Assessment Schedule – 2015

Agricultural and Horticultural Science: Demonstrate understanding of how NZ commercial management practices influence livestock growth and development (91294)

Evidence Statement

Question One: Calf rearing

Achievement	Achievement with Merit	Achievement with Excellence
Describes how ensuring calves get milk containing colostrum in their first six hours of life increases their growth and development. *OR* **Describes** the difference between once-a-day and twice-a-day feeding systems.	**Explains** how providing calves with good quality nutrition through their milk and feed increases their liveweight. *OR* **Explains** how these feeding systems impact on the calf's growth and development.	**Compares and contrasts** the two different feeding systems by their impacts on quality and economics of production.

N0	No response; no relevant evidence.
N1	Some writing, but does not describe how milk containing colostrum affects calves' growth and development, or the difference between the feeding systems.
N2	Partial or insufficient description of how milk containing colostrum affects calves' growth and development, or the difference between the feeding systems.
A3	Describes how milk containing colostrum affects calves' growth and development, or the difference between the feeding systems.
A4	Fully describes how milk containing colostrum affects calves' growth and development, or the difference between the feeding systems, with reference to growth rates.
M5	Explains how good-quality nutrition, or the feeding practices, affects the calves' growth and development, linking to growth rates.
M6	Fully explains how good-quality nutrition, or the feeding practices, affects the calves' growth and development, linking food utilisation and energy or protein intake to growth rates.
E7	Compares and contrasts the two different feeding systems by their impacts on quality and economics of production. Comprehensive evidence for superiority in ONE aspect, with the other aspect well supported.
E8	Compares and contrasts the two different feeding systems by their impacts on quality and economics of production. Comprehensive supporting evidence for superiority in BOTH aspects.

Q1	Sample evidence
(a)	**Describes** how ensuring calves get milk containing colostrum in their first six hours of life increases their growth and development. The calf should drink at least 2–3 litres of fresh colostrum during the first six hours of life to get a supply of antibodies, and should be fed colostrum, or a colostrum substitute, for at least the first four days of life. The antibodies protect the calf against disease, as it receives no passive transfer of immunity via the placenta before birth, so any antibodies that it needs have to be ingested. The calf has a very immature digestive system, and colostrum delivers its nutrients in a very concentrated, low-volume form, as well as being lower in fat and higher in protein than ordinary milk.
(b)	**Explains** how providing calves with good-quality nutrition through their milk and feed, such as meal, increases their liveweight. A calf can grow only once, so it is essential that they are well fed. Calves are in an active phase of growth, increasing in weight until maturity is reached. At the same time muscle development is at a maximum, while fat deposition is beginning to increase as time passes. Low-quality feed can cause irreversible stunting of growth. By being fed good-quality milk and feed, such as meal, the calves are able to maximise their growth rates, as they have a higher intake of nutrients and better utilisation of the milk and feed, which results in faster liveweight gain. The feeding of dry matter, such as high-protein pellets and straw roughage, and confining the calf off pasture are all necessary in early development of the rumen. Higher feed intake increases digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth, and for muscle and tissue development. Calves with a poorly developed rumen cannot digest grass. Pellet or meal intake encourages rapid rumen development and enables earlier weaning.
(c)	**Describes** the difference between once-a-day and twice-a-day feeding systems. A once-a-day feeding system is done when the calf is fed in one, low-volume feed. This is achieved by condensing the dry matter content of the milk into a reduced volume; 600–800 gms of solids per litre is required for calves using calf milk replacer. They are fed about 3 litres of milk per calf, once a day, after one week of age. With a twice-a-day feeding system, the calf is fed in two, high-volume feeds – one in the morning and one in the evening. Whole milk is usually utilised, where 4.5–6 litres is needed per feed to achieve the 600–800 gms of solids required for calves. **Explains** how these feeding systems impact on the calf's growth and development. Rumen development is quicker with once-a-day feeding systems, due to the low milk volume, and the calves can be weaned off the milk at between 5–7 weeks of age. Since calves are not fed milk in the evening, they are able to consume more solid feed, such as pellets and meal, earlier. Solid feed intakes promote early rumen development and ensure that calves can efficiently digest high levels of pasture sooner. Higher solid feed intake increases digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth, and for muscle and tissue development. Calves are kept inside, as the milk is rapidly digested, leaving the calf for a long period each day without an available energy supply to combat cold weather. Rumen development is slower in twice-a-day feeding systems, and calves cannot be weaned until they are about 9–10 weeks old. A high volume of milk is fed in these systems, which slows rumen development. Solid feed intakes are lower than on once-a-day programmes, due to the large amount of milk drunk. **Compares and contrasts** the two different feeding systems by their impacts on quality and economics of production. Twice-a-day milk feeding is widespread, due to dairy farmers wanting to use waste colostrum and antibiotic milk. Whole milk is produced on most dairy farms twice a day, and may be seen to be more cost-effective to use than buying in calf milk replacer. Whole milk is not sufficiently concentrated to use alone for once-a-day feeding, and is fed twice a day to reduce the risk of nutritional scours from the large milk volumes used. The health issues associated with twice-a-day feeding tend to be higher. The once-a-day milk feeding system provides improved calf health, due to fewer scours and lower vet bills, as less liquid is used, leading to drier beds, which results in lower humidity and less pneumonia, and lower bedding costs. Rearing calves is extremely labour-intensive and continues for up to 12 weeks. The once-a-day milk feeding system has reduced labour inputs of 30%–40% compared with twice-a-day feeding. Twice-a-day feeding requires a higher labour input due to the two feeds per day, but means that each calf can be

