

## Assessment Schedule – 2025

### Agricultural and Horticultural Science: Analyse a New Zealand primary production environmental issue (91532)

#### Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<p><i>Analyse an environmental issue</i> involves:</p> <ul style="list-style-type: none"> <li>explaining the environmental issue arising from primary production management practices</li> <li>explaining potential courses of action to mitigate the negative impacts of the management practices</li> <li>recommending course(s) of action to support sustainable management practices.</li> </ul>	<p><i>Critically analyse an environmental issue</i> involves:</p> <ul style="list-style-type: none"> <li>explaining, in detail, the environmental issue arising from primary production management practices</li> <li>evaluating potential courses of action to mitigate the negative impacts of the production management practices. This may include comparing and contrasting alternative courses of action.</li> <li>recommending course(s) of action to support sustainable production management practices that best address the issue.</li> </ul>	<p><i>Comprehensively analyse an environmental issue</i> involves:</p> <ul style="list-style-type: none"> <li>justifying course(s) of action to support sustainable production management practice(s) that best address the issue; this includes environmental, economic, political, and / or social considerations.</li> </ul>

#### Evidence

TASK	Sample evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)	<p>For your chosen primary production system, explain the <b>negative</b> impact its production can have on biodiversity in terms of management practice, and explain how diversity is impacted.</p> <p><b>Dairy farming</b></p> <ul style="list-style-type: none"> <li>Clearing of native bush / grassland to grow pasture to run more cows per hectare results in decreased diversity in ecosystems. Decreased diversity of production species or types on farm creates monocultures.</li> <li>Draining of wetlands to grow pasture to have more cows per hectare removes the water filtration, which results in degradation of surrounding waterways, impacting on aquatic life.</li> <li>Nutrient runoff and leaching entering waterways results in declining levels of biodiversity in waterways. Lower macroinvertebrate community index scores (MCI) due to decreased quantities of native fish species means less 'life' in the water to support a healthy ecosystem.</li> <li>There are decreased quantities / flows in waterways due to increased demands for irrigation water. Less water in the waterways reduces the habitat for native aquatic invertebrates and fish species.</li> </ul>	Basic facts given. Not supported with relevant data.	Comprehensive answer supported by relevant, up-to-date data.	

	<ul style="list-style-type: none"> <li>• Use of intensive grazing systems, particularly in the wintertime, has a negative impact on soil organisms.</li> </ul> <p><b>Crop farming</b></p> <ul style="list-style-type: none"> <li>• The use of insecticides to control insect pests in fruit and vegetable crops will typically increase saleable crop yields per hectare.</li> <li>• These insecticides can result in a decrease in biological services by insects, e.g. pollination from bees.</li> <li>• Soil erosion from overcultivation results in loss of habitat for soil organisms.</li> </ul>			
(b)	<p>Explain how TWO courses of action, when used correctly, will <b>mitigate</b> the negative impacts or <b>improve</b> biodiversity for your chosen production system.</p> <p><b>Action (1)</b></p> <ul style="list-style-type: none"> <li>• Planting marginal land into native trees / bush.</li> <li>• Reducing nutrient leaching and runoff by keeping animals, such as cows, off pasture at certain times of the year.</li> <li>• Wintering cows indoors to reduce the need for intensive winter cropping and hence lessening the impact on the soil.</li> <li>• On-farm water storage utilised to reduce water takes from surface water or groundwater.</li> <li>• Lower inputs to optimal levels to maximise profitability, not productivity, per hectare.</li> </ul> <p><b>Action (2)</b></p> <ul style="list-style-type: none"> <li>• Use of precision farming procedures, such as mapping of the production system, to understand soil type and nutrient levels.</li> <li>• Use of the best genetics, which are bred to be more efficient, so can produce the same yield from less animals.</li> <li>• Use of direct drilling to reduce soil disturbance between each crop.</li> <li>• Pest monitoring in an orchard to understand which insect pests are present and then use targeted insecticides to kill the insects present.</li> </ul>	<p>Basic facts given. Not supported with relevant data.</p>	<p>Comprehensive answer supported by using relevant up-to-date data.</p>	

