7. ANIMALS

Important information for managing a herd. Body condition score targets, breeding dates, calf rearing, animal health and welfare requirements.

7. ANIMALS

Body condition score recommendations

Body condition score (BCS)		
BCS	3.0	BCS less than 3.0 is emaciated
BCS	4.0	Minimum at mating
BCS	5.0	Calve at 5.0 for mature cows
BCS	5.5	Calve at 5.5 for first and second calvers
BCS	6.0	Feeding cows to achieve BCS above 6.0 is not efficient

Cows calving 1 BCS lower than target will:

- take 8-10 days longer to start cycling
- result in a later calving date next year
- produce approximately 15 kg milksolids less in the following lactation.

Cows calving at BCS 6.0 (fat) rather than BCS 5.0 will:

- have lower intakes than thinner cows post-calving
- mobilise more BCS post-calving and are more prone to metabolic diseases.

Realistically dry cows only gain ½ BCS in 30 days unless very well fed with high quality supplement. Do not expect cows to gain BCS during their final month of pregnancy.

Reproduction and milksolids benefits associated with body condition score for a 500kg Lwt cow

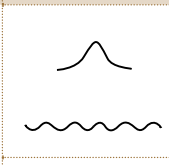
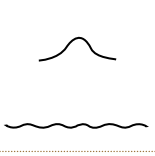
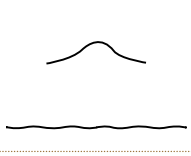
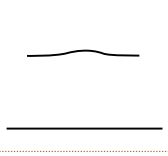
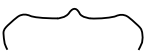
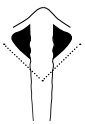
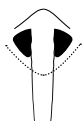
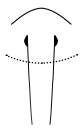
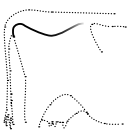
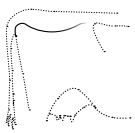
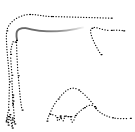
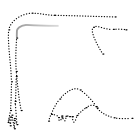
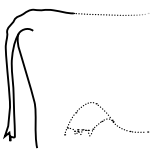
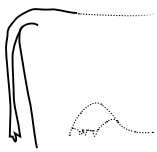
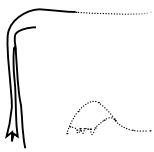
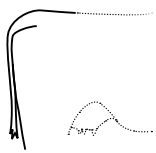
BCS change	MS response kg MS	$5.50/kgMS	**Repro benefits** (over two seasons)	Total $/BCS
From 3.0-4.0	18.0	$99	$40	$139
From 3.5-4.5	12.5	$69	$40	$109
Rule of thumb	15.0	$83	$40	$123

Drying off time (days from calving) based on cow body condition score and feed type

Body condition score		Days from Calving	
Cow	Rising 3-year old	Autumn pasture only	Well-fed with high quality supplement
3.0	3.5	160	120
3.5	4.0	130	100
4.0	4.5	100	80
4.5	5.0	70	60

Includes 10 days when cows are being dried off and not gaining weight and 30 days when cows do not gain weight before calving

What to look for when body condition scoring

BCS	3.0	4.0	5.0	6.0
Backbone - Rear view - Side profile				
Long Ribs				
Short Ribs				
Hips				
Pins				
Tailhead				
Rump				
Thigh				

Gestation length (term of pregnancy)

		Average period (days)	Range (days)
Cow	(9 months plus 9 days)	282	279-289

Breeding dates and periods

Conception date		Expected calving date	
July	9	April	17
July	23	May	1
August	6	May	15
August	20	May	29
September	3	June	12
September	17	June	26
October	1	July	10
October	15	July	24
October	29	August	7
November	12	August	21
November	26	September	4
December	10	September	18
December	24	October	2
January	8	October	17
January	22	October	31
February	5	November	14
February	19	November	28
March	5	December	12
March	19	December	26
April	2	January	9
April	16	January	23
April	30	February	6
May	14	February	20
May	28	March	6
June	11	March	20
June	25	April	3

Note:

1. Proven sires with short gestation length genetics are used in herds to calve some cows earlier than 282 day's term, to compact the calving pattern and give these cows more days to recover before next mating.
2. Expected calving reports now adjust for gestation length Breeding Values (BV) for individual cows using a formula

e.g. Conception date +282 days + BV gestation length = expected calving date.

