

Assessment Schedule – 2021**Agricultural and Horticultural Science: Demonstrate understanding of land use for primary production in New Zealand (91297)****Assessment Criteria**

Achievement	Achievement with Merit	Achievement with Excellence
Explains how factors have made land suitable for different types of primary production.	Explains in detail how factors have influenced a region's different types of primary production.	Evaluates how land is suitable for different types of primary production based on certain factors.

Evidence**Pasture and forestry**

Question ONE	Evidence
(a)	<p>Explains how environmental factors make one region suitable for pasture and another suitable for forestry.</p> <p>These are potential examples; other regions may be referred to.</p> <p><i>Evidence is for pasture in the Waikato and forestry on the East Coast.</i></p> <p><i>Waikato – Pasture</i></p> <p>The Waikato has consistent year-round rainfall and plenty of sunshine. The winters are mild, which allows for year-round grass growth. The region has a flat and rolling topography with fertile soil, making it suitable for dairy, horse studs, and beef cattle. Links to photosynthesis / grass growth for Merit.</p> <p><i>East Coast – Forestry</i></p> <p>The East Coast of the North Island is prone to erosion and so plantation forests were planted to prevent this. The East Coast has a climate suitable for radiata pine, with dry summers and no weather extremes. <i>Pinus radiata</i> is a coastal species from California, which has a similar climate to the East Coast.</p>
(b)	<p>Discusses why a farmer would make the decision to retain land in pasture or convert land to forestry. Considers economic and workforce factors.</p> <p><i>Pasture</i></p> <p>Around 7–8 million hectares in New Zealand is covered by improved pasture, and it is used for a range of purposes from relatively low-intensity sheep and beef farming to high-intensity dairy farming. New Zealand's largest agricultural land use is for sheep and beef farming. This makes up 31.9% of New Zealand's land total, followed by dairy at 9.8%. Improved pasture can be found in all regions of New Zealand, from Northland to Southland. However, certain regions need improvements, such as irrigation or fertilisation for efficient year-round grass growth.</p> <p><i>Forestry</i></p> <p>New Zealand has around 1.7 million hectares in plantation forestry, with 90% of being <i>Pinus radiata</i>. The central North Island is the main region with nearly 600,000 hectares in plantation forestry. Plantation forests make up 7% of our land use. <i>Pinus radiata</i> is typically harvested between 26–32 years with an average of 28 years. Land is normally replanted back into plantation forestry after harvest.</p>

Economic

- Return on pasture is highly variable, dependent on intensity of land use. Dairy is \$5,000 per hectare, while sheep and beef can be \$30–\$600 per hectare, depending on land quality.
- An income is realised each year when land is in pasture. This income can vary, depending on environmental factors.
- Pastoral farmers generally have no control over sale price, and cannot stockpile while waiting for a better price.
- Forestry return is \$1000–\$1500 per ha a year. A return is only realised after harvest (28 years).
- Forest owners can delay harvest for better returns.
- Forest owners can sell carbon credits at \$25 per tonne CO₂ equivalent (CO₂e), with a hectare of pine absorbing 15–26 tonnes per year.

Workforce

- In pastoral farming, employment is consistent from year to year and delivers year-round employment (Wairoa district 7.4 local jobs per 1000 hectares).
- Forestry employs fewer people per hectare, and most of them are employed during harvest (Wairoa district 5.1 local jobs per 1000 hectares), but it employs more in regional centres where processing takes place.
- Forestry gangs service a number of regions and do not necessarily support the local economy.
- Carbon forestry has minimal employment requirements (Wairoa district 0.6 local jobs per 1000 hectares).
- Both pastoral farming and forestry require skilled workers and unskilled workers. However, the jobs are quite different.
- Pastoral farming:
 - Physical labour – shearing, fencing, agricultural work.
 - Advisory and technical services – animal health, agronomy, materials, and advice.
 - Support – stock agents, meat works.
- Forestry:
 - Planting and pruning.
 - Logging and trucking.
 - Mechanics.