<p>(c)</p>	<p><i>Justify which of your two courses of action has the greatest positive impact on biodiversity, while ensuring the environmental, economic, and social sustainability of your production system.</i></p> <p><b>Example: Sheep and Beef – planting marginal land into native trees / bush</b></p> <ul style="list-style-type: none"> <li>• In certain parts of New Zealand, the majority of sheep and beef farms are found in the hill or high country. Farms found in these environments tend to be more extensive and have lower inputs, but over time they have cleared more land to increase the effective size of their properties. During the 1980s, farmers were incentivised by the government to clear land and increase the amount of productive farmland, but this resulted in reduced biodiversity due to habitat destruction. Today we are starting to see many farmers planting some parts of their farm back into native bush, or in some cases letting the native bush regenerate. In doing so they are once again providing a habitat for a diverse range of birds, insects, and plants, many of which would have existed in the area prior to the land being intensified.</li> <li>• Planting natives not only has an environmental benefit but also improves both economic and social sustainability.</li> <li>• Socially, planting native trees enhances the aesthetic of the farm and helps the farmer gain social licence to farm. If society is more accepting of the way that the farmer is producing their lamb (or beef), they are much more likely to purchase their products and much less likely to lobby the government to make law changes that makes farming harder for the producer. Planting native forest can also provide areas that members of the public can use for recreation. It takes time for native forests to grow, but once established they can have a positive impact on local communities.</li> <li>• Economically, while planting is a cost for the producer, they can start to generate carbon credits from the forestry. Carbon credits are a measurement of the amount of carbon that the forest sequesters per hectare, and this carbon is then traded in the carbon market with industries that emit carbon. Many native species will sequester between 10 and 16 tonnes CO<sub>2</sub> / ha / yr with species such as Kauri being faster at sequestering carbon than Totara. At 10 tonnes CO<sub>2</sub> / ha / yr a 50 ha block will sequester 500 tonnes CO<sub>2</sub> / ha / yr. Currently the price for carbon is around \$60 / t (one unit) which will provide the farmer with an additional \$30,000 income. Due to this land being marginal and mostly unimproved land, the farmer should not need to decrease stock numbers, so their income from lamb (and / or beef) should be largely unaffected.</li> </ul> <p><b>Example: Dairy – Wintering barns / herd homes</b></p> <ul style="list-style-type: none"> <li>• Use herd homes or wintering barns to collect effluent from animals for either part of, or all the year, depending on the area of New Zealand where the farming occurs. Keeping animals off pasture reduces N leaching into groundwater or surface water. Urine patches are the biggest loss of N from dairy farm systems.</li> </ul>	<p>Candidates can select any of the courses of action from Part (b).</p>	<p>Note: The answer will be reasoned, and supporting data included. Answers should be well prepared and laid out in logical order.</p>	<p>Gives a comprehensive answer, justifying the choice, including relevant data. Compares two courses of action.</p>
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Studies have found that up to 95 per cent of the N ingested by cows ends up being urinated back onto the ground. This is far more Nitrogen than the soil can absorb, so in many cases this N is then leached or will run off into nearby waterways, causing a reduction of biodiversity in the water due to eutrophication.

