Assessment Schedule – 2019

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

Assessment Criteria

Question ONE: Environmental modification

Achievement	Achievement with Merit	Achievement with Excellence
Describes how a farmer can modify the environment for selected livestock.	**Explains** how this environmental modification practice affects the growth and development of the livestock.	**Justifies** the use of an environmental modification practice to improve the quality, timing, and economics of production.

N1	N2	A3	A4	M5	M6	E7	E8
Partially describes how a farmer can modify the environment for selected livestock.	**Partially** describes how a farmer can modify the environment for selected livestock, but insufficient description.	**Describes** how a farmer can modify the environment for selected livestock.	**Describes in detail** how a farmer can modify the environment for selected livestock, with reference to growth rate.	**Explains** how an environmental modification technique affects livestock growth and development.	**Explains in detail** how an environmental modification technique affects livestock growth and development, linking energy intake or feed utilisation to growth rate or increased production.	**Justifies** the use of an environmental modification technique by discussing how it improves the quality, timing and economics of livestock production. Comprehensive evidence for superiority in TWO of these aspects, with the remaining aspect well supported.	**Justifies** the use of an environmental modification technique by discussing how it improves the quality, timing, and economics of livestock production. Comprehensive evidence of superiority in ALL three aspects.
N0 = No response; no relevant evidence.							

Q1	Sample Evidence
(a)	**Describes** a specific technique that farmers use to modify the chosen livestock's environment. *Modifying the environment for bees* Beekeepers modify the bees' environment in several ways, the main method of which is to provide the bees with an artificial home in the form of a hive. These are designed to give all the benefits of a naturally chosen hive, while allowing easy access to the honey for the beekeeper. Hives modify the bees' environment to provide shelter from the wind, rain, and temperature extremes. This modified environment gives optimum conditions for the bees to grow and for the colony to expand. This means there are more bees able to produce honey at a higher rate.

(b)	**Explains** how this modification leads to improved growth and development of the livestock. By using hives to modify the environment for the bees, the farmer can provide optimum conditions for bee growth and development. The apiarist may also consider positioning the hives in a north-facing area for increased sunlight, and therefore warmth. Coupling this with the proximity of a shelterbelt or trees for protection from the prevailing wind means that the bees will be active for longer periods, which will enable them to gather more nectar, pollen, and water. Having better access to more resources will mean less energy is wasted keeping warm, fighting disease, or searching for food. More energy can be efficiently utilised to increase growth and production. This will result in the production of more honey.
(c)	**Justifies** the use of this modification technique to improve the quality and timing of production, with reference to the economics of production. Apiarists use hives to modify the environment for bees. When positioned near a shelterbelt, in a north-facing area, they provide optimum environmental conditions for increased colony growth and hive activity. The bees need to be sheltered and safe, and the colonies need to be able to expand as the bee population grows. Modern hives can be easily expanded as the colony grows, which prevents swarming from occurring and allows the number of bees in the colony to increase. An increase in the quantity of bees means more honey can be produced. If the colony were to swarm, then this could severely impact the size of the colony. If an apiarist can position the hives near flowering manuka, this will allow the bees to produce manuka honey, which is of a higher quality than, for example, clover, rewarewa, or blended honey. Because manuka honey is a high-quality health product, it has significantly more economic value to the beekeeper. The timing of the positioning of the hives is important, as this must match the time of flowering for the target floral type, and therefore honey type. The hives can also be re-purposed for fruit pollination, for example, by relocating them to a kiwifruit orchard during the kiwifruit flowering period as another source of income for the beekeeper. Hives cost money and labour to build, set-up, and maintain, especially in areas considered the best for producing manuka honey. However, these costs are easily offset by the increased profit to be gained from the production of high-quality manuka honey.

Question TWO: Disease management

Achievement	Achievement with Merit	Achievement with Excellence
Describes how a disease management practice is carried out.	**Explains** how a disease management practice affects the growth and development of the livestock.	**Justifies** the use of disease management practice by discussing how it improves the quality and economics of livestock production.

