

FARM INFRASTRUCTURE – THE REAL STORY BEHIND STANDOFF/WINTERING FACILITIES

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The use of wintering facilities and standoff pads are becoming increasingly popular on New Zealand dairy farms – particularly in regions with more adverse weather conditions, such as Southland. Numerous studies have concentrated on the financial and environmental advantages and disadvantages of these structures on a farm system. These studies often show a high capital cost which can reduce the overall profitability of the structure. The common solution is to increase farm intensification to partly mitigate and offset the infrastructure cost. However as a flow on effect - farm intensification often leads to an erosion of the potential environmental benefits of the structure.

The question then remains – if the financial and environmental benefits of installing a wintering/standoff facility are minimal, why are we seeing a huge increase in the number of such facilities on New Zealand dairy farms. A DairyNZ-AgFirst study of five South Island farms with free stall barns found that farmers had generally invested in barns for farm management reasons; such as reducing pasture damage, better utilisation of supplementary feed, better control of grazing management and feeding, better conditions for livestock in adverse weather and reducing the cost of wintering cows off-farm. As discussed above, financial and environmental reasons were further down the list.

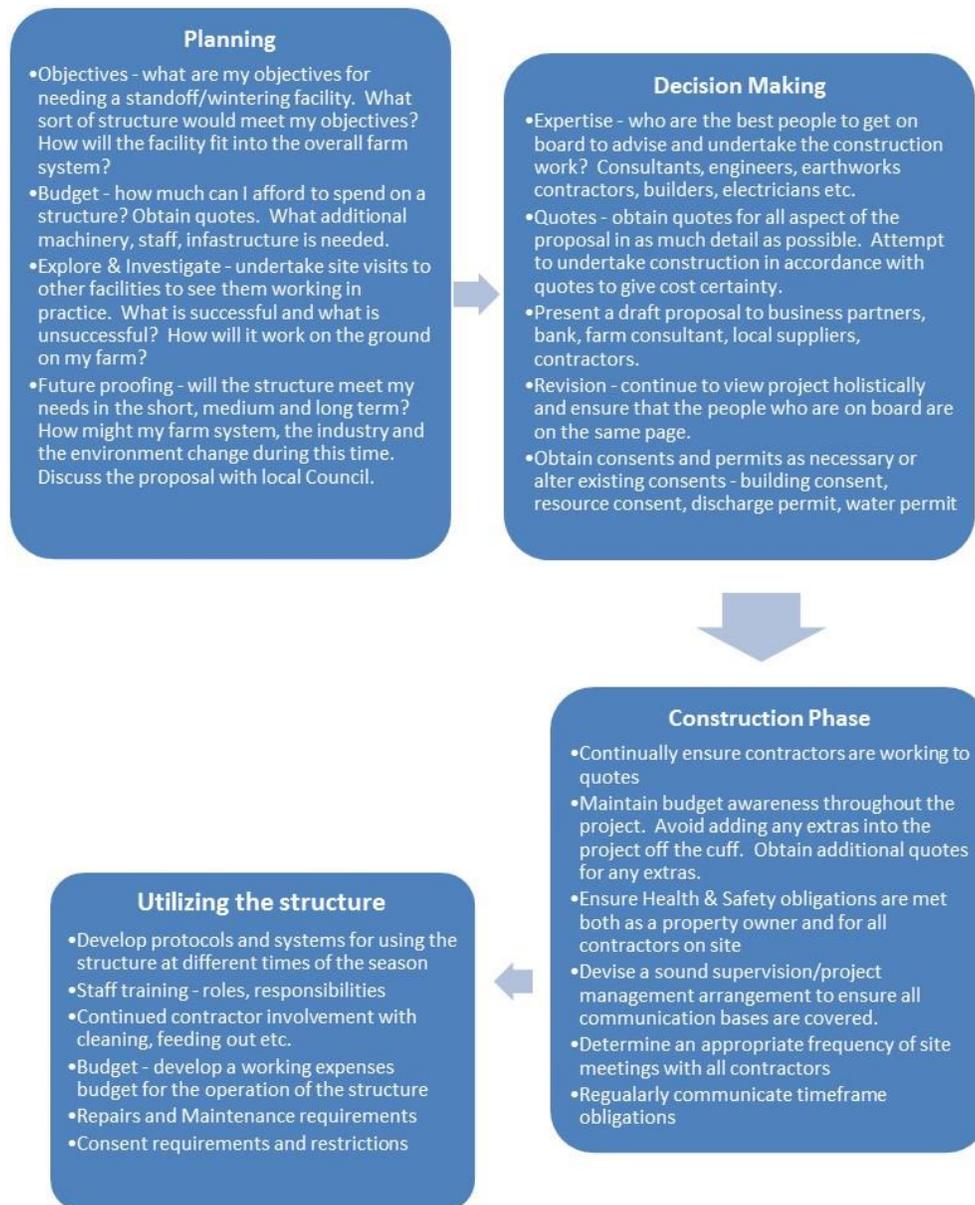
The difficulty arises that it is very hard to accurately calculate and measure the implications on farm business profitability of reduced pasture damage, better body condition scores leading into calving and better control of grazing management and feeding for example. It is even more difficult to isolate the implications of the structure because many factors play a part in these farm management implications, such as weather, milk payout, farm system, herd genetics, staff

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management etc. The result is that impacts on farm business profitability from utilizing a standoff/wintering facility may be best analysed on an individual farm basis rather than comparing between different farms and operations.

