*Best practice recommendation:*

Cows should be moved to calving facilities prior to when they are due to calving, particularly if there is a risk of poor weather. Cows should be monitored at least daily in the run up to their calving date to pick up any early calvings.



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# Wintering practices for dairy cows:

## Summary of recommendations

- Cows should be provided with **shelter** (artificial or natural) which is accessible at all times and can be used by all of the cows at the same time.
- Cows should have access to **dry, comfortable lying areas**, with enough space for all cows to lie down at the same time.
- **Bale grazing** is an excellent option for wintering cows, delivering both welfare and environmental benefits. Using hay bales provides dry, comfortable lying areas as the hay gets dragged out onto the ground, meaning cows rest and ruminate for longer, show greater thermal comfort, have cleaner coats, meet their energy and nutrition requirements and can maintain body condition, and reduces calf mortality. As the hay protects the topsoil, it reduces heavy poaching of the ground, improving soil health and pasture regeneration.
- **Rotating between paddocks** to reduce poaching and using drier paddocks during forecast wet weather can be carried out. Rotational grazing systems which incorporate a regenerative farming approach, such as adaptive multi-paddock grazing (AMP), have both animal welfare and environmental benefits, mimicking the natural grazing patterns of large wild herbivores, improving carbon sequestration, biodiversity and soil health and allowing cows to graze more naturally.
- **Well-designed stand off pads** with comfortable lying areas (i.e. not just bare concrete) and shelter should be used where possible, especially for forecast poor weather. Stand-off areas need to provide shelter, have soft flooring to provide comfortable lying areas and the stocking density should be controlled so that cows can all lie down and access feed and water simultaneously, and can carry out normal social behaviours.
- Cows need to be given **sufficient forage** to meet their energy and nutrition requirements. This can be done by rotating between paddocks and providing supplemental feed (e.g. hay or silage bales), for all cows to access simultaneously. **Body condition** should be assessed regularly to prevent cows becoming thin.
- Cows nearing calving should be moved to appropriate paddocks which are dry and have shelter or to **calving facilities** if poor weather is forecast.
- **Contingency planning** for any system is needed, to reduce the impact of extreme weather on animal welfare and the pasture / soil. E.g. identify drier paddocks with shelter, move to stand-off pads, cows approaching their calving date should be moved to calving facilities, provide supplemental feed and increase the number of checks during extreme weather.

## Useful links:

- Paddock selection <https://www.dairynz.co.nz/environment/winter-grazing/winter-crop-paddock-selection/>
- Best practice tips on wintering <https://www.dairynz.co.nz/news/best-practice-tips-on-wintering/>
- Improving your wintering system <https://www.dairynz.co.nz/resources?spotlight=10071>
- Winter grazing plan <https://dairynz-web.aueast01.umbraco.io/media/153clymf/your-winter-grazing-plan-on-the-ground-action-this-winter-2024.pdf>
- Winter grazing checklist <https://www.fonterra.com/content/dam/fonterra-public-website/fonterra-new-zealand/campaign-images/codof/docs/2024-winter-grazing-checklist.pdf>
- What to look out for in paddocks over winter [https://www.dairynz.co.nz/media/zfpikdye/what-to-look-out-for-in-the-paddock-during-winter-poster\\_v6.pdf](https://www.dairynz.co.nz/media/zfpikdye/what-to-look-out-for-in-the-paddock-during-winter-poster_v6.pdf)
- Cow care in winter <https://www.dairynz.co.nz/environment/winter-grazing/cow-care-in-winter/>
- Winter Grazing Guide [https://catalystag.co.nz/assets/P62421-Winter-Grazing-Guide\\_FA-WEB.pdf](https://catalystag.co.nz/assets/P62421-Winter-Grazing-Guide_FA-WEB.pdf)
- Pugging guidance <https://environment.govt.nz/assets/publications/Pugging-Guidance-for-intensive-winter-grazing.pdf>
- Hay bale grazing best practice guide <https://www.quorumsense.org.nz/news/hay-bale-grazing-a-best-practice-guide>
- Example of AMP grazing for a beef suckler herd <https://www.faifarms.com/case-study-outwintering/>
- Dairying and silvopastoral agroforestry <https://teagasc.ie/wp-content/uploads/media/website/crops/forestry/research/Why-dairy-farming-and-silvopastoral-agroforestry-could-be-the-perfect-match.pdf>
- Research summary of silvopastoral trial <https://www.organicresearchcentre.com/resources/resource-library/the-silvopastoral-trial-at-elm-farm-research-digest/>
- Example of agroforestry in Scotland <https://www.soilassociation.org/blogs/2021/august/3/pairing-agroforestry-with-livestock-the-major-benefits/>
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