

## Assessment Schedule – 2022

### 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
<b>Explains</b> the factors that determine traditional, current, and future land use for primary production in New Zealand.	<b>Explains in detail</b> the factors that determine traditional, current, and future land use for primary production in New Zealand.	<b>Evaluates</b> the factors that determine traditional, current, and future land use for primary production in New Zealand.  This may involve <b>justifying, comparing and contrasting</b> , and <b>analysing</b> the use of the techniques.

#### Evidence

##### Question One: Intensification

Sample evidence	
(a)	<p><i>Explains the impact of intensification of primary production land use on TWO of the following factors:</i></p> <p><b>Economic</b></p> <ul style="list-style-type: none"> <li>• Land farmed intensively (such as horticulture or dairy) can have a greater return than less intensive land uses, such as sheep and beef or forestry.</li> <li>• Higher incomes for the farmers mean they have greater disposable income to spend in local economies.</li> <li>• Higher incomes result in greater tax paid, which means the government can invest in infrastructure.</li> </ul> <p><b>Environmental</b></p> <ul style="list-style-type: none"> <li>• Higher-intensity land uses such as dairy tend to have a greater environmental impact, including nutrient run-off, leaching, soil compaction, and greenhouse gas emission.</li> <li>• Intensification can mean that the farmer can invest in better environmental mitigation infrastructure, such as effluent storage ponds, riparian planting, or land retirement.</li> </ul> <p><b>Workforce</b></p> <ul style="list-style-type: none"> <li>• Higher-intensity land uses tend to have a greater workforce requirement, e.g. horticulture requires fruit pickers, pruners.</li> <li>• Higher-intensity land uses have greater secondary employment opportunities, e.g. packhouses, dairy factories, etc.</li> <li>• Higher-intensity land uses tend to have a greater return, which means more money available to pay salaries and wages.</li> </ul> <p><i>Note: at least one must be positive.</i></p>

(b)	<p><i>Explains the advantages and disadvantages of reducing the intensity of land use, considering TWO of the following factors: economic, environmental, workforce.</i></p> <p>High-intensity land uses such as dairy and horticulture tend to require greater inputs in the form of fertilisers, supplementary feed, labour, and water. These inputs come with a greater financial cost. With the greater inputs comes an expectation of a greater economic return. However, this can also mean the environmental cost can be greater, with an increase in waste products and processing. Greater-intensity land uses tend to have higher workforce requirements, employing a larger number and wider range of staff. Due to low unemployment and the rural location of these land uses, it can be difficult to source workers.</p> <p><b>Economic</b></p> <p>Increasing the intensity of land use by increasing the number of stock or trees per hectare increases the potential return to a point. However, it also increases the operating costs, which can reduce the profit.</p> <ul style="list-style-type: none"> <li>• A greater number of cows per hectare means increased costs of supplementary feed.</li> <li>• Low input models can result in better use of feed, raising production per animal.</li> </ul> <p><b>Environmental</b></p> <ul style="list-style-type: none"> <li>• Reducing the number of animals means less effluent needs to be disposed of.</li> <li>• Fewer cows mean less methane emitted.</li> <li>• Reduced yield in crops means less fertiliser needs to be applied, reducing the application and potential leaching impacts.</li> </ul> <p><b>Workforce</b></p> <ul style="list-style-type: none"> <li>• Reduced production means fewer workers need to be employed, reducing labour costs.</li> </ul>
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N1	N2	A3	A4	M5	M6	E7	E8
Some writing but does not explain the impact of intensification / deintensification of land use.	Partial or insufficient explanation of the impact of intensification / deintensification of land use.	Explains an impact of intensification / deintensification of land use.	Explains TWO impacts of intensification / deintensification of land use.  (At least one impact positive.)	Explains in detail ONE impact of intensification / deintensification of land use.	Explains in detail TWO impacts of intensification / deintensification of land use.	Discusses the impact of reducing the intensity of land use in terms of economic / environmental / workforce factors.  Provides comprehensive evidence given for ONE factor.	Discusses the impact of reducing the intensity of land use in terms of economic / environmental / workforce factors.  Provides comprehensive evidence given for TWO factors.

**N0** = No response; no relevant evidence.

**Question Two: Change in land use**

<b>Sample evidence</b>	
(a)	<p><i>Explains why the land in a chosen region has traditionally been used for a specific primary production, considering TWO of the following factors: environmental, political, or workforce.</i></p> <p><i>Evidence is for the Central Plateau and forestry.</i></p> <p><b>Environmental</b></p> <p>The Central Plateau has a volcanic-based pumice soil, which is lacking in 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><b>Political</b></p> <p>In the 1920s, the government realised that they were depleting the forestry reserves of timber for construction and would need lumber to build houses. Due to the presence of the timber mills in Waipa and the unsuitability of the land for animal production at the time, the government selected the Central Plateau for plantation forestry.</p> <p><b>Workforce</b></p> <p>The Central Plateau has experienced foresters and mill operators due to large-scale native logging in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. In addition to this, a large number of unemployed men returning from the First World War needed employment. The government, through the New Zealand Forestry Service, used these people to establish the large-scale pine plantations on the Kāingaroa Plateau.</p>
(b)	<p><i>Discusses why a farmer or grower might change to a new land use, referring to TWO of the following factors: economic, technological or social.</i></p> <p><i>Evidence is for the Canterbury Plains and dairy.</i></p> <p>Land in the Canterbury Plains is relatively flat and free draining, and is located near population centres. It is suitable for a range of intensive land uses, including both dairy and horticulture. Traditionally the land has been used for sheep and beef, and arable farming. One of the main limitations of the area is the seasonal droughts in summer. However, with modern irrigation techniques, year-round grass growth can be achieved. Leaching can be an issue in the free-draining Canterbury soils, especially with modern dairy farming. Good farm management practices ensure nitrogen run-off and leaching can be minimised. Examples of this include 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 sheep and beef at around \$5,000 per hectare, while sheep farming can be less than \$400 per hectare. As land that is suitable for dairy is worth a lot more than land that isn't (up to \$40,000 per hectare for the landowner to get an effective return) it can make sense to convert to a low-intensity land use. While the cost of conversion can be high, with dairy farmers having an average of \$1.2 million dollars' 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 for 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 costs, and limiting run-off and leaching.</p>