The presentation discusses the changes that farmers have witnessed by fully utilizing standoff/wintering infrastructure in their farm systems. The positive and negative implications on profitability will be discussed anecdotally. Despite these difficulties in generating exact impacts on farm profitability, the process by which a farmer/owner embarks on to construct and utilize a standoff structure is fairly generic.

The planning through to utilisation process



Additional considerations when installing a wintering/standoff facility

Effluent storage

Most standoff/wintering structures will need to be approved and consented by the Regional Council by way of either a new or amended Discharge Permit. You will need to demonstrate to the Council that existing or new effluent storage facilities are sufficient to cater for the additional effluent generated by the standoff/wintering structure. Effluent generation estimates can be difficult to calculate given variables in feed intake at different times of the year, breed of animal, substrate material in the structure and duration of use during the year.

An example of how to size an effluent storage structure for a full enclosed bark chip wintering shed:

The shed houses 600 cows for approximately 60 days and the structure is then used throughout the season as a standoff pad. The bark chip is underlain with washed gravel and nova pipe drains which act to collect urine leachate through the bedding material. The bark chip bedding collects dung over the course of the winter period which will be partially absorbed into the bark chip. The dung collected on the bark chip remains in situ until the end of winter when the cows leave the shed. The dung/bark chip is then applied to land as a sludge and does not enter a storage facility.

The wintering shed has 3.6m concrete lanes which collect dung and urine slurry deposited where the cows eat. The concrete lanes are expected to collect approximately 60% of the total dung and urine deposited in the shed. These lanes are scraped daily directly into the adjacent sludge bed. The sludge beds are sized to ensure all slurry scraped from the concrete lanes can be stored during the entire winter period. The weeping walls remove liquid from the slurry which is then pumped to the effluent storage pond.

The Massey Effluent Pond Calculator is a tool which is used to calculate effluent storage volumes for farm dairy effluent. Currently the calculator is not suitable to use to predict effluent storage volumes from a wintering shed with a bark chip bedding and a manual calculation is

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needed. The effluent volumes for the wintering shed effluent are predicted in the attached spreadsheet:

Copeland Farming 22-Sep-15 Q Scandrett Dairy Green Ltd
Feed Pad Effluent Volumes & Storage Requirements

Month	Solid Effluent Collected In Sludge Bed			Effluent Volume Daily per Cow			
	Cow Numbers	Hours/Day	Days	Solids (L)	Urine (L)	Solids Total M ³	Liquid Total M ³
June	600	24	21	6	8	76	101
June	600	24	9	5	8	27	43
July	600	24	30	4	8	72	144
August	600	12	30	2	8	36	144
Totals			90			210.6	432

Based on 16 and 10 Kg/DM/Day/Cow

Month	Rainfall Allowance On Catchment Area Calculations:				Volume Totals m ³	
	Apron Area m ²	Silage Pad	Loafing	Rainfall mm	Apron	Silage
June	1,512	0	0	100	151.2	0
July	1,512	0	0	75	113	0
August	1,512	0	0	80	120.96	0
Totals				255	386	0

Assume 50% retained in sludge beds

Combined Effluent Totals m ³	
Solids Generated	427
Liquid Generated	602

← Required in storage pond volume - pumping hours

Irrigation Volumes		
Daily Irrigation Volume L	Irrigation Days*	Total m ³
18,000 (1 hour pumping)	26	468
36,000 (2 hours pumping)	26	936

Liquid Generated Minus Irrigation Volume	
1 hour pump	134 m ³ of storage required
2 hour pump	-334 m ³ of storage required

*Based on a soil moisture deficit of 4 and 5 mm

The top box calculates the amount of solid and liquids generated when the full herd is fed between 10 and 16 kg DM/day/cow. The total per month has been divided by 60% based on the assumption that 60% of both the dung and urine will land on the concrete lanes and 40% will land on the barkchip loafing area. Therefore:

- the solid effluent volume that needs to be stored in the sludge bed is equal to 210.6m³ of solid plus 50% of the liquid retained following separation (which is now solid) = 427m³.
- The liquid effluent volume that needs to be stored in the sludge bed is equal to 386m³ of rainfall on the concrete apron plus the 50% liquid component from the concrete lanes = 602m³

The total storage requirement in the sludge bed is 1,029m³. The design volume of 1,204m³ is sufficient to cater for the wintering shed effluent.

The slurry nature of the wintering shed effluent means that the sludge beds are the most appropriate structure to use as storage for the slurry collected over winter. For this reason, the sludge beds were sized to ensure that all wintering shed effluent generated over the winter period can be stored. The sludge beds were also sized larger to cater for effluent generated for 30 days after winter when the shed can be used as a standoff area.

