Assessment Schedule – 2025

Agricultural and Horticultural Science: Demonstrate understanding of environmental sustainability in primary production management practices (91931)

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrates understanding involves describing the impacts of primary production management practices on environmental sustainability.	*Explains environmental sustainability* involves explaining the impacts of primary production management practices on environmental sustainability.	*Evaluates environmental sustainability* involves evaluating the impacts and discussing how these could influence the decisions of primary producers.

Evidence

NB: Students are expected to include how a Māori value relevant to sustainability is being shown in their response.

Question ONE	Sample evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)	In a table: *Identify two ways a production system has had a negative impact on waterways.* • Increasing stock numbers. • Using chemical sprays. • Clearing land for pastoral farming.	Names a relevant primary production system.		
	Explain how these impacts have reduced the overall quality of waterways. • High stock numbers have increased the levels of nutrients. High levels of nutrients, like nitrogen and phosphorus, can lead to algal blooms (eutrophication), which will decrease the level of oxygen in waterways when they respire at night. • Chemical sprays, such as herbicides and pesticides, can drift into waterways and make them toxic environments, which negatively impacts freshwater plants and invertebrates. • The clearing of land to increase the area for pastoral farming has increased phosphorus and decreased water clarity. High phosphorus levels contribute to algal blooms, and high sediment levels can affect fish life by covering gills and covering habitat.	Describes how a management practice has had a negative impact on waterways. Basic facts.	Explains how a management practice has had a negative impact on waterways, making links.	

(b)	*Explain how this management practice is carried out and how it has a positive impact on water quality.* • Planting pine trees is when the trees are planted on farms, usually on the steepest or most unproductive land. This improves water quality by reducing erosion, as the roots of the trees hold the soil particles on the slopes together and decrease the chances of erosion happening. Reducing the amount of soil that enters waterways through erosion will improve water clarity and decrease the amount of phosphorus that enters waterways. • Fencing waterways is when a fence is placed along both sides of a river, lake, or stream to stop stock from accessing the water. This improves water quality by preventing stock releasing effluent (urine and faeces) directly into the waterway, which will help lower nitrate and E. coli levels. Stock can also carry sediment into the river on their hooves or by collapsing the stream bank, so fencing the area will also reduce sediment levels and improve clarity.	Describes a management practice that can be used to improve water sustainability. Basic details.	Explains how a management practice improves water sustainability using examples to support answer.	
(c)	*Justify which management practice is more effective at ensuring environmental sustainability in the long term, considering how the alternative is carried out and how management practices improve water quality.* **Riparian planting** *Strengths* • Stabilises riverbanks, which decreases erosion and maintains water clarity. • Plants act as a filter, stopping runoff (effluent, sediment, and phosphorus) from entering waterways. This improves nutrient levels and clarity, as well as reducing E. coli levels. • Roots of plants can absorb nitrogen in the underground flow. • Provides shade, which lowers temperature and increases oxygen levels. *Weaknesses* • Without fencing, stock can still access waterways. Effluent / nitrogen enters through direct access, and stock can carry sediment on their hooves.	Describes a strength and / or weakness of a management practice. Identifies ways the management practice improves water quality.	Explains strength(s) and weakness(es) of a management practice, with reference to sustainability. Explains how the management practice improves water quality.	Justifies why a management practice is more effective in improving water quality by comparing the strengths and weaknesses of the alternative management practices. Explains, in detail, how both management practices are sustainable practices by explaining how they improve water quality.

	Fencing waterways *Strengths* • Fencing stops stock from entering the stream. This limits direct access of nutrients, effluent, and soil. • It allows plants to grow without being eaten / damaged by stock. • It provides a barrier – grass and plants may grow up and filter nutrients, sediment, and effluent. *Weaknesses* • Trees, plants, and shrubs that grow are not necessarily specific for removing / filtering nutrients. • No shade – does not lower the temperature and have a positive impact on oxygen content. • Nutrients, pathogens, and soil will still enter the waterways – negatively impacting the water quality.			