N1	N2	A3	A4	M5	M6	E7	E8
Some writing, but does not explain why environmental factors make a region suitable for either pasture or forestry.	Partial or insufficient explanation of why environmental factors make a region suitable for either pasture or forestry.	Explains why environmental factors make a region suitable for either pasture or forestry.	Explains why environmental factors make a region suitable for pasture and a region suitable for forestry.	Explains, in detail, land use in pasture or forestry for ONE region.	Explains, in detail, land use in pasture and forestry for TWO regions.	Compares and contrast land use in pasture and forestry in terms of TWO factors: economic and workforce. Comprehensive evidence given for ONE factor, with the other factor well supported.	Compares and contrast land use in pasture and forestry in terms of TWO factors: economic and workforce. Comprehensive evidence given for BOTH factors.

N0 = No response; no relevant evidence.

Barriers to change land use

Question TWO	Evidence
(a)	<p>Explains two factors that have acted as barriers to more intensive land use in an area of traditional low-intensity land use.</p> <p><i>Evidence is for the southern Waikato region and forestry. Similar evidence could be used for sheep, beef, or other low intensity land use in other regions.</i></p> <p><i>Environmental</i></p> <p>The Central Plateau has a volcanic-based pumice soil, which lacks the mineral cobalt. When livestock is grazed, they can develop a wasting condition due to microorganisms in the gut being unable to produce vitamin B12. This can lead to a failure to thrive, or death. The cause was not discovered until 1937 and, due to being unable to graze the land and a shortage of timber, the government planted the region in plantation forests.</p> <p><i>Political</i></p> <p>The Taupo catchment has very strict nitrogen limits with a goal of reducing the amount of nitrogen entering the lake. Resource consents are required for any activity that is likely to increase nitrogen discharge, such as deforestation or increasing the intensity of land use, such as moving from sheep and beef to dairy, or for increasing the stocking rates of an existing dairy farm.</p>
(b)	<p>Justifies why a farmer would change from a traditional low-intensity land use to a more intensive land use in terms of two factors (economic, environmental, or technological).</p> <p><i>Evidence is for dairy farming in the southern Waikato region. Similar evidence could be used for any other high-intensity land use in other regions. Regional links and / or specific production types not required.</i></p> <p>Land in southern Waikato is relatively flat, has good year-round rain, and is relatively fertile. It is suitable for a range of intensive land uses, including both dairy and horticulture. Traditionally the land has been used for forestry and, at one stage, had the largest manmade forest in the world. Due to the lack of cobalt in the soil, the land was unsuitable for grazing stock. However, with the addition of cobalt to fertilisers, this limitation can be overcome. Nitrogen loss is a major issue for any intensive land use, especially modern dairy farming. With good farm management practices, nitrogen runoff and leaching can be minimised by the use of feed pads, barns, and riparian planning, as well as catchment-wide nutrient management plans.</p> <p>Dairy has a much greater rate of return than forestry at around \$5000 per hectare, while forestry is \$1000–\$1500 per hectare. Land that is suitable for dairy is worth a lot more than land that isn't. It takes up to \$40,000 per hectare for the landowner to get an effective return (within eight years) and, therefore, it can make sense to convert from a low-intensity land use. While the cost of conversion can be high, with dairy farmers having an average of \$1.2 million worth of assets (stock and machinery) per farm, at current low interest rates, this can be justified.</p> <p>The use of new technologies has allowed for intensification in dairy. Large rotary sheds allow cows to be milked faster and more efficiently, using fewer workers. The advent of robotic milking allows cows to milk themselves, which further reduces staffing costs and recruitment issues. Precision farming allows farmers to irrigate and fertilise exactly where needed, reducing cost, and limiting runoff and leaching.</p>

Environment factors

- New farming practices, such as feed pads, barns, and riparian planting, can reduce the environmental impact of more intensive land uses.
- Catchment-wide nutrient plans can prevent excessive nutrients entering waterways.

Economic factors

- Land suitable for intensification tends to be of high value and requires a high return.
- Low interest rates mean borrowing money for conversion to higher intensity land use is more viable.

Technological factors

- New technologies can get around the need for extra staff for more intensive land use.
- Precision farming and irrigation technology can reduce the environmental impact of intensification.