During the winter the sludge beds are continuously separating the liquid effluent using the weeping walls. The calculations above show that 602m³ of liquid effluent will be transferred to the

main effluent storage pond by the end of winter. The bottom box has calculated that there are an average of 26 days during the period 1st July to 31st August (based on the last 33 years of data) where irrigation can occur. This means that at least 468m³ of liquid effluent can be applied to land based on 1 hour of pumping rather than stored in the effluent pond. The remaining 134m³ of liquid effluent can be stored in the effluent storage pond without compromising the storage capacity for farm dairy effluent.

Overseer implications

Most farms are already using Overseer to generate nutrient budgets to give an indication of nutrients coming into the property, how they are used and distributed and predict what can be lost from the property via leaching. The Overseer budget works backwards from production to calculate pasture growth needed to fulfil animal feed requirements. Overseer can model any farm system provided the inputs are genuine and realistic and based on long term averages. The inclusion of a wintering/standoff facility in an Overseer scenario can potentially reduce modelled nutrient losses. This can be advantageous where nutrient limits exist or where a farm system is attempting to achieve environmental targets.

The bark chip wintering shed described above can be modelled in Overseer in two ways. Primarily the wintering shed is modelled as a facility which is used 24 hours per day/ 7 days per week for the duration of the winter. Cow numbers can be specified during this period to account for the removal of calving mobs. Secondly, the wintering shed can be modelled as a standoff pad which is used periodically throughout the season i.e., during adverse weather. The modelling of the wintering shed as both a wintering facility and a standoff pad under both scenarios can be extremely advantageous in reducing modelled nutrient losses. The combination of the two scenarios in the program reduces the instances where the model predicts nutrient losses during high risk drainage periods such as late autumn and the winter period. Of course, the modelling of these scenarios should follow what is done on farm in practice. On farm, the advantage of using the wintering shed

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in this manner should significantly reduce pasture damage and limit concentrated losses from dung and urine patches during high leaching periods.

The image below shows how the wintering shed described above is inputted into Overseer.

Wintering pad, animal shelter or housing details

Pad type ▼ ◀

Bunker management

Bunker lining material ▼ ◀

Time between first adding animals and cleaning out of bunker ◀ months

Liquids drained away (added to liquid effluent)

Concrete feeding apron

Concrete feeding apron is present and used ?

Solids management

Describe how solid effluent is managed.

Solids management method ▼ ◀ ?

Storage method before solids are spread ▼ ◀

Time in storage ◀ months

Liquid effluent (bunker or concrete)

Describe how liquid effluent is managed.

Effluent treated the same as the farm dairy effluent ?

The image below shows how the wintering shed can be modelled as a standoff pad in Overseer. The inputs describe the average number of hours the cows are stood off in the shed during each month of the year. The use of the shed as a standoff pad reflects one particular farm system where the shed is used frequently during the autumn months when the weather is more unfavourable and average pasture cover needs to be maintained going into winter.

? Show help

Time animals are on the feed pad

Enter for each month the percentage of milking cows on the feedpad and the hours spent on the pad per day. Feedpads can only be used during the milking season.

Percentage of milking cows (%)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
100	100	100	100	100	0	0	0	0	100	100	100

Fill to the right ?

Hours per day on feed pad

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.0	5.0	5.0	5.0	5.0	0.0	0.0	0.0	0.0	4.0	4.0	2.0

Fill to the right ?

The imported feed section in Overseer must be consistent with how the standoff pad is managed by ensuring that the quantities of feed imported are sufficient for the duration that the standoff pad is used each month. In this instance, 115 tonnes of cereal silage is used in total over the year when the shed is used as a standoff pad.

? Show help

Supplements imported

Describe here any imported feed supplements and where they are fed. 'Imported' means (a) brought in from outside the farm or (b) retrieved from farm storage.

When including custom supplements remember these must be entered into the database first before being entered here. [Click here to create or edit custom supplements](#)

Supplement description	Dry weight (t)	Destination
Purchased, Process byproducts, Palm kernel meal	150	Dairy on blocks
Purchased, Process byproducts, Molasses	38	Milking shed feeding - ...
Purchased, Silage, Cereal silage	115	Dairy - Feed pad

Supplement source: Purchased Storage conditions: Average

Category: Silage

Supplementary feed: Cereal silage

Weight: 115 tonnes Weight on dry weight basis

Purchased, Silage, Pasture good quality silage 600 Dairy - Wintering pad, a...

Add supplement Total dry weight: 903 t DM Clear all supplements

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The same method is used when the shed is modelled as a wintering facility. The total quantity of feed imported needs to be consistent with the duration that the cows are in the shed and also appropriate for the type of animals and expected production.

The resulting effect on modelled nutrient losses will differ under each farm scenario, however the modelling and on-farm use of the wintering shed as both a wintering facility and standoff pad should provide environmental benefits and be favorable under a nutrient limit restriction.

Summary

There are a number of considerations to address when constructing a wintering/standoff facility on farm. The facility needs to be viewed holistically within your specific farm system -at present and into the foreseeable future. Although environmental or financial benefits may not be forefront drivers for the construction of a facility, these benefits will exist in some shape or form provided that the planning and utilization of the facility is as faultless as possible.