**Economic**

- 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.

**Social**

- Converting to a more intensive land use, such as dairy, brings money into communities. This money is spent in rural communities, allowing for the revitalisation of small towns.
- Land uses such as dairy require more workers as well as more secondary employment opportunities, such as in animal health and equipment maintenance.

**Technological**

- 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.

<b>N1</b>	<b>N2</b>	<b>A3</b>	<b>A4</b>	<b>M5</b>	<b>M6</b>	<b>E7</b>	<b>E8</b>
Some writing but does not explain why a region has been traditionally used for a specific primary production land use.	Partial or insufficient explanation of why a region has been traditionally used for a specific primary production land use.	Explains why a region has been traditionally used for a specific primary production land use.	Explains TWO reasons why a region has been traditionally used for a specific primary production land use.	Explains in detail, why a region has been used for a specific primary production land use <i>OR</i> why a farmer/ grower might change land use.	Explains in detail, reasons why a region has been traditionally used for a specific primary production land use <i>AND</i> why a farmer / grower might change land use.	Discusses why a land use might change with reference to ONE factor: economic, technological, or social.  Comprehensive evidence given for ONE factor, with another factor well supported.	Discusses why a land use might change with reference to TWO factors: economic, technological, or social.  Comprehensive evidence given for BOTH factors.

**N0** = No response; no relevant evidence.

**Question Three: Climate change**

**Sample evidence**

*Discusses both the risks and opportunities in terms of land use in the primary sector in a chosen region, referring to TWO of the following factors: economic, environmental, or technological.*

Climate change is expected to result in an average temperature increase of over 2°C by 2090, resulting in an increase in heatwaves, droughts, fires, and storm events. The impacts of climate change are forecasted to vary across the country, with some parts on the east coast forecasted to see a four-fold increase in droughts, while those on the west coast could see an increase in rainfall and flood events.

Some of the risks involved in climate change in regard to land use are:

- Certain horticultural crops, such as kiwifruit, require winter chilling to produce high flower numbers. If areas such as the Bay of Plenty, New Zealand's main kiwifruit growing region, have insufficient cold days in winter, this could lead to a decrease in yield and an increase in chemical substitutes such as Hicane. Certain regions, such as Northland, might become completely unsuitable for kiwifruit.
- Reduced rainfall in eastern areas will require expansion and greater reliance on irrigation. This could potentially make some water-intensive land uses, such as dairy, unsustainable.
- A greater number of storm events will lead to damage to infrastructure and stock losses, driving up operating costs.
- An increase in pests and diseases as winters become warmer allows some species, which wouldn't otherwise be able to establish populations in New Zealand, to survive.

Some of the opportunities involved with regard to land use are:

- Warmer temperatures will allow earlier sowing of crops such as grains, and they will reach maturity earlier.
- Elevated CO<sub>2</sub> levels will result in positive yields in crops such as wheat.
- A decrease in frosts and warmer winters could result in an increase in yield and reduce operating costs.
- Warmer temperatures allowing new and novel species to become commercially viable, such as bananas in Northland.

**Economic**

- Increased operating costs due to reliance on irrigation / pest and disease control / chemical hormones.
- Increased yield due to warmer temperatures / fewer frosts / carbon dioxide fertilisation.

**Environmental**

- The range of plants will change due to different environmental growing conditions, warmer / drier / frosts.
- Greater environmental impact on water due to the necessity of a greater water uptake and the expansion of water schemes.

**Technological**

- A greater investment in water-efficient irrigation and drought-tolerant crops.
- Development of warm-weather plants / plants that are less dependent on winter chilling.

<b>N1</b>	<b>N2</b>	<b>A3</b>	<b>A4</b>	<b>M5</b>	<b>M6</b>	<b>E7</b>	<b>E8</b>
Some writing but does not explain the risks and opportunities in terms of land use.	Partial or insufficient explanation but does not explain the risks and opportunities in terms of land use.	Explains a risk <i>OR</i> opportunity in terms of land use.	Explains a risk <i>AND</i> opportunity in terms of land use.	Explains in detail a risk <i>OR</i> opportunity in terms of land use.	Explains in detail a risk <i>AND</i> opportunity in terms of land use.	Discusses the risks and opportunities in terms of land use in terms of ONE factor: economic, environmental, or technological, with another well supported.	Discusses the risks and opportunities in terms of land use in terms of TWO factors: economic, environmental, or technological.

**N0** = No response; no relevant evidence.

### Cut Scores

<b>Not Achieved</b>	<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
0 – 6	7 – 12	13 – 18	19 – 24