N1	N2	A3	A4	M5	M6	E7	E8
Shows minimal understanding of how a chosen production system has a negative impact on waterways.	Shows limited understanding of how a chosen production system has a negative impact on waterways.	Describes positive OR negative impacts of management practices on water quality.	Describes in detail positive OR negative impacts of management practices on water quality.	Explains how management practices positively OR negatively impact water quality.	Explains in detail how management practices positively AND negatively impact water quality.	Justifies the use of a management practice to improve water quality by identifying strengths and weaknesses.	Fully justifies the use of a management practice to improve water quality and sustainability, with detailed reasons and reference to a named primary production system.

N0 = No response; no relevant evidence.

Question TWO	Sample evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)	*Describe a negative impact that inorganic fertiliser can have on the following:* Air • Nitrogen-based fertilisers, like urea, can release nitrous oxide, which is a greenhouse gas. Water • Nitrogen and phosphorus (from fertiliser) can enter waterways, encouraging algae growth. Biodiversity • Algae removes oxygen from waterways, which has a negative impact on freshwater life. High levels of nitrates can increase the acidity of soil, which makes the soil less habitable for microbes.	Describes negative impact of inorganic fertiliser		
(b)	*How do soil tests allow growers to reduce the potential negative environmental impacts of fertiliser use?* • Soil tests are used to identify the soil pH and what nutrients are currently in a soil. • This helps farmers target their fertiliser application to what their soil needs, which means there is less run-off of excess nutrients into waterways and less excess nitrogen being converted into nitrous oxide.	Describes how tests reduce negative impact of fertiliser.	Explains how tests reduce the negative impacts of fertiliser and make fertiliser more sustainable.	
(c)	*Justify why your chosen method is more environmentally sustainable by comparing it to fertiliser application, considering strengths and weaknesses of both methods and the impact on air, water, or soil quality, and long-term sustainability.* Examples of sustainable alternatives could include: • Compost • Effluent • Organic fertiliser, e.g. blood and bone. **Effluent** *Advantages* • Effluent adds nutrients to soil but in much lower concentrations than fertiliser, which prevents the chance of excess nutrients leaching or runoff and entering waterways, causing eutrophication / pollution. • Organic matter in effluent provides a food source for micro-organisms, which will increase their numbers in the soil, and over time, improve the structure and fertility of the soil.	Describes alternative to inorganic fertiliser.	Explains how an alternative to inorganic fertiliser has a positive impact on the environment, with reference to soil, air or water quality	Justifies the use of an alternative to inorganic fertiliser. Compares the positive impacts of an alternative with the negative impacts of removing inorganic fertiliser, with reference to air, water, and / or soil quality. *NB: Candidates are recommended to write their answer in a paragraph format for E7/E8.*

	Disadvantages • Effluent can be high in nitrogen from cattle urine, which means that there is a risk of nitrates leaching into waterways and damaging water quality. • E.Coli is a pathogen that is found in effluent, and when effluent is applied incorrectly, this could get washed into water, decreasing the quality.			

N1	N2	A3	A4	M5	M6	E7	E8
Shows minimal understanding of sustainability when using fertiliser.	Shows limited understanding of sustainability when using fertiliser.	Describes how fertiliser has a negative impact OR how soil testing or an alternative to fertiliser can have a positive impact on environmental sustainability.	Describes in detail how fertiliser has a negative impact OR how soil testing or an alternative to fertiliser can have a positive impact on environmental sustainability.	Explains how fertiliser has a negative impact OR how soil testing or an alternative to fertiliser can be used to decrease the negative impact of inorganic fertilisers.	Explains in detail how fertiliser has a negative impact AND how soil testing or an alternative to fertiliser can be used to decrease the negative impact of inorganic fertilisers.	Justifies the use of a management practice by explaining how it improves sustainability.	Fully justifies the use of a management practice by explaining in detail how it improves sustainability, with reference to long-term environmental sustainability.

N0 = No response; no relevant evidence.