- While the cows will still be eating the same source of feed, and urinating similar amounts of nitrogen, much of this will now be collected and stored. The stored effluent can then be dried and spread over the farm as organic matter, or can be separated into solids and liquids and the liquids sprayed onto the soil at a much lower N concentration than what comes out of the cow. Being able to control the application of the effluent is the key to reducing N loading on the soil.
- Winter is a particularly at-risk time for leaching and runoff as the soils are generally wetter, so there is more risk of nutrients being washed through or over the soil. Also, crops and pasture are growing slowly (or not at all) so there is very little uptake of nutrients by the plants. In many parts of New Zealand, due to the lower temperatures, winter crops are used to get through the winter while conserving pasture for the spring. Intensive winter cropping increases the effluent loading in the soil as there are more animals in a small area for a longer period of time. Using a herd home or wintering barn over this time eliminates the need for winter crops, significantly reducing the nutrient loading on the soil.
- It also eliminates the risk of pugging and soil compaction over the winter period. Soil compaction has a significant negative impact on the diversity of life within the soil. With the compaction of soil peds and particles there is reduced macropore space and therefore reduced oxygen levels. Soil organisms, such as earthworms, bacteria, fungi, nematodes, beetles, and other insects, play a huge role in the decomposition of organic matter and the formation of productive soil. They are negatively affected by the lack of oxygen, as they all need oxygen to respire. Without this diverse range of organisms, the soil would be much less productive. By having the cows in a wintering barn, the risk of pugging is eliminated so the biodiversity of the soil is also protected.
- Using herd homes not only has a significant environmental benefit, but also helps with social and economic sustainability.
- Economically, a herd home has a large up-front cost to build with a home to house 400 cows, upwards of \$1million to build, but farmers who are using these systems are finding much greater efficiency and productivity. Some farmers have found an increase in production, up to 40%, due to the cows being in better condition coming into calving and then being able to use the shed at any time during the year to feed the cows when the environmental conditions aren't ideal. The biggest improvement is in feed utilisation, as no feed is trampled and lost to the environment. The cows are also kept warmer and a warm, well-fed animal is also a healthier animal, so vet bills are reduced also. With the average MS / cow production being about 400MS / cow / year, a 40% increase will be an extra

<p>160MS / cow / year, which for a 400-cow farm equates to over \$500,000 additional income a year.</p> <ul style="list-style-type: none"> <li>• Socially, helping to clear up the waterways means that they can be used by society for recreational activities such as fishing. Good healthy numbers of fish in the rivers relies on having a diverse range of invertebrate species for the fish to feed on. This will also improve or help maintain our environmental image on the global stage, which will help with tourism and help to provide jobs to many people in the tourism and hospitality sector. Lastly, using practices such as herd homes helps the farmer gain the social licence to farm. While society doesn't like the idea of indoor or factory farming, herd homes provide the balance of having the cows outdoors when the conditions are good and indoors when the conditions mean there is a risk of environmental damage.</li> </ul>	
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N1	N2	A3	A4	M5	M6	E7	E8
<p><b>Some writing, but does not</b> explain how the production of the chosen product has a negative environmental impact on biodiversity.</p>	<p><b>Partially</b> explains how the production of the chosen product has a negative environmental impact on biodiversity.</p>	<p><b>Explains</b> how the production of the chosen product has a negative environmental impact on biodiversity <i>AND</i> <b>explains</b> ONE realistic course of action the producer could take to mitigate the negative environmental impacts on, or improve, biodiversity <i>AND</i> <b>partially explains</b> a second realistic course of action the producer could take to mitigate the negative environmental impacts on, or improve, biodiversity.</p>	<p>Explains how the production of the chosen product has a negative environmental impact on biodiversity <i>AND</i> explains TWO realistic courses of action the producer could take to mitigate the negative environmental impact on, or to improve, biodiversity.</p>	<p><b>Explains in detail</b> how the production of the chosen product has a negative environmental impact on biodiversity <i>AND</i> <b>explains in detail</b> ONE realistic course of action the producer could take to mitigate the negative environmental impact on, or to improve, biodiversity <i>AND</i> <b>partially explains</b> a second realistic course of action the producer could take to mitigate the negative environmental impact on, or to improve, biodiversity.</p>	<p>Explains in detail how the production of the chosen product has a negative environmental impact on biodiversity <i>AND</i> explains in detail TWO realistic courses of action the producer could take to mitigate the negative environmental impact on, or to improve, biodiversity.</p>	<p><b>Justifies why</b> a course of action has the greatest positive impact on biodiversity while ensuring sustainability of the production system. Answer includes the impacts of environmental, social, or economic sustainability. (Environment and ONE of economic or social covered in detail, with some discussion of the third).</p>	<p><b>Fully justifies why</b> a course of action has the greatest positive impact on biodiversity, while ensuring sustainability of the production system. Answer includes the impacts of environmental, social, and economic sustainability. (All THREE covered in detail).</p>

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

### Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0–2	3–4	5–6	7–8