That explains why some cows have due to calve dates on the expected calving report prior to the herds planned start of calving date, which is based on the standard 282 days.

InCalf herd reproduction targets – calving and mating

Measure	Target	Seek professional advice if
% calved by week 3	67%	<60%
% calved by week 6	88%	<75%
% calved by week 9	98%	<92%
3-week submission rate	90%	<81%
Conception rate	60%	<53%
6-week in-calf rate	78%	<68%
Not-in-calf rate (6 weeks)	22%	>25%
Not-in-calf rate (9 weeks)	13%	>17%
Not-in-calf rate (10 weeks)	12%	>16%
Not-in-calf rate (11 weeks)	11%	>15%
Not-in-calf rate (12 weeks)	10%	>14%
Not in-calf rate (15 weeks)	8%	>12%
Length of total mating	<12 weeks	>12 weeks

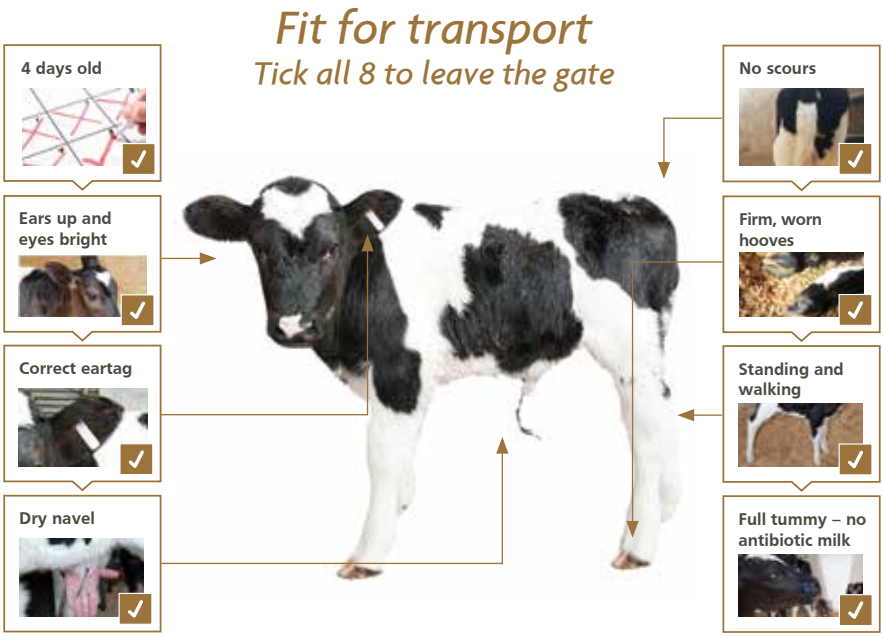
Note:

1. InCalf is an integrated approach to improving herd reproductive management, by setting one's own targets and striving for incremental gains in performance, year-by-year, through a 4-step continuous improvement programme. For more information go to **dairynz.co.nz/incalf**.
2. The InCalf Fertility Focus report available through licensed providers CRV, LIC and Infovet, automatically calculates the above measures and compares your herd's results with target.

Bobby calves

Regulations governing the selection, transportation and processing of young calves were introduced in 2016/17. Failure to meet the requirements of the regulations may result in an infringement and fine.

Fit for transport



The owner or person in charge must make sure that all calves are healthy, strong and have been recently fed to be considered fit for transport. Prior to transport, young calves must receive sufficient milk to ensure that their needs are met during the total length of the journey that they will take. For calves destined for slaughter, this also includes the time that they will spend in holding pens before they are slaughtered.