N1	N2	A3	A4	M5	M6	E7	E8
Partially describes management practice, but does not describe a disease management practice.	**Partially describes** how management practice is carried out, but gives an insufficient description.	**Describes** how a disease management practice is carried out.	**Describes in detail** how a disease management practice is carried out, with reference to growth rates.	**Explains** how this disease management practice affects growth and development of the chosen livestock, linking to growth rates.	**Fully explains** how this disease management practice affects growth and development of the chosen livestock, linking food utilisation and energy intake to growth rates.	**Justifies** the use of a disease management practice by discussing how it improves the quantity of livestock production, with reference to economics of production. Comprehensive evidence for superiority in ONE aspect, with the other aspect well supported.	**Justifies** the use of a disease management practice by discussing how it improves the quantity of livestock production, with reference to economics of production. Comprehensive evidence for superiority in BOTH aspects.
N0 = No response; no relevant evidence.							

Q2	Sample Evidence
(a)	**Names** a nationally significant disease that affects the selected livestock species, and **describes** how farmers prevent its spread. *Cattle and Mycoplasma bovis* *Mycoplasma bovis (M.bovis)* is a cattle-specific bacterial disease that can lead to serious conditions in cattle and create animal welfare and productivity issues. Previously, New Zealand and Norway were the only countries confirmed to be free of the disease. *M.bovis* does not have a cell wall, and this means that it is not treatable with antibiotics and is not preventable with vaccines. However, it is fragile outside of the host. The clinical signs of the bacteria are variable and can include untreatable mastitis, abortions, and severe arthritis. Respiratory illness, pneumonia, meningitis, ear infection, and general poor thrift can occur in young cattle. The bacteria like to live in mucosal membranes of the mouth and throat, and also the vagina. It can live in these areas for some time without stimulating an immune response or causing the disease. Stress appears to contribute to triggering the disease. This makes the effects of the bacteria very unpredictable and complex. It is also very difficult to detect, as blood samples do not always identify infected animals, and the method is therefore not accurate. Bacteria can be picked up in the milk, and the polymerase chain reaction (PCR) technique can be used to test the DNA of the bacteria when it is shed in milk.

	The most effective method that farmers can use to prevent the spread of this disease within their herd is to prevent contact with cattle from other herds – for example, when animals can reach each other across a boundary fence. Equipment used for artificial insemination should be sterilised by technicians when moving from farm to farm. *M.bovis* can also be spread by feeding infected milk from one farm to calves on another farm. The milk can be treated through pasteurisation or acidification. *M.bovis* affects the productivity of the animals, because whole herds with positive results have to be culled.
(b)	**Explains** how a farmer uses a disease management practice to improve the growth and development of the chosen livestock. Farmers must use a multipronged attack to prevent the spread of *M.bovis*. Preventing contact with neighbouring stock at the farm boundary, sterilising artificial insemination equipment, acidifying calf milk, cancelling Ag Days, and culling whole herds when positive tests results are received are important methods of preventing the spread of the disease. Having correct and complete NAIT records for the transfer of cattle is very important in understanding and preventing transmission of the disease. Cattle that are infected by the disease will use energy to support their immune response. This means that the cattle are unable to properly utilise their food source because protein and energy from the diet is used to support the body's defence system. This means that less protein and energy are able to be used to build muscle in beef cattle and, therefore, a reduction in growth rate occurs. In dairy cattle, this also results in reduced milk production.
(c)	**Justifies** the use of the disease management practice to improve the quantity of livestock, with reference to economics of production. Eradication of *M.bovis* is expected to cost the New Zealand taxpayer $886 million in a 10-year plan that could see an estimated 15 000 livestock culled from the national cattle herd. Long-term management of the disease is expected to cost $1.2 billion, including $698 million in lost productivity for farmers. If farms can protect their herds through undertaking simple biosecurity practices, such as preventing direct contact with cattle from other farms, then they are likely to be insulated from the impacts of the disease. Using the NAIT recording system to correctly record cattle movement is crucial to preventing the spread of the disease. Double-fencing paddock boundaries to stop nose-to-nose contact between neighbouring stock is important in preventing the spread of the disease, but has a significant cost in terms of materials and labour. When buying in feed, this will need to be from farms that do not have a Restricted Place Notice, which could cost more than usual if demand for the feed increases. When moving animals for grazing, it is important to check a property's biosecurity health status, as all *M.bovis*-infected properties are under Restricted Place Notices under the Biosecurity Act. This means that any stock movement on the farm requires a permit from the Ministry for Primary Industries. Properties that are deemed to be at risk of spreading the disease can be issued a Notice of Direction, which aims to prevent further spread and does not restrict movement of stock or goods onto the farm. However, cattle can move off the farm only with a permit. It is important to ensure that the grazing property has good biosecurity measures in place, such as preventing the stock from having nose-to-nose contact with neighbouring stock. If a farmer receives a positive *M.bovis* test result in a bulk milk test, a Notice of Direction will be issued and more stringent testing will take place. After this, all the cattle will be culled and government financial compensation will be made available to cover most forms of financial loss to the farmer. Some effects, such as stress on farming families and the farming community, will be difficult to quantify. Overall, *M.bovis* is likely to result in a severely reduced quantity of cattle across the national herd, and this is expected to come at a large cost to the industry. The long-term effects of the *M.bovis* outbreak on the industry are likely to be significant, as both international and domestic markets may be negatively impacted if the government is unsuccessful in its eradication programme.

