

## Lesson 3 and 4: About a cow. (Will run over 2 lessons)

<b>Starter</b>	DairyNZ Rosie introduces the different breeds of cows. <a href="https://youtu.be/6SNXDB6uT8A">https://youtu.be/6SNXDB6uT8A</a>
<b>Teach</b>	<p>“L3_How cows spend their day” PowerPoint.</p> <p>This exposes students to some of the data we are collecting around cows and gets them to practice working with that data. Teacher notes are available.</p>
<b>Video (58mins)</b>	<p>Watch “The Private Life of Cows” available on YouTube. It is based in England so the way they farm is different, but they cover the behaviour of cows really well.</p> <p>Get students to write down 10 interesting facts or thoughts.</p>
<b>Close</b>	<p>Stop the video 10 mins before the end of the lesson and get students to give feedback around what they found interesting or something they have learnt.</p> <p>Take a photo and use that as a recap in the next lesson.</p>

<b>Starter</b>	<p>Have the photo of the class facts/ideas that they shared from the last lesson.</p> <p>Using the feedback and facts that they found interesting last lesson, they can either group different ideas and facts together under a maximum of 4 titles <b>or</b> they can choose one fact/idea and link that to another idea/fact with a line with the goal to make as many connections as possible and to create a spider web of links. They then explain each of their links to another group, who has a chance to push back on that link or accept it, each link is worth 1 point. The person/team with the most valid links is the winner.</p>
<b>Video (58mins)</b>	<p>Finish watching “The Private Life of Cows” available on YouTube.</p> <p>Get students to write down 10 interesting facts or thoughts.</p>
<b>Close</b>	<p>Can they add those extra facts/thoughts to either their category headings or to their link diagram.</p> <p>Extensions</p> <ul style="list-style-type: none"> <li>- If they have used four categories, can they split the ideas/facts into 5 categories.</li> <li>- If they did the link diagram, can they colour code the links into environment, animal biology, animal behaviour, production/ economics, society and/or technology.</li> </ul>

Slides 2-5 = Foraging and Grazing: Relatable Animal Behaviour...

Get 3 volunteers but don't let them know what they are volunteering for. Then offer them the option of either carrots or chocolate one after the other. Do this 3 times. Then see what item most students pick. It tends to be chocolate because it is sweet, which is a sign of high energy. Just like humans, our grazing animals prefer sweet tasting food. Carrots are sweet, but chocolate is sweeter. A cow feed equivalent would be hay, silage, green grass, and treats like molasses. But just like our chocolate treats molasses and palm kernel tend to be more highly processed, have greater carbon miles and less sustainable. They are great for training cows though, just like you train dogs using treats.

Sometimes students will pick more carrots and often it is for health reasons. For cows they are more like toddlers, and if given the option more often they will go for the sweets. Variety is also important, and you can get cows to consume more if there are different flavours in the pasture (different pasture plants taste differently) or food on offer.

Slide 6 and 7 = What does caring for a productive animal involve?

The feed requirements are done as kilograms (kgs) as this is a more familiar unit that students can understand. Deer are odd animals and can lower their metabolism. The standard winter values are what is required to maintain their weight and don't have extra demands like being pregnant or growing.

It is good if you have a series of weights so students really get an idea of how much an animal consumes in a day.

In the industry kgs is not used, instead feed is measured in kilograms of dry matter (kgsDM), which is what is left over once all the water is removed from the feed. This is because water doesn't have calorific worth and if it has rained the grass would be heavier as the plant has absorbed water, and when it is dry the grass is lighter because there is less water in the plant.

**Extension:** If you wanted to demonstrate Dry Matter this in the class you could get students to pretend to be cows and use their hands to tear at the grass (cows use their tongues to tear the grass, while sheep nibble and use their teeth). You could then weigh it, take a picture of it and put it through a dehydrator and weigh it again the next day.

Slide 8 = Pasture Play Activity: Refer to the pasture play instructions and handouts.

Slide 9 to 13 = Cow Data and tracking

This data can now be accessed by our researchers and farm staff through a phone app as well as online.

**Question 1:** Not active could be sleeping and dozing. It is estimated that cows only REM sleep for approximately 4 hours a day but this is in intermittent bursts, not a long spell like humans do. When cows are lactating/ milking they can have less sleep as they need more time to eat and ruminate to keep up with energy demands.

Active could cover the social time that they have in the paddock maintaining relationships and hierarchy. This involves licking/grooming other cows (dominant behaviour) and controlling access to resources (best grass, trough). If cows are given feed that has a lot of energy, then they meet their energy requirements easily, so they can get bored and can get up to mischief.

Highly active could be the cows walking to and from the dairy shed, if you are on a large dairy farm cows can walk up to an hour either way to the dairy shed, which is a lot of lost grazing time and impacts milk production.