Any calf considered for transport off farm must:

- be at least 4 days (96hrs) of age
- be alert and able to stand and bear weight evenly on all 4 limbs
- move freely and protect itself from being trampled or injured by other calves. The calf's hooves are firm and worn flat, not bulbous with soft unworn tissue.
- have a shrivelled navel.

Transport times

Young calves under the age of 14 days must not be transported on journeys that take longer than 12 hours, nor can they be transported across Cook Straight.

Loading facilities

The farm must provide a facility, or make available other means, to allow calves to walk safely onto a stock truck. Examples of this include a raised platform, a loading ramp, an embankment or lowering the height of the vehicle track relative to the calf shed.

A stock truck is defined as having a loading height of 90 centimetres or more. Loading facilities are not required for vehicles with a loading height of less than 90cm such as utes or farm trailers.

Shelter

All calves awaiting transportation must have access to shelter that provides protection from the weather and keeps them warm/cool and dry. The shelter must be well ventilated and constructed so that calves can stand up and lie down in a natural posture. The facility must be kept clean and be safe to use

Maximum time off feed

Maximum time off feed before slaughter requires that a young calf must be slaughtered as soon as possible after arrival at the slaughter premises, and within 24 hours of the last feed on farm. If the calf is unable to be killed within the 24 hours calves can be fed at the slaughter premises. To allow the processors to meet their obligations a declaration stating the time of last feed on-farm must accompany each consignment of calves when they leave the farm.

Heifer calf rearing

Colostrum

- Colostrum for new born calves should be first milking (gold colostrum) ONLY. All other milkings are classified as transition milk and are suitable for calves over 24 hours.
- The calf should drink 4 to 6 litres of fresh gold colostrum during the first six to twelve hours of life in two separate feeds to get an adequate supply of immuno-globulins (antibodies).
- To check your system, your vet can take blood samples of 12 healthy calves, between one and seven days of age, for estimating antibody levels. This is the best way to know if your calves are getting enough antibodies from colostrum
- Consider measuring the quality of your colostrum with a Brix refractometer as it cannot be assumed that the colostrum you are providing is of good quality. Brix higher than 22% are best for newborns.
- Store colostrum in lidded drums, in a cool place, or a refrigerated vat. Ensure it is stirred twice a day with a stirrer ONLY used for colostrum and hung up to avoid touching the ground.
- If refrigeration or freezing is not possible, a preservative, such as potassium sorbate, can be added to stop the rapid decline of antibodies. Yoghurt does not preserve colostrum quality. Colostrum can be stored frozen for up to six months. Thaw in hot water, do not microwave.
- Bacteria in colostrum can decrease its quality and prevent calves from absorbing antibodies. Wash any buckets, storage containers, and feeders after every use with hot water, detergent and scrubbing.

Calf rearing rations

Feed comparisons

All of the following quantities of different feeds can supply about 3 MJ ME to the calf:

- 1 litre of whole Friesian milk (fresh, acidified or stored colostrum)
- or 0.9 litres of whole Jersey milk
- or 0.14 kg of whole milk powder
- or 0.16 kg fat fortified milk powder.

Calf rearing key points

- Calves need to be fed milk for at least the first four to six weeks. Some systems extend milk feeding up to 10 weeks
- Sufficient milk to meet all their needs must be fed for the first two to three weeks as their digestive system will not be sufficiently developed to deal with "hard feeds"
- Calves can be fed alternatives to milk (or milk replacer), from week two to three onwards, and milk reduced after week three
- Meal can be offered from week one onward. Meal needs to be high quality, fed fresh every day and kept clean and dry
- Calves need access to clean water at all times.