	individually checked twice each day for any health issues. Twice-a-day feeding systems means calves can be outside earlier and fed in larger mobs using large calf trailers, but the calves are older before they can be weaned, due to the later rumen development. Less solid feed is fed. Calf growth and development are lower, and overall costs of feeding (mostly labour) are much higher. With the once-a-day feeding system, calves are kept inside for a longer period of time, and are fed using compartmentalised feeders, but the calves are weaned younger (at 5–7 weeks), up to 2 weeks earlier, due to more advanced rumen development and improved growth rates of up to 35%. More solid feed is fed and at an earlier age (+15%) as the calf's stomach is not full of milk. Calf growth and development are higher, and overall costs of feeding are much lower. A once-a-day feeding system is usually a simple system, and therefore not at risk of technological breakdown. It has a lower capital requirement, no expensive machines, and is often gas operated, and therefore has minimal requirements for electric power. A twice-a-day feeding system is usually a more advanced system due to the volume of milk required to be fed, is at risk of technological breakdown, has a higher capital cost, and usually has more expensive machines and higher requirements for electric power. Once-a-day milk feeding offers clear advantages in terms of reduced labour inputs, healthier calves, increased dry feed intakes, less bedding as a result of drier beds, earlier weaning, and growth rates improved by up to 30%. The system is much more cost-effective and produces healthier, stronger calves than twice-a-day rearing. A calf that starts well will usually continue to do well throughout its life.

Question Two: Internal parasite management in lambs

Achievement	Achievement with Merit	Achievement with Excellence
Describes how ONE of the management practices of drenching, or clean / safe pasture, is carried out.	**Explains** how controlling internal parasites effects lamb growth rates.	**Evaluates** the effectiveness of the integration of these management practices by explaining how greater growth rates improve lamb numbers, and explaining its effect on economics of production.

N0	No response; no relevant evidence.
N1	Some writing, but does not describe how ONE of the management practices of drenching or clean / safe pasture is carried out.
N2	Partial or insufficient description of how ONE of the management practices of drenching or clean / safe pasture is carried out.
A3	Describes how ONE of the management practices of drenching or clean / safe pasture is carried out.
A4	Fully describes how ONE of the management practices of drenching or clean / safe pasture is carried out, with reference to growth rates of lambs.
M5	Explains how controlling internal parasites affects lamb growth rates.
M6	Fully explains how controlling internal parasites affects lamb growth rates, linking to pasture utilisation and energy or protein intake.
E7	Evaluates the effectiveness of the integration of these management practices by explaining how greater growth rates improve lamb numbers, and explaining its effect on economics of production. Comprehensive evidence for superiority in ONE aspect, with the other aspect well supported.
E8	Evaluates the effectiveness of the integration of these management practices by explaining how greater growth rates improve lamb numbers, and explaining its effect on economics of production. Comprehensive supporting evidence for superiority in BOTH aspects.

