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Draw a cross through the box (☒) if you have NOT written in this booklet

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NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Agricultural and Horticultural Science 2025

91931 Demonstrate understanding of environmental sustainability in primary production management practices

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of environmental sustainability in primary production management practices.	Explain environmental sustainability in primary production management practices.	Evaluate environmental sustainability in primary production management practices.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–15 in the correct order and that none of these pages is blank.

Do not write in the margins (////). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement

TOTAL 11

Page 1

INSTRUCTIONS

Read ALL parts of the questions before choosing a production system.

Ensure reference to a Māori concept or value related to environmental sustainability is included in your response.

QUESTION ONE: Water quality

"Many of our rivers, lakes, and groundwaters have unnaturally high levels of nutrients, chemicals, disease-causing pathogens, and sediment. Pollution degrades the health, mauri, and wairua of waterways and can make our water unsafe for drinking, recreation, food gathering, and cultural activities."

Ministry for the Environment: *Our freshwater 2020*

Name a primary production system.

Primary production system: Dairy Farm

(a) Complete the table below, describing:

- two ways your named production system has had a **negative** impact on waterways
- how each impact has reduced the overall water quality.

	Negative impact on waterways	How this impact has reduced overall water quality
Impact 1	One way that dairy farms may have a negative impact on waterways is if they use effluent as a fertiliser but can't manage it well.	Poor effluent management has reduced overall water quality by adding incorrect nutrients and bacteria into the water. This lessens the waters purity causing fish and other living organisms that rely on the water to become ill or even die.
Impact 2	Another way that dairy farm could have a negative impact on waterways could be the removal of riparian zones. Riparian zones are the areas between the farm and the river bank that are full of plants.	The plants in a riparian zone help to hold things such as fertiliser run off or effluent run off and stop them from reaching the water. Dairy farms may often remove these zones to be able to create larger paddock sizes and icrease stock numbers. The loss of riparian zones reduces the overall water quality by comprimising the cleanliness and safety of the water.

The photos below show a range of management practices that have been used by farmers to improve New Zealand water quality.

Planting poplar poles

Biological control of pests and diseases

Fencing waterways

Planting pine trees

Choose one manangement practice from the photos above that could be used on your chosen primary production system.

Management practice: Fencing waterways.

(b) Explain how this practice is carried out, and how it has a positive impact on water quality.

Fencing waterways in a dairy farm is a good way to keep stock from entering the water. This is done by using the fences to keep the cattle in their paddock. This positively impacts water quality by keeping the water clean from stock urine and effluent by not allowing them in the water.

Name an alternative management practice that could be used on your primary production system to improve water quality.

Alternative management practice: Riparian planting.

(c) Justify which management practice is more effective at ensuring the long-term sustainability of your named primary production system.

In your answer consider:

- how the alternative management practice is carried out
- how both management practices improve water quality.

Riparian planting is very similar to fencing waterways in the fact it is done near the water bank in an effort to keep the water clean from cattle. However riparian planting is also used to stop excess fertiliser and effluent from running into the water. This is done by planting bush and other plants along the side of the river or stream to hold the excess nutrients. This is why I believe riparian planting is more efficient than fencing waterways. Not only does it have other added benefits of stopping runoff, but it is also more natural, especially if you use native plants. Riparian planting can also show tiakitanga. Tiakitanga is a maori concept of showing guardianship and taking care of your land. This is showen in riparian planting because you are making an extra effort to ensure the water stays clean.

Sources: (poplar poles) https://www.hbrc.govt.nz/our-council/news/article/449/time-to-order-poplar-and-willow-poles-for-soil-conservation

(caterpillars) https://trogtrogblog.blogspot.com/2017/06/cinnabar-moth.html

(fencing) https://www.horizons.govt.nz/news/funding-still-available-for-fencing-and-planting

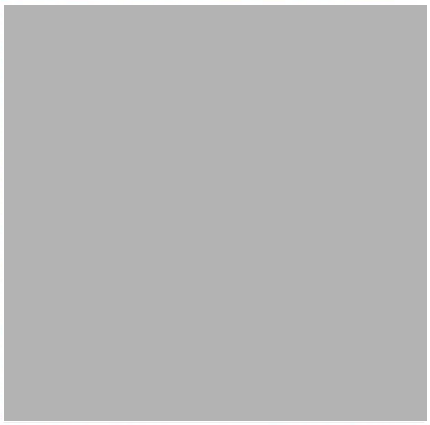
(pine trees) https://environment.govt.nz/news/new-forestry-rules-increase-council-controls-and-require-large-slash-removal/

Page 2

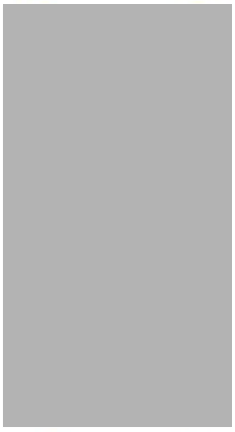
Ensure reference to a Māori concept or value related to environmental sustainability is included in your response.

QUESTION TWO: Inorganic fertiliser

Inorganic fertilisers, such as potash or superphosphate, are used to increase plant growth.



Potash fertiliser



Superphosphate fertiliser

(a) Describe the negative impact that inorganic fertiliser can have on:

Air

Some inorganic fertilisers are applied in liquid form and diluted with water. This mixture is then sprayed in mass amounuts over crop and fields. This can often evaporate when applied in large amounts. These inorganic fertilisers then end up in the air and reduce the purity and natural state.

Water

When inorganic fertilisers are not manged properly they can often end up running off or leeching into streams or rivers that run alongside farms. This can then harm or even kill living organisms that live in or rely upon the water.

Biodiversity

Inorganic fertilisers can have a negative impact on natural biodiversity by coming into contact with native animals or native bush. If some inorganic fertilisers come into contact with wild native animals it can cause serious harm to them and cause them to become very ill. This in turn also impacts our biodiversity as it may be harming our native species.

Soil tests are often carried out before fertiliser is applied.

(b) How do soil tests allow growers to reduce the potential negative enviornmental impacts of fertiliser use?

Soil tests are a great practice to carry out before the application of fertiliser because you can find out what specific nutrients your soil may need and what amounts to add. This reduces the potential negative environmental impacts because you are not adding too much of one nutrient and there is less of a chance of any excess nutrients leeching out of the soil.

Name an environmentally sustainable alternative to inorganic fertiliser application.

Alternative management practice: Organic fertiliser application.

(c) Justify why your chosen method is more environmentally sustainable by comparing it to fertiliser application.

In your answer consider:

- strengths and weaknesses of both methods
- impact on the air, water, or soil quality
- long-term sustainability.

I think that organic fertilisers such as blood and bone or well managed effluent fertilisation are far more ethically sustainable than inorganic fertilisers. This is because they have less of a chance of negatively affecting our native biodiversity because they are natural and less harmful. They are also harmful towards our waterways for the same reasons. As far as long-term sustainability organic fertilisers are much easier to source and are more plentiful because they are regenerative. Organic fertilisers may have less of an immediate effect on plant growth but if applied correctly the improvements will be just a great. Using organic fertilisers in comparison to inorganic fertilisers also helps to show tiakitanga as you are taking care of your land and crops while keeping natural.

Source: https://media.generalkinematics.com/wp-content/uploads/2022/05/Potash.jpg

https://tuigarden.co.nz/product/tui-superphosphate/

Page 3

Ensure reference to a Māori concept or value related to environmental sustainability is included in your response.

QUESTION THREE: Cultivation

Cultivation is used to prepare the soil before planting a crop.

(a) How can cultivation have a negative impact on soