

Assessment Schedule – 2013

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

Evidence Statement

Question ONE: Lamb production

Achievement	Achievement with Merit	Achievement with Excellence
<p>Describes how vaccinating lambs affects their growth and development for meat production.</p> <p>OR</p> <p>Describes how the breed of sheep influences their growth and development for meat production.</p> <p>OR</p> <p>Describes how the use of scanning influences sheep growth and development for meat production.</p>	<p>Explains how vaccinating lambs affects their growth and development for meat production.</p> <p>OR</p> <p>Explains how the breed of sheep influences their growth and development for meat production.</p> <p>OR</p> <p>Explains how the use of scanning influences sheep growth and development for meat production.</p>	<p>Justifies the use of scanning at the meat processing plants to enable farmers to make sheep breed decisions and improve the quantity of lamb meat sold.</p>

N0	No response; no relevant evidence.
N1	Some writing, but does not describe how the use of vaccinations OR the breed of sheep OR scanning influences lamb growth and development for meat production.
N2	Partial or insufficient description of how the use of vaccinations OR the breed of sheep OR scanning influences lamb growth and development for meat production.
A3	Describes how the use of vaccinations OR the breed of sheep OR scanning influences lamb growth and development for meat production.
A4	Fully describes how the use of vaccinations OR the breed of sheep OR scanning influences lamb growth and development for meat production, with reference to growth rates.
M5	Explains how the use of vaccinations OR the breed of sheep OR scanning influences lamb growth and development for meat production, linking energy use OR muscle growth OR growth rates.
M6	Fully explains how the use of vaccinations OR the breed of sheep OR scanning influences lamb growth and development for meat production linking energy use OR muscle growth AND growth rates.
E7	Justifies the use of scanning at the meat processing plants to enable farmers to make sheep breed decisions and improve the quantity of lamb meat sold. Comprehensive evidence for superiority in ONE aspect, with the other aspect well supported.
E8	Justifies the use of scanning at the meat processing plants to enable farmers to make sheep breed decisions and improve the quantity of lamb meat sold. Comprehensive supporting evidence for superiority in BOTH aspects.

Q1	Evidence
(a)	<p><u>Describe how vaccinating lambs affects their growth and development for meat production</u></p> <p>Vaccinating is giving the lambs an injection to prevent them from contracting infectious or lethal diseases. Injections are usually given at docking, and then again four weeks later as a booster. They are administered either by inserting a needle under the skin, or into the muscle in areas such as the neck or over the ribs. Diseases can be spread by “carrier” sheep, by being in the ground or on pasture, or on contaminated machinery or tools. Vaccinations are necessary to maintain a low level or no presence of diseases in the stock. Infectious diseases can spread rapidly throughout the property, either killing the lambs or impeding their growth and development, as they use their energy to “fight” the diseases.</p> <p><u>Explain how vaccinating lambs affects their growth and development for meat production</u></p> <ul style="list-style-type: none"> • Vaccinated lambs are free from diseases, meaning less pain (such as scabby mouth) or irritation of the gut (such as Johne’s disease), so they spend more time feeding. This leads to higher feed intake and better utilisation of feed, keeping the lambs in good condition. Vaccinations maximise growth rates to a mature size, as they allow higher feed intake and better utilisation of pasture, which results in greater growth and higher liveweight gain. Higher feed intake increases digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth, muscle, and tissue development. • Deaths from diseases (such as pulpy kidney, tetanus, and blood poisoning) result in less stock for sale, while non-fatal diseases will increase the time needed to reach slaughter weights, and therefore have a negative financial impact. Loss of nutrients to the disease, or ill effects of the disease, means fewer nutrients for growth or other functions such as wool production.

(b)	<p><u>Describe how the breed of lamb and breeding decisions influence their growth and development for meat production</u></p> <p>The sheep's breed influences their growth and development for meat production by being early or late maturing, their rate of liveweight gain, the quality of their carcasses due to the development of muscle, and the amount of fat deposits.</p> <p><u>Explain how the breed of sheep and breeding decisions influence their growth and development for meat production</u></p> <ul style="list-style-type: none">• Breed has an important effect on mature bodyweight and the fat content. Breeds differ in their rate of growth and maturity – the rate at which they deposit fat. For example, the Southdown will produce fat at a younger age, as they are early maturing and therefore must be killed at lower weights if fat grades with lower prices are to be avoided.• As early maturing breeds are fatter, they must be killed at lighter weights so that they do not grade as over-fat, which has a lower dollar value. Late-maturing breeds can be grown to heavier weights before fat content threatens the value of the animal. At the same age, breeds with faster growth rates will produce heavier carcass weights which, when combined with lower fat cover, will command a significant price premium. Fast growth rates mean lambs can be sold at an earlier age, freeing up feed supplies for alternative uses.• Breed also affects the dressing-out percentage, such as a higher yield, for those meat processing plants that give premiums for this characteristic. Breeds that have more muscle growth will have higher yields. Fast growth rates mean heavier carcass weights at a given time, which on a \$/kg basis increases financial returns. <p><u>Describe how the use of scanning influences sheep growth and development for meat production</u></p> <p>Lamb carcasses at the meat works are scanned, taking a three-dimensional photo that comes up with a yield. Scanning of lamb carcasses at the meat processing plants provides great information for the farmer to improve their sheep breed's growth and development. After the lambs have been killed, scanning occurs, measuring the amount of meat in the loin, leg, and shoulder, minus the bone and fat. This gives the yield performance of each of the farmer's lambs.</p> <p><u>Explain how the use of scanning influences sheep growth and development for meat production</u></p> <p>Scanning gives the yield of meat from that carcass, as opposed to simply producing lambs of a certain weight and fat cover. The farmer can then use this information to understand current market information and help them in on-farm decision-making, such as achieving higher yields through genetics by the selection of high-quality breeding stock that meet the current market's needs.</p> <p><u>Justify the use of scanning at the meat processing plants to enable farmers to make sheep breeding decisions that will improve the quantity of lamb meat sold. Consider the information that can be provided to the farmer from scanning, and how scanning can affect the quantity of sheep meat produced</u></p> <p>Scanning improves the quantity of high-value meat, as not only is there a higher percentage of the lamb carcass used, but the farmer uses the information provided to improve their flock's genetics. If a particular ram is producing lambs that have a high yield of meat in the loin, leg, and shoulder, the farmer may want to breed more lambs using that ram's genetics, ie using genetics to increase the ratio of meat to bone and fat. A gene labelled MyoMax Gold generates 10–15% extra meat on a sheep, and 90 percent of Texels have this gene. If the farmer wants that characteristic, it is a matter of selecting rams with that gene. The higher quantity of usable lamb meat increases the price and profit for the farmer.</p>
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Question TWO: Pasture utilisation in bull beef production

Achievement	Achievement with Merit	Achievement with Excellence
<p>Describes how monitoring pasture quality improves growth and development of the bulls. <i>OR</i> Describes how topping improves growth and development of the bulls. <i>OR</i> Describes how stocking rate influences bull growth and development.</p>	<p>Explains how pasture quality through the use of monitoring pasture improves the growth and development of the bulls. <i>OR</i> Explains how pasture quality through the use of topping improves growth and development of the bulls. <i>OR</i> Explains how the stocking rate impacts on the bulls' growth and development.</p>	<p>Justifies the selected stocking rate by comparing with another stocking rate in terms of pasture utilisation and profit.</p>

N0	No response; no relevant evidence.
N1	Some writing, but does not describe how the stocking rate, topping <i>OR</i> monitoring pasture quality improves growth and development in bull beef production.
N2	Partial or insufficient description of how the stocking rate, topping <i>OR</i> monitoring pasture quality improves growth and development in bull beef production.
A3	Describes how the stocking rate, topping <i>OR</i> monitoring pasture quality improves growth and development in bull beef production.
A4	Describes how the stocking rate, topping <i>OR</i> monitoring pasture quality improves growth and development in bull beef production, with reference to growth rates.
M5	Explains how the stocking rate, topping <i>OR</i> monitoring pasture quality improves growth and development in bull beef production, linking pasture utilisation to growth <i>OR</i> development.
M6	Explains how the stocking rate, topping <i>OR</i> monitoring pasture quality improves growth and development in bull beef production, linking pasture utilisation and energy <i>OR</i> protein intake to growth rates.
E7	Justifies the selected stocking rate by comparing with another stocking rate in terms of pasture utilisation <i>AND</i> financial returns. Comprehensive evidence for superiority in ONE aspect, with the other aspect well supported.
E8	Justifies the selected stocking rate by comparing with another stocking rate in terms of pasture utilisation <i>AND</i> financial returns. Comprehensive supporting evidence for superiority in BOTH aspects.

Q2	Evidence
(a)	<p><u>Describe how pasture quality through the use of topping improves the growth and development of the bulls</u></p> <p>Topping is mowing the top half of the pasture, which prevents the pasture from going to seed and becoming indigestible. It prevents lower quality pasture accumulating.</p> <p><u>Describe how pasture quality through the use of pasture monitoring improves the growth and development of the bulls</u></p> <p>Monitoring pasture allows the farmer to estimate the quality and quantity of the pasture available to the bulls, and ensures that suitable management practices are carried out, so that pasture grasses are retained, protected, and managed correctly, and the pasture is best utilised.</p> <p><u>Explain how pasture quality through the use of topping improves the growth and development of the bulls</u></p> <p>By removing the top half of the pasture through mowing, all the seed heads are taken off, and this slows reproductive growth. The new growth that takes place is of better quality to the bulls, which leads to higher pasture intake and better pasture utilisation, and therefore greater digestibility, faster growth, and higher liveweight gain. If the seed heads are not removed, they are indigestible and are therefore either not eaten, so liveweight gain is reduced or, if eaten, passed straight through the bull's digestive system, wasting energy in consumption.</p> <p><u>Explain how pasture quality through the use of pasture monitoring improves the growth and development of the bulls</u></p> <p>Monitoring the pasture allows the farmer to match the bull's nutrient and feed requirements with the pasture available. It means that there are accurate feed planning and grazing regimes to ensure that the bulls have optimum pasture available at all times. This leads to higher feed intake and better utilisation of pasture, which results in faster growth and greater liveweight gain. Higher feed intake increases digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth and tissue development.</p>

(b) Describe what is stocking rate and how it influences bull growth and development

Stocking rate is a measure of the carrying capacity of a paddock, or the whole farm, over an extended period of time – ie how many bulls can be fed in a paddock, or over the whole farm, enabling them to reach their maximum growth and development during their time on the farm.

Explain how the stocking rate influences the bulls' growth and development

- The more bulls in the paddock/on the farm, the higher the feed requirements, and the higher the grazing pressure. As stocking rate increases, pasture utilisation will increase, leading to increased liveweight gain per hectare. If stocking rate is increased, pastures will be grazed harder, leading to improved pasture quality for the next round of grazing, which will improve liveweight gain. Higher feed intake increases digestion and absorption of food nutrients, therefore maximising the intake of digestible energy and protein required for growth and tissue development. This results in greater growth rates, higher liveweight gain, and bulls in good, healthy condition. However, individual bull liveweight gains will be reduced if there is over-stocking.
- A lower stocking rate means more feed is available for each bull, which should lead to increased liveweight gain. However, if not well managed, pasture quality would decrease for the next round of grazing, which would lead to reduced liveweight gain in the longer term.

Justify your selected stocking rate over ONE of the other stocking rates by comparing pasture utilisation and profit to the farmer. Consider how the stocking rate would influence the growth and development of bulls, efficient pasture utilisation, and financial returns to the farmer

- The stocking rate of 4.5 bulls/ha is the best stocking rate to utilise on this farm, as it provides the highest economic returns of \$1 953 per hectare, compared with \$1 447 for the lower stocking rate of 2.5 bulls/ha. The aim of the farmer would be to put maximum liveweight gain on their bulls, to reach the specified market carcass weight and its quality requirements as quickly as possible, thus receiving the best price for them. There will always be a trade-off between output per bull and output per hectare, but economically the objective is clearly to find the combination that gives the greatest dollar returns per hectare. Profitability is determined mainly by the amount and quality of feed eaten, and stocking rate has a dominant effect on pasture utilisation rate. A high stocking rate of 4.5 bulls/ha means that the feed supply from pasture is restricted, and thus the production per head will decline, meaning the farmer will receive the lowest profit per bull, but the highest profit per hectare. This is due to pasture utilisation being at the highest value of 81%, compared with 2.5 bulls/ha, where pasture utilisation is 59%.
- A low stocking rate of 2.5 bulls/ha ensures that there is no restriction of feed supply on pastures and the bull growth rate will be high, thus receiving the highest profit per bull. As pasture utilisation is low, to maximise the pasture at this stocking rate, efficient management of pasture would be required to ensure that the pasture maintained its quality, otherwise long-term pasture quality will be reduced, thus reducing liveweight gain and profitability.

Question THREE: Broiler production

Achievement	Achievement with Merit	Achievement with Excellence
<p>Describes how environmentally controlled sheds would influence the growth, development, and yield of broiler chickens.</p> <p><i>OR</i></p> <p>Describes how an incubator would influence the growth and development of broiler chickens.</p>	<p>Explains how environmentally controlled sheds would influence the growth, development, and yield of broiler chickens.</p> <p><i>OR</i></p> <p>Explains how keeping the environment constant is important in the development and growth of the chicken embryo.</p>	<p>Justifies the financial impact of the timing of hatching and maturity of broiler chickens for the market when using incubators in broiler poultry production.</p>

N0	No response; no relevant evidence.
N1	Some writing, but does not describe how environmentally controlled sheds <i>OR</i> incubators influence the growth and development in broiler chicken production.
N2	Partial or insufficient description of how environmentally controlled sheds <i>OR</i> incubators influence the growth and development in broiler chicken production.
A3	Describes how environmentally controlled sheds <i>OR</i> incubators influence the growth and development in broiler chicken production.
A4	Fully describes how environmentally controlled sheds <i>OR</i> incubators influence the growth and development in broiler chicken production, with reference to growth rates.
M5	Explains how environmentally controlled sheds <i>OR</i> incubators influence the growth and development in broiler chicken production, linking food utilisation <i>OR</i> energy <i>OR</i> the use of resources for growth and development.
M6	Explains how environmentally controlled sheds <i>OR</i> incubators influence the growth and development in broiler chicken production, linking food utilisation <i>OR</i> the use of resources to increase growth rates, <i>AND</i> energy <i>OR</i> protein intake for tissue development.
E7	Justifies the utilisation of an incubator over broody hens in terms of the financial impact of the timing of hatching and maturity of broiler chickens for the market. Comprehensive evidence for superiority in ONE aspect, with the other aspects well supported.
E8	Justifies the utilisation of an incubator over broody hens in terms of the financial impact of the timing of hatching and maturity of broiler chickens for the market. Comprehensive supporting evidence for superiority in ALL aspects.

Q3	Evidence
(a)	<p><u>Describe how environmentally controlled sheds would influence the growth, development, and yield of broiler chickens</u></p> <ul style="list-style-type: none"> • Environmentally controlled sheds eliminate bright light, wind, rain, frosts, and draughts. • Heating, such as heat pumps, and cooling systems, such as a ventilator or a sprinkler system, are in place to increase or decrease the temperature, thereby providing a relatively constant and moderately warm temperature. • Constant dimmed lights are used to encourage them to eat constantly. If the lights are too bright, the chickens tend to fight, injuring themselves and therefore using their food intake to heal rather than grow, reducing their growth rate. <p><u>Explain how controlled sheds would influence the growth, development, and yield of broiler chickens</u></p> <ul style="list-style-type: none"> • Environmentally controlled sheds reduce temperature fluctuations, ensuring the chickens do not have to expend energy to maintain body heat, therefore more nutrients are available for tissue development, contributing to faster growth rates. Chickens cannot sweat, and will die rapidly at temperatures above 41 degrees Celsius, but before this they will become stressed, pant, and stop eating in hot conditions, resulting in reduced feed consumption and growth. If they are cold, they use much of their food intake to keep warm rather than grow, therefore decreasing their growth rate. • By ensuring that all environmental conditions are met, the chickens spend more time feeding. This leads to higher feed intake, better utilisation of the feed, and increased digestion and absorption of food nutrients. Carbohydrates are required for energy, which is used for bodily functions and growth. Proteins are used for replacing body tissue, and for the growth of muscle and feathers. Protein is critical, as the chicken turns this into its “meat”. This results in greater growth, higher liveweight gain, and chickens in good, healthy condition. The quicker the chicken grows, the better.

(b)

Describe how an incubator would influence the growth and development of the chicken embryo

An incubator eliminates wind, rain, frosts, and draughts, and provides constant humidity, stable airflow, and a warm air temperature. These factors ensure optimum growth rates occur in the development of the chicken inside the egg. Incubators provide an environment with constant conditions, unlike a natural hatching under a broody hen, where conditions typically fluctuate.

Explain how the use of incubators to provide environmental consistency is important in the development and growth of the chicken embryo

- Temperature must be kept within the same range as a broody hen's body temperature (37.5–37.8°C). If this constant temperature is not maintained, the embryo will not develop properly.
- There needs to be 60% humidity in the air to ensure that the eggs do not dry out, or the chick will die. If the air is too moist, the chick will grow too big and may die at hatching, as it cannot turn in the shell to peck its way out. Very high humidity can cause premature hatching, and again, the chick will die.
- Ventilation is required, as the developing chick needs to be supplied with 17.5% oxygen and water vapour through the shell of the egg, and the waste gas carbon dioxide (minimum levels are 0.4%) needs to be removed out of the egg.
- By maintaining optimum environmental conditions, the chicken embryo uses all the provided energy and protein to convert to tissue development, ensuring that growth rates remain constant and that all the chickens will be of a similar size when they hatch.

Justify the financial impact of the timing of hatching and maturity of broiler chickens for the market when using incubators in broiler poultry production

- Eggs hatched by a broody hen take 21–24 days after a clutch has been laid, due to fluctuating environmental conditions.
- Incubators provide an optimum hatching environment. Eggs in incubators take only 21 days to hatch, due to the constant environmental conditions. By having all the chickens hatched in an incubator, there is no variation in the hatching time, as they have been exposed to the same environmental conditions, so they will all hatch within a 24-hour period. This means that all the chickens can be transferred into the brooding unit at the same time, and you know that they are going to be ready for killing at around 42 days for a female, and up to 55 days for a male (current average figures for broiler production). Providing constant environmental conditions ensures a quicker and more certain time for production, as all the chickens grow at the same rate and therefore hatch at the same time, and later are killed at the same time. Costs are reduced if brooding time is reduced.

Judgement Statement

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