Daily intakes (litres) of milk (5.0% fat and 3.7% protein) for calves to gain weight to weaning

Liveweight of calf (kg)	Daily Lwt gain (kg Lwt/day)				
	0.63	0.71	0.83	1.00	1.25
	Litres of milk				
40	5.8	6.4	7.3	8.5	10.4
60	6.2	6.8	7.7	8.9	10.8
80	6.5	7.2	8.2	9.3	11.2

Low volume milk systems

- Calves are fed ten percent of their body weight (i.e., starting from 4-5 L/day) for up to 10 weeks of age.
- Restricting the volume of milk fed encourages the calf to eat more meal and leafy pasture, which promotes earlier rumen development
- Free access to good quality meal and fibrous feeds (good quality hay, leafy pasture) from first week
- Continue to feed meal until eating 1.0-1.5 kg/day and hold at this level
- Calves may lack energy in the first 2-4 weeks, which can increase risk of disease and slow growth
- Economics depends on relative cost of milk and meal, with best approach involving early weaning at 4-6 weeks of age

High volume milk systems

- Calves are fed 20 percent of their body weight (i.e., starting from 8-12 L/day) until a stepwise weaning process needs to occur to encourage meal intake, and rumen development.
- Calves tend to be more satisfied and exhibit more natural behaviours
- Calves tend to be less susceptible to disease during the pre-weaning period and reach higher weaning weights
- High quality concentrate meal needs to be fed for two to three weeks after milk feeding ceases.

Weaned calf

- Requires at least 16% crude protein (CP); but ideally 20% CP
- Most if not all commercial supplements should supply 16-20% CP
- Homemade mixes (plus fresh pasture and minerals, vitamins and a coccidiostat (e.g. Bovatech or Rumensin). Soya is the best source of protein, due to the amino acid profile. Other protein resources can be used:
  - 80% kibbled maize; 20% soybean
  - 60% barley or maize; 30% PKE; 10% soybean.
- PKE is a suitable feed for weaned calves providing it does not make up more than 10-15% of diet.

Treatment of diarrhoea in calves

Calf scours is a broad, descriptive term referring to diarrhoea in calves. Calf scours is not a specific disease but the clinical sign of a disease complex with many possible causes. Scours occurs when normal movement of water into and out of the digestive tract is disrupted, resulting in water loss and dehydration. Loss of body fluids through diarrhoea is accompanied by loss of body salts which can lead to severe depression in the calf and eventual death.

Non-infectious diarrhoea (nutritional scours)	Caused by changes to the feeding program. Not usually severe enough to cause death, non-infectious diarrhoea can weaken the calf and make it more susceptible to infectious diarrhoea. Temperature: normal – 38-39.5°C.
Infectious diarrhoea	Caused primarily by viruses, bacteria and protozoa. Identifying the infectious agent causing diarrhoea is an important part of developing a sound prevention program. Temperature: fever 39.5-42°C.
Mild to moderate diarrhoea	Continue milk feed and add electrolyte directly to milk diet, plus water ad lib.
Moderate/severe diarrhoea	Day 1: Electrolyte AM, milk lunch time electrolyte PM Day 2: Milk AM, electrolyte lunchtime, milk PM Day 3: as above or back to milk.

- Isolate to sick bay immediately
- For infectious diarrhoea consult your vet
- Oral electrolyte is easy to feed and successful in treating diarrhoea
- All calves (even those being treated) need to have clean, fresh ad-lib access to water
- Home brew mixes: rarely are home brew electrolyte mixes effective, as most lack enough of the vital ingredients of salts and energy
- Clean bedding area regularly.

Electrolyte Solution

- Feed electrolyte solution at least 2 hours before or after a milk feed but a milk feed should be given every day.
- Talk to your vet about a suggested electrolyte regime for your calves.

Herd replacement rate

New Zealand dairy cows have an average productive life of 4.5 lactations, thus requiring a replacement rate of 22% of heifers entering the herd.

The optimal replacement rate for maximising profit has been estimated at 18%. This considers the trade-off between the costs of younger animals (including reduced production until they reach maturity) versus the increased lifetime profitability of higher genetic merit animals. The replacement rate is expected to cover the final not in-calf rate, culls, all deaths on farm, and any planned herd growth.