Question THREE: Nutrition

Achievement	Achievement with Merit	Achievement with Excellence
Describes how a livestock feed is chosen.	**Explains** how a specific livestock feed is chosen to improve livestock growth and development.	**Justifies** the use of a livestock feed by comparing and contrasting it with an alternative in relation to quality, quantity, and the economics of production.

N1	N2	A3	A4	M5	M6	E7	E8
Partially describes feed, but does not describe how a feed is chosen.	**Partially describes** how a feed is chosen but gives an insufficient description.	**Describes** how a feed improves livestock growth and development.	**Fully describes** how a feed improves livestock growth and development, making some reference to growth rates.	**Explains** how a feed improves livestock growth and development, linking to growth rates.	**Fully explains** how a feed improves livestock growth and development, linking food utilisation and energy intake to growth rates.	**Justifies** the use of a feed over an alternative, by discussing how each impacts the quality, quantity, and economics of livestock production. Comprehensive evidence for superiority in TWO aspects, with the other aspect well supported.	**Justifies** the use of a feed over an alternative, by discussing how each impacts the quality, quantity, and economics of livestock production. Comprehensive supporting evidence for superiority in ALL aspects.
N0 = No response; no relevant evidence.							

Q3	Sample Evidence
(a)	**Explains** how a specific livestock feed is selected to improve the chosen livestock species' growth and development. *Lucerne vs Ryegrass silage for goats* Before giving any feed to livestock, it is usually assessed to determine the energy levels it contains. Typically, the measurements used are metabolisable energy (ME) measured in megajoules, dry matter (DM) measured in kilograms, and crude protein (CP) measured in percentage of DM (%DM). ME is a good measure of the nutritive value of a feed and is essentially the proportion of energy absorbed from the feed by the digestive tract and retained for metabolic purposes. All feed can be ranked on their ME content as a proportion of feed dry matter, expressed as MJME/kg DM to indicate their value to the livestock. 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). Goats require feed that has high ME and CP. This enables energy and protein to be efficiently utilised for the production of meat, which means increased growth rate, or in the case of dairy goats, increased milk production.

(b) **Justifies** the use of this feed by comparing it with the use of an alternative, discussing how each impacts the quality, quantity, and the economics of livestock production.

Silage type	Dry matter (DM) %	Metabolisable energy (ME) ME/kgDM	Crude protein (CP) %DM
Traditional pasture	30–35	11.0	17.0
Lucerne	30–50	9.0–11.0	19–23

Goat farmers usually rely on a cut and carry system for feeding pasture to the goats. Farmers will also usually supplement this pasture feed with traditional grass silage. They can also choose to supplement the feed with Lucerne silage. Based on the figures in the table above, when compared to traditional pasture, Lucerne is the better choice, as it contains similar ME but significantly more CP and a wider DM range, depending on quality. This is likely to result in better utilisation of the Lucerne silage compared to traditional pasture, as more protein and digestible energy is available to be converted into meat or milk. This means an increase in growth rates and milk production. This will result in better quality meat or milk, meaning an increased profit for the farmer.

Lucerne is a perennial legume that can fix nitrogen, giving added economic benefit to the farmer. It also has a long tap root that is very tolerant of dry conditions. However, controlling weeds and aphids can be an extra cost for Lucerne crops.

In the case of feed that is grown rather than purchased, other factors, such as the plant's suitability for the soil type and climate need to be considered, as these can affect overall yield. If the yield from the Lucerne silage was considerably less than traditional pasture, then this may have a negative impact on the farmer's expected profit. Planting and harvesting costs must also be considered, as any significant increase in these costs could make Lucerne silage less economical to use than traditional pasture silage.

Cut Scores

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