Q2	Sample evidence
	Describes how ONE of the management practices of drenching or clean / safe pasture is carried out. Drenching is the giving of liquid medicines or chemicals to lambs to kill any internal parasites that live within them. The drench is given to the lambs using a drench gun, which allows a predetermined amount of drench to be administered to each animal. Clean / safe pastures are paddocks that have low larvae levels, such as new grasses, forage crops, hay, or silage re-growth, or when other livestock such as cattle or deer have previously grazed the paddock (which reduces the number of worm larvae ingested by the lambs). By using safe / clean pastures the chances of re-infection from parasites is reduced. Grazing management using safe / clean pastures is easier to control when using intensive subdivision or non-sheep grazing. Internal parasite management is necessary to maintain a low level or no presence of parasites in the stock. Internal parasites can spread rapidly throughout the property, either killing lambs or impeding their growth through anaemia, as they have less energy to grow and develop. **Explains** how controlling internal parasites affects lamb growth rates. Internal parasites feed on the nutrients contained in the lamb's digestive system. The animal is then unable to use all the nutrients in its food, or the ill effects from the parasites means that they do not put on as much weight or grow as much wool as they would without internal parasites. Some symptoms of internal parasites are scouring, anaemia, severe weight loss, and dehydration. Death can sometimes occur when there are high infestations. Internal parasites are often prevalent in dry summers. Long-acting drenches are needed, or more frequent use of shorter-acting drenches (has shorter withholding period). By using these internal parasite management practices, the lambs have minimal presence of internal parasites, meaning the feed that they consume is directly used in their own growth and development. This leads to better utilisation of feed, due to increased digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth, and for muscle and tissue development, which results in higher growth rates and greater liveweight gain. **Evaluates** the effectiveness of the integration of these management practices by explaining how higher growth rates improve lamb numbers and its effect on economics of production. Integrated programmes of grazing on safe / clean pastures and drenching are very successful in increasing lamb performance and reducing internal parasites. Farmers need to minimise the impact that internal parasites have on an animal's performance. It is important to understand how each management practice works, as killing the internal parasites is the main concern, but reducing pasture contamination, and hence the future ingestion of larvae, is important for high production, better lamb health, and less reliance on drenching, so that resistance does not build up. Few pastures are totally safe / clean, but careful grazing management reduces the larvae. Internal parasites in lambs can result in substantial production losses, through the reduction in liveweight gain (up to 50%), wool production (up to 25%), and in extreme cases death, therefore reducing the farmer's income. Reducing deaths from high infestations of internal parasites results in more lambs for sale, thus increasing income. Non-fatal infestations will increase the time needed to reach slaughter weights and have a negative financial impact. Loss of nutrients to parasites means less for growth or other functions such as wool production. If fed on clean pasture, possibly less long-acting drench – medium term – can be used, and thus lambs can be sent to the works earlier. This is especially important in dry summers when feed becomes short. By using this integrated programme, internal parasite numbers will be reduced. This increases lamb growth and development, ensuring that more lambs are able to be sold at the required weight in the appropriate timeframe, therefore increasing profitability.

Question Three: Supplementary feeding for livestock

Achievement	Achievement with Merit	Achievement with Excellence
Describes how supplementary feed impacts on livestock growth and development during the winter months. *OR* **Describes** how the farmer would use metabolisable energy and dry matter values to determine the energy requirements for their beef cows.	**Explains** how supplementary feed impacts on livestock growth and development during the winter months. *OR* **Explains** how fodder beet could maintain or increase beef cows' liveweight.	**Justifies** the decision to plant fodder beet by explaining how maintaining or improving beef cows' liveweight improves the quality of the cows coming out of winter, and the economics of production.

N0	No response; no relevant evidence.
N1	Some writing, but does not describe how supplementary feeding or the use of metabolisable energy and dry matter values influences livestock growth and development.
N2	Partial or insufficient description of how supplementary feeding or the use of metabolisable energy and dry matter values influences livestock growth and development.
A3	Describes how supplementary feeding *OR* the use of metabolisable energy and dry matter values influences livestock growth and development.
A4	Fully describes how supplementary feeding *OR* the use of metabolisable energy and dry matter values influences livestock growth and development, with reference to growth rates.
M5	Explains how supplementary feeding impacts on beef cows' liveweight, linking to growth rates.
M6	Fully explains how supplementary feeding impacts on beef cows' liveweight, linking energy intake to growth rates.
E7	Justifies the decision to plant fodder beet by explaining how maintaining or increasing beef cows' liveweight improves the quality of the cows coming out of winter, and improves the economics of production. Comprehensive evidence for superiority in ONE aspect, with the other aspect well supported.
E8	Justifies the decision of planting fodder beet by explaining how maintaining or increasing the beef cow's liveweight improves the quality of the cows coming out of winter, and improves the economics of production. Comprehensive supporting evidence for superiority in BOTH aspects.

Q3	Sample evidence
(a)	**Describes** how supplementary feed impacts on livestock growth and development during the winter months. Supplementary feed is any animal feed that is used to supplement a normal supply of pasture. This is often in the form of conserved hay, balage, silage, fodder crops such as kale and fodder beet, or concentrates such as grain or meal. They provide energy, protein, minerals, and vitamins essential for staying alive, and for growth and development. **Explains** how supplementary feed impacts on livestock growth and development during the winter months. Supplementary feeding is essential to provide the energy and protein intake to maintain liveweight gain during the winter. At this time, livestock growth is restricted by minimal pasture growth and therefore low energy intake, which is made worse by the need for livestock to expend energy to keep warm. Supplementary feeds used to maintain stock do not have to be high in energy content, such as hay, unwilted silage, and rationed root crops, but if the stock are lactating or rapidly growing, good-quality feeds are required, such as lucerne, silage, green crops, root crops, and grains. Good-quality feed allows for a high intake of digestible energy, and when combined with relatively high protein levels, promotes fast growth and turnover. A higher feed intake increases digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth, and for muscle and tissue development in livestock.
(b)	**Describes** how the farmer would use metabolisable energy and dry matter values to determine the energy requirements for their beef cows. Supplementary feed is assessed according to the energy levels it contains. Typically, the measurements used are metabolisable energy (ME), measured in megajoules, and dry matter (DM) measured in kilograms. ME is a good measure of the nutritive value of a feed. ME is the proportion of energy absorbed from the feed by the digestive tract and retained for metabolic purposes. The units for ME are megajoules. All feeds can be ranked on their ME content as a proportion of feed dry matter, expressed as MJME / kg DM to indicate their value to ruminants. DM is a standardised measure of feed quantity. It is the weight of feed after all moisture has been removed from it, and it is measured in kilograms per hectare (kg DM / ha). The ME for the three crops is similar, but the DM for fodder beet is significantly higher than swedes or kale per hectare, and so provides a greater amount of energy per hectare. **Explains** how fodder beet could maintain or increase beef cows' liveweight. To maintain the liveweight of the beef cows over the winter period, an adequate amount of ME must be supplied to provide energy needed for essential body functions. If this energy is not supplied in the diet, it will be obtained by metabolising body tissue, predominantly fat, and the cows will lose weight. Fodder beet supplies 12 MJ / kg DM, which is about the same as swedes and kale. However, the DM for fodder beet is significantly higher than swedes or kale per hectare, and hence more ME is gained per hectare from fodder beet. Using fodder beet as a supplementary feed would therefore maintain or increase the cows' liveweight more effectively than the other two crops. **Justifies** the decision to plant fodder beet by explaining how maintaining or increasing beef cows' liveweight improves the quality of the cows coming out of winter, and the economics of production. Using fodder beet as a supplementary feed to pasture provides the cows with higher energy content, and therefore has the potential to increase liveweight. Fast growth rates are dependent on a high intake of energy and protein being available for body processes, such as growth. While any of the crops (swedes, kale, and fodder beet) will provide similar levels of nutrients, their cost is different. Well-fed cows yield better than poorly fed cows, and so feed quality and quantity is important. Where such crops as kale, swedes, and fodder beet are used, yields are likely to be 2–4% higher than with only pasture-fed cattle. Fodder beet has a high palatability, which encourages the cows to eat it (8–12 kg DM per day), and this increases liveweight and improves body condition

	scores. Cows that have been fed well are of better quality, have a higher liveweight and better body condition score, and also perform better at calving. The most significant factor affecting profitability is the cost of feeding the cattle. Fodder beet has higher establishment costs, but has a higher disease and insect pest tolerance, so less is spent on these areas than with the other crops. Fodder beet also has a higher yield potential than swedes or kale, which means that the amount of land required is reduced. This, along with high ME, suits winter crop use for cows and has favourable economic returns. There are clear advantages of fodder beet over traditional winter crops such as kale and swedes – lower costs, longer windows of use, and reduced land requirements – which make it suitable where land is restricted. Reduced nitrogen excretion rates and higher body condition scores are possible on the back of the higher ME values, and these are further reasons for planting fodder beet as the winter crop of choice.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 12	13 – 18	19 – 24