Optimal target age structure for a herd

(% of herd for each age group)

Age (years)	2	3	4	5	6	7	8	9	10+
% Dairy Herd	18	16	13	12	11	9	8	7	6

Breeding

Animal evaluation and selection indexes

Breeding decisions have a permanent and compounding effect on a dairy herd. The New Zealand dairy industry's breeding objective is to identify animals whose progeny will be the most efficient converters of feed into farmer profit.

For more information, visit the DairyNZ website: **dairynz.co.nz/animalevaluation**

Breeding Values: the estimated genetic merit of a cow or bull

- New Zealand Animal Evaluation limited (NZAEL) produce breeding values for a wide range of individual traits. These include milkfat (kg), protein (kg), volume (litres), liveweight (kg), fertility (%), somatic cell (score), body condition score (score), residual survival (days), as well as udder and conformation traits.
- The estimated breeding values represent the genetic merit of an animal, compared to an average 2005 born cow (the genetic base).
- An estimated breeding value of +10kg protein indicates a bull will transmit 5 kg more protein per lactation to his daughters than a bull with a protein breeding value of zero (a daughter inherits half of her genetics from her father).

Breeding Worth (BW): The ability for a cow or bull to breed profitable and efficient replacement heifers

- BW is calculated by combining breeding values with the appropriate economic values.
- The economic value which is applied to each trait represents the net income from one additional unit of the trait.
- The base unit of feed is 5.0 tonnes of DM of average quality pasture
- BW can be used to decide which bulls to use during Artificial Breeding (AB), and which cows to keep heifers from.
- BW becomes more accurate as herd test records are accumulated. In the case of bulls this herd test information comes from daughters.
- Refer to the website to get current economic values for the BW traits. dairynz.co.nz/animalevaluation

Production Worth (PW): A cow's own productive ability

- This index measures the ability of the cow to convert feed into profit over her lifetime.
- The main use for the PW is in making purchasing and culling decisions.
- The reliability of PW indicates how much information is known about the cow i.e. how many herd tests records she has.
- A well-recorded heifer typically starts her life with a PW reliability of about 20%; by the time she has five recorded lactations, and some liveweight recording, the reliability will be about 85%.
- A PW of 72/56 indicates that the cow is expected to generate an extra $72 profit per year (per 5 tonnes of feed on a dry matter basis) compared to a typical cow born in 2005. The '56' represents the reliability.

Animal health

Magnesium and milk fever

Magnesium plays an important role in milk fever prevention (calcium deficiency). Magnesium is required for the production of hormones that are important for the absorption of calcium (Ca) from the gut and the mobilisation of Ca from bones. Supplementing with magnesium daily for two to three weeks pre-calving will reduce the risk of milk fever. However it does not build up a store of magnesium in the cow.

Magnesium and grass staggers (grass tetany)

The cow is dependent on what magnesium is supplied in her daily diet. The initial symptoms of magnesium deficiency are nervousness, ears pricked, nostrils flaring, eyes alert and head held high. Movement is stiff, like walking on stilts, and cows stagger when forced to move quickly. Cows suffer loss of appetite and reduced milk production. Death results from a "tetany" where the muscles contract uncontrollably, including the heart.

Dietary magnesium concentrations and quantity of supplementary magnesium required (g/cow/day)

Mg requirement (% of diet)		Supplementary Mg (g/cow/day)		
		Jersey	J x F	Friesian
Dry	0.35%	12	16	20
Lactating	0.28%	15	17	20

Quantities of magnesium sources to supply the required amounts of pure magnesium (down the throat).

Magnesium source (% Mg)	Example product	Magnesium required (g/cow/day)				
		12 g	14 g	16 g	18 g	20 g
Mg Oxide (55%)	CausMag	22	25	29	33	36
Mg Sulphate (10%)	Epsom salts	122	142	162	182	202
Mg Chloride (12%)	Mag chloride	100	117	134	151	167

- If dusting Magnesium Oxide on pasture, need to at least double possibly triple the above to allow for field losses. When mixing with feed, double the rates above.