Question THREE	Sample evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)	*How can cultivation have a negative impact on soil?* • Reduce the soil structure – finer soils are more likely to be blown away by wind or washed off by rain / water. • Over cultivation can compact soils – reducing their ability to drain freely and hold air that supports macro / microorganisms and plant growth. • Loss of soil fertility due to erosion of topsoil.	Describes a way cultivation can have a negative impact on soil.		
(b)	*Explain how cultivating in a sustainable way has a positive impact on soil.* • Refrain from cultivating when soils are too dry or too wet. This can help prevent damage to the soil structure, and allow soil to continue to be able to drain freely and hold enough air to support plant growth and organisms that live in the soil. • Using lighter machinery or machinery that has wider tires will reduce soil compaction by reducing the weight of the machinery on the field. Spreading the weight over a larger area means soil is less compacted and has a better mix of air and water as well as more organic matter / organisms in the soil. • Direct drilling or planting seeds into an existing crop enables the existing crop to protect the soil from wind and rain, helping to prevent erosion. It adds organic matter into the soil that microorganisms can recycle and then release nutrients that the new crop can use. • Rotating crops by moving the paddock a crop is planted in each year will mean that the different root depths of different crops will take nutrients from different levels and aerate the soil to improve drainage. • Cultivation, when done correctly can break apart compacted soils. This will increase macropore space in the soil, allowing excess water to drain out of the soil. Cultivating the soil into marble-sized peas means the water will be able to infiltrate the soil preventing the water causing runoff where it could transport nutrients and faeces into nearby streams causing water pollution. It will also allow oxygen to enter the soil, allowing soil microbes and insects to respire. Having more air in the soil will also warm the soil making a better habitat for soil organisms.	Describes cultivation methods that reduce the impact on soils	Explains how cultivation methods can reduce the impact on soils.	

(c)	*Comparing your chosen management practice with direct drilling, which method is more effective at ensuring soils remain sustainable, considering how each method reduces the negative impacts and the short- and long-term sustainability of soils.* **Direct drilling** *Strengths* • New crops are drilled into an existing crop meaning the soil is not exposed, reducing the loss of fertile topsoil from erosion. • No change to the particle size / structure of soil, which prevents soil from becoming compacted or waterlogged. It also prevents a decline in the number or diversity of macro / micro organisms. *Weaknesses* • Tractors and heavy machinery moving over the soil can cause soil compaction, which will damage soil structure and reduce soil drainage. **Crop rotation** *Strengths* • Crop rotation is planting the same crop in a different field each year. • Planting different crops, with different root depths, mean they aerate the soil, breaking up soil structure and limiting compaction, which can help prevent the need for cultivation methods like power harrowing / ploughing etc. • Planting legumes, like white clover, will release nitrogen into the soil and improve overall soil fertility in time. • Plant roots with different depths, means nutrients are taken from different levels and soil does not become so depleted in nutrients as quickly. *Weaknesses* • Cultivation can still be required to plant new crops, which means that the negative impacts are not completely removed.	Describes how direct drilling and another method improve soil sustainability.	Explains how direct drilling and another method improve soil sustainability	Justifies the use of one method and how it improves soil sustainability by identifying the strengths and weaknesses of both methods. Explains how a method allows for the long-term sustainability of soils.

N1	N2	A3	A4	M5	M6	E7	E8
Shows minimal understanding of soil sustainability or any relevant Māori value.	Shows limited understanding of soil sustainability but no relevant Māori value.	Describes positive OR negative impacts of cultivation OR an alternative to cultivation with regard to soil sustainability.	Describes in detail the positive OR negative impacts of cultivation OR an alternative to cultivation with regard to soil sustainability.	Explains how cultivation OR an alternative practice can positively and negatively impact soil sustainability.	Explains in detail how cultivation can negatively impact soil sustainability AND how an alternative to cultivation can positively impact soil sustainability.	Justifies the use of a management practice to positively affect soil sustainability.	Fully justifies the use of a management practice to positively affect soil sustainability with reference to both long- and short-term sustainability.

N0 = No response; no relevant evidence.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0–6	7–12	13–18	19–24