N1	N2	A3	A4	M5	M6	E7	E8
Identifies a factor but does not explain how barriers have shaped land use in a named region.	Partial or insufficient description of barriers that have shaped land use in a named region.	Explains how ONE factor that is a barrier has shaped land use in a named region.	Explains how TWO factors that have acted as barriers have shaped land use in a named region.	Explains, in detail, how ONE barrier to intensive land use can be overcome.	Explains, in detail, how TWO barriers to intensive land use can be overcome.	Justifies a change in land use from a traditional low-intensity land use to a more intensive land use in terms of TWO factors: economic, environment or workforce. Comprehensive evidence given for ONE factor, with another factor well supported.	Justifies a change in land use from a traditional low-intensity land use to a more intensive land use in terms of TWO factors: economic, environment or workforce. Comprehensive evidence given for TWO factors.

N0 = No response; no relevant evidence.

Social licence to farm

Question THREE	Evidence
<p>(a)</p>	<p>Names two different primary production land uses, and explains how a farmer’s social licence to farm has been threatened.</p> <p><i>Evidence is for caged eggs and dairy farming. Similar evidence can be used for other land uses.</i></p> <p><i>Factory farming, e.g. battery hens</i></p> <p>People have become increasingly concerned about where their food is coming from. With the rise of social media, people are able to share photos and videos of conditions inside factory farms, such as battery-caged chicken farms. Raising animals in conditions like this is no longer considered socially acceptable. With the ease in sharing information, groups are able to influence society to an extent not seen before. This has led to public pressure on retailers and the government to increase standards in intensive factory farms. As a result, there is now a move from conventional cages to colony cages and barn chicken farms.</p> <p><i>Dairy</i></p> <p>Due to the rapid expansion of dairying and lax environmental standards at the time, dairy farms negatively affected water quality, especially in the Canterbury region. This led to a campaign in 2002 to highlight this and raise it in the public eye. In addition to water quality, dairy accounting for 47% of New Zealand’s greenhouse gases, and the mistreatment of bobby calves by a small number of dairy farmers, has led to dairy being painted in a negative light by urban New Zealanders.</p>
<p>(b)</p>	<p>Justifies how a farmer would explain a primary production land use in terms of a social licence to farm. Considers two factors (technological, social, political).</p> <p><i>Evidence is for kiwifruit and dairy farming. Similar evidence can be used for other land uses.</i></p> <p>The kiwifruit industry is actively building and promoting its social licence to farm by working with growers to conduct practices above the regulatory minimum – things like paying above minimum wage, the use of nutrient budgets to reduce leaching, and requiring growers use the Kiwigreen programme to reduce agrichemical use.</p> <p>The dairy industry in New Zealand has worked hard to rebuild its social licence to farm with both self-imposed rules and government rules regarding water quality and animal welfare. In 2013 DairyNZ launched the Water Accord to highlight the industry’s commitment to improving water quality. Fonterra has also set standards on the humane treatment of bobby calves – rules regarding tethering and confinement.</p> <p><i>Technology</i></p> <ul style="list-style-type: none"> • New technologies enable farmers to reduce their environmental impact – irrigation technologies, effluent disposal systems, animal health trackers. • Technology allows farmers to actively promote their social licence to farm by allowing the public on to their farms virtually, and connecting with them through social media. <p><i>Society</i></p> <ul style="list-style-type: none"> • By opening their gates, primary producers can invite the general population on to their farms and show what is happening on the farm, rather than what social media is promoting. • The use of shelterbelts can limit the impact on neighbours – reducing noise, smell, and spray drift. <p><i>Political</i></p> <ul style="list-style-type: none"> • Governments and councils set minimum standards that landowners are required to meet. By raising these standards and promoting improvements, to the environment / animal welfare / workforce, land users are increasing their social licence to farm.

N1	N2	A3	A4	M5	M6	E7	E8
Describes social licence but does not explain how a land user's social licence to farm has been threatened.	Partial or insufficient answer but does not explain how a land user's social licence to farm has been threatened.	Explains how ONE land user's social licence to farm has been threatened.	Explains how TWO land users' social licences to farm have been threatened.	Explains in detail, how TWO land user's social licence to farm has been threatened. Provides evidence with ONE land user with the other land user well supported.	Explains in detail, how TWO land users' social licences to farm have been threatened.	Justifies how a farmer would explain a specific primary production land use in terms of social licence to farm. Provides evidence of ONE factor with another factor well supported.	Justifies how a farmer explains a specific production land use in terms of social licence to farm. Provides evidence of TWO factors with BOTH factors well supported.

N0 = No response; no relevant evidence.

Cut Scores

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