On the 14 August you will see she became highly active at 54%. That was because she was “in heat” so ready to mate. She probably was doing a lot of walking around seeking out a bull, although these days most dairy farms use AI before the bull is used (if he is used at all).

### Question 2 and 3:

	Avg %	Time	Time (whole hour)
<b>Ruminating</b>	17%	4.1hrs	4hrs
<b>Eating</b>	23%	5.5hrs	6hrs
<b>Not Active</b>	17%	4.1hrs	4hrs
<b>Active</b>	11%	2.6hrs	3hrs
<b>High Activity</b>	32%	7.7hrs	8hrs

### Question 4:

Cow 204 has a higher rate of ‘rumination’ (avg 27%) and being ‘not active’ (avg 17%). She has a lower rate of ‘eating’ (avg 18%) and ‘high activity’ (avg 23%). Her ‘active’ rate was similar to 23.

With this data we could look back and see if these averages are ‘normal’ for 204 or if it's a sign that she is not feeling well. Because cows are ‘prey animals’ they are very good at masking signs of pain and discomfort so it can be hard for us to pick up on it. This also gives us data to see if there is a correlation between behaviours, outputs and environmental impacts as sometimes you can breed in behavioural predisposition into animals (eg: mothering ability).

The data suggests that 204 is less social and further down the hierarchy than 23. We should not assume that it is sad, as it could be that she doesn't require as many social connections as 204.

### Question 5:

While dominant cows are often observed to be larger and older, the social hierarchy also allows for individual differences in temperament and behaviour.

Cow 23 is the more dominant cow as she is spending more time physically eating food but does not have to spend as much time digesting it which suggests that she is getting a lot of easily digestible high-quality pasture.

She is also very active and some of the movement may be associated with hunting out better feed, but it is also because she is a social butterfly. Dominant cows are bossy and can shove other cows, but good leaders are not only bossy they also tend to care. Cow 23 would be going around the herd and licking other cows (giving more licks than she is receiving) to help with social bonding. They are an important part of the cow hierarchy, just as less dominant/ submissive cows like 204 are important.

Submissive cows are crucial for maintaining stability and reducing aggression. Submissive cows, those that yield to dominant cows, help establish and maintain the pecking order, which in turn regulates access to resources and minimizes conflict within the herd. If you have a herd of only dominant cows, it would not go well with constant competition and potential injuries.

## Q6

When Cow 23 is in heat her activity increases and rumination (digestion) decrease as she spends time looking for a bull. Seeing that she is cycling is an important so they can be tracked, and artificial insemination can be used.

Sometimes cows have “silent heats”, where there is no obvious difference in behaviour if you were using field observation. About 70–80% of cows will not have a visible heat at the first ovulation after calving. But with the collars they will still identify silent heat as they record their behaviour overtime. If a cow is cycling at the planned start of mating and there is a 10-week mating period, she would have 3.3 cycles within that period (19-23 days/ cycle) to get in calf. This is to ensure a tight calving window, so milk is produced when grass growth is high. If she is a late calver then she will have less chances to cycle during the 10-week mating period.

## Slide 8 = Looking at the individual: Milk production

Highlight that if you just looked at individual milk production you would think the cow producing 21 litres is not a good cow. But what could be some of the factors impacting her production?

- Feed quantity and quality, (she maybe a less dominant cow). If poor quality pasture is feed, then milk production drops.
- She could be a younger, smaller cow. Two-year-old cows have had their first calf but are still growing themselves so energy will be going towards their own growth (they should also be given more feed to help with that).
- She could be more Jersey (a smaller breed) than Friesian (a bigger breed). In New Zealand producers are paid on milk solids (fat and protein), not the water component of milk. Jerseys produce less litres of milk, but it tends to be creamery, so is equal milk solids to Friesian cows.
- Milk production (in litres) can change over the season depending on when they calved.
- If they are a new cow just introduced to the herd then they need to find their place. It is like a students first days at high school. If you have some friends with you, it can help but it still takes a while to figure out the lay of the land, the schedule and how things work.

## Interesting facts:

- We need to be careful when feeding out some feed like turnips as it can affect the flavour of the milk.
- The taste of New Zealand milk is something that overseas people comment on and enjoy, as in some countries cows are not feed grass but corn feed.
- In America the farmer is paid on litres of milk, not milk solids. This has led to their cows being breed a lot bigger and around some 30% to 40% heavier than average NZ cows (even though they are still Friesians). American cows produce more than double the milk that New Zealand cows produce with some of the farms milking cows three times a day. The American dairy system has 12-month non-seasonal calving. On the large farms, the lactating and dry cows are typically kept inside 24/7. The cows are housed in large free-stall barns, where each cow chooses its own stall which has soft bedding.