Amount of magnesium oxide dusted (g/cow/day)

	Magnesium Oxide	Rate of Mg Oxide required (g/cow/day)				
		12 g	14 g	16 g	18 g	20 g
Mg Oxide (55%)	Double rate	44	50	60	66	72
	Triple rate	66	78	90	100	108

Magnesium supplementation

- Supplementing with magnesium sulphate or magnesium chloride before calving is more likely to prevent milk fever than using magnesium oxide.
- However, it can be difficult to supply cows with enough magnesium when using either magnesium sulphate or magnesium chloride. Therefore dust pastures with magnesium oxide as well, to ensure the cows receive enough magnesium, not just the correct type.
- One way to achieve the required dietary magnesium concentration pre-calving is to add 60 grams of magnesium chloride or magnesium sulphate into the water trough and dust pastures with 50-70 grams of magnesium oxide per cow per day as well. For more information refer to DairyNZ Farmfact 3-1 – magnesium supplementation.
- Supplement with magnesium until after spring pasture growth rates have slowed (December). Use blood tests to determine if continued supplementation is required from December onward.
- Magnesium requirements are also affected by the levels of potash and calcium in the diet. Some farms with very high potash levels in pasture will require high rates of magnesium supplementation.
- Applying potassium fertiliser or lime within three months of calving can affect cow magnesium levels at calving. Where magnesium is added to water and the dosage is not accurate there is a risk of the water becoming toxic and stock refusing to drink.

Facial Eczema prevention

Facial Eczema (FE) is a disease of the liver that significantly impacts on the health and productivity of cattle and presents significant welfare concerns for the industry. For more information on facial eczema visit **dairynz.co.nz/facial-eczema**.

Symptoms:

- Drop in milk production
- Cows are restless
- Cows seek shade
- Cows lick their udder
- Exposed unpigmented or thin skin thickens and peels

Most animals affected by facial eczema will not show any clinical signs but their liver is damaged. It is estimated that for every 3 in 100 cows showing clinical FE, about 70% of the herd may have subclinical FE.

Prevention: Breeding for FE Tolerance

Breeding cows that are more tolerant to facial eczema is a solution to reduce the impact of facial eczema in the long term.

In the interim the following preventative measures should be applied.

Pasture spore counts

Pasture spore counting is an excellent tool to visualise pasture spore count trends. However, variability between farms is very large because every farm, paddock and even sections of paddocks contain a slightly different micro-climate for the fungus.

It is therefore important that when regional spore counts start trending upwards to reach 20,000, it is important to gather a picture of your own farm.

Spore count	Risk
0-20,000	Low
20,000-30,000	Slight
30,000-60,000	Moderate
>60,000	High

Long term intake of low numbers of spores can cause just as much damage as short term intake at high numbers.

Zinc oxide drenching

Drenching should start when spore counts start to rise on your farm. Daily individual cow drenching at full dose is optimal for protection against facial eczema.

Drench recipes and dose rates

Using a stabilised drench will allow a higher concentration of Zn and therefore lower volume of drench.

Each brand of zinc will have a slightly different dose rate that will need to be checked on the bag. The following relates to Global Supa Zinc Oxide.

Stabilised drench	
Long term dosing rates are 2.5g ZnO/100kg Lwt/day. Mix 1kg of Global Supa Zinc to 1L of water. Stir to get a smooth lump free solution. Makes 1.2L of drench that contains 80% elemental zinc.	
Long term daily dosing	3mls/100kg Lwt
Crisis daily dosing (emergency only)	4.5mls/100kg Lwt
3 day to weekly intervals long term dosing (dry stock only, not recommended)	4.5mls/100kg Lwt x No. of days between drenching

Zinc sulphate water treatment

For all water treatment you will need to calculate the requirements for ALL stock on the farm.

Water treatment at a half dose should begin 3-4 weeks before the FE season starts to prime troughs and get cows used to the water taste.

Full dose rates should be dispensed when spore counts start to rise on your farm.

Weight of animal (kg)	MONO ZINC (grams/head/day)	HEPTA ZINC (grams/head/day)
30kg	1.7	2.4
60kg	3.4	4.8
100kg	5.5	8
150kg	8.3	12
200kg	11	16
250kg	14	20
300kg	16	24
350kg	19	28
400kg	22	32
450kg	25	36
500kg	28	40

Floating in-trough dispensers

Calculate amount of zinc sulphate to be added to the trough daily for all animals using that trough (use above table) e.g. 100 cows (at 450kg) x 36 grams/day = 3,600 grams of heptahydrate/day.

Refill the dispenser twice daily with half the daily amount (ie 1,800 grams or 1.8kg) at each visit to the trough.

In-line dispensers

Use the above table to calculate daily dispenser requirements for ALL stock on the farm and then set the dispenser to deliver that amount.

Hepta zinc	
200 cows (450kg) x 36 grams/day	= 7,200
50 heifers (300kg) x 24grams/day	= 1,200
55 calves (150kg) x 8grams/day	= 440
TOTAL	= 7,740g = 7.74 kg heptahydrate/day

Direct addition to the supply tank

Do not use this method if the supply tank also supplies the house water.

Calculate the daily requirements for all stock on the farm (see In-line dispenser example).

Add the daily zinc sulphate requirement to the supply tank at the same time each day. Dissolve the zinc sulphate in water before adding to the tank. If the supply tank is regularly re-filled e.g by pump on time switch, add zinc just after filling.

Where zinc is added to the water and the dosage is not accurate there is a risk of the water becoming toxic and stock refusing to drink it.

Zinc in feed

Zinc oxide can be added to feed for in shed feeders or added to feed on the feed pad. Zinc for in shed feeders is often put in by the feed company. Zinc administration onto pasture is not recommended. Pelletized feed or a mixer wagon will give a more constant distribution of zinc in the feed in comparison to un-pelletized feed and feed out wagons.

Administer full dose rates of zinc oxide in the feed when spore counts start to rise on your farm.

- If there are cattle that eat more than others they may be at risk for zinc toxicity.
- If zinc is not properly mixed into the feed in a silo, or wagon, cattle may be at risk of toxicity or have inadequate protection against FE.
- Consider independently testing zinc in feed.

Intraruminal bolus

An intraruminal bolus (capsule) slowly releases zinc into the rumen over a period of 4-6 weeks.

There are two brands of capsule, Face-Guard™ and Time Capsule®.

Both are extremely consistent and effective at managing FE as long as it is administered before the FE challenge and is administered at the correct dosing intervals (4 weeks for FaceGuard™, 4-6 weeks for Time Capsule® depending on challenge).

The Time Capsule® bolus provides protection against FE in animals from 90-600kg.

- Check the liveweight of your cattle to avoid under or over dosing
- Capsules must be administered with correct applicator
- Do not use damaged capsules

Follow the label instructions of the product.

Fungicide spray

Fungicides are used to slow the development and spore production of the fungus that causes facial eczema. This is an effective way of managing facial eczema without the use of zinc but only if:

- pasture has confirmed spore counts below 20,000 spores/gram pasture
- pasture is green and growing (in dry conditions the grass will not uptake the fungicide)
- spraying should cover all areas including fence lines, under hedges and under trees
- spraying should reduce spore growth for 4-6 weeks. After this pasture should either be immediately re-sprayed or monitored with spore counting.

Trace element supplementation

Consult with your veterinarian to determine if cows are deficient in trace elements before supplementation.

- Of the 7 macro minerals (i.e. required in large amounts), only two (magnesium and calcium) are deficient when the majority of the diet is pasture.
- Sodium can be deficient when more than one third of the diet is a low sodium feed (e.g. cereal grains) and dietary phosphorus can become inadequate in cows grazing fodder beet.
- Of the 18 trace elements (i.e. required in very small amounts), only five are likely to be deficient in pasture-based systems (i.e. cobalt, copper, iodine, selenium, zinc).
- Magnesium and the five scarce trace elements should be supplemented during the 2-4 weeks before calving and for four months after calving.
- Calcium should be provided to cows in the colostrum herd, and to cows before transport. There is unlikely to be a benefit of continued supplementation to milking cows unless the herd is experiencing downer cows.
- All sources of trace elements (i.e. pasture, supplementary feeds, water, fertiliser, and mineral supplements) need to be accounted for in dietary plans to avoid the risk of over-supply of any trace element.

Cobalt

Required for production of Vitamin B12, energy metabolism in the rumen and in the cow, fibre digestion and immunity. High manganese in soil reduces cobalt uptake by the plant. Therefore, as pasture is generally high in manganese it is usually low in cobalt.

Copper

Copper deficiency is common in grazing dairy cows because copper concentrations are generally low in pasture (6-10 mg/kg DM), the absorption of available copper is low (3-5%), and concentrations of sulphur and iron are high, particularly in spring with soil contamination of the pasture/crop; furthermore, the concentration of molybdenum can also be high. These three elements form insoluble complexes with copper in the rumen and render it unavailable for absorption.

Of all the trace elements provided, copper is the most likely to become toxic, particularly in Jersey cows or crossbred cows with a high proportion of Jersey genetics. It is important to account for all sources of copper before deciding on the most effective supplementary feeding strategy.

Warning: Some feeds (e.g. PKE) contain copper, so use great caution if feeding PKE and providing additional copper supplementation.

Iodine

Required for intake, energy metabolism and milk production, protein synthesis, reproduction, and heat detection. Uptake of iodine by pasture can be low. Additionally, iodine is easily leached during wet weather in winter and spring. Requirements for iodine increase during cold wet weather. One of the most important times for iodine supplementation in the South Island is during winter, when the cows are grazing brassica crops, so supplementation with iodine is recommended through the dry period and for approximately four months post-calving. Brassica crops contain compounds that render dietary iodine unavailable to the cow and because they are high in water, fortification of the water with iodine is an ineffective way of supplying iodine to cows.

Selenium

Required for disease resistance (e.g. mastitis), placental shedding (post-calving cleaning), milk production, reproduction, calf viability and immunity. There are regions that will have high selenium levels in pasture, particularly if they have been fertilised with selenium fertiliser. In such areas supplementation should be avoided. If in doubt, consult with your vet or farm consultant.

Zinc

Required for growth and production, reproduction, hoof strength, and immune system. The need for zinc supplementation will vary from farm to farm. Farms using zinc in summer for facial eczema may still require zinc supplementation in the spring. Pasture analysis should determine the need for supplementation. Excess zinc intake will increase the risk of milk fever and copper deficiency, and may depress appetite.

Nutrient	Requirements mg/cow/day	Sources
Cobalt	1-10	Cobalt sulphate orally, commercial cobalt sources, cobalt sulphate fertiliser, strategic use of Vitamin B12 injections. Can be added to spring fertiliser.
Copper	200-300	Copper sulphate orally, copper bullet, copper capsule (needles), copper injection (not recommended for cows during the breeding season), commercial copper sources, copper sulphate fertiliser (not recommended in secondary deficiencies).
Iodine	10	"Stock iodine" (3ml of 2% or 0.5ml of 10% per cow orally), 8 ml of 5% teat spray on flank weekly, commercial iodine sources, oil-based slow release injections.
Selenium	5	Oral or injection products, commercial selenium sources, and slow release injections. Can be added to fertiliser.
Zinc *other than for facial eczema	400-750	Zinc sulphate, zinc oxide, and commercial zinc sources.

Trace element requirements vary a lot and depend on many inter-related factors so get professional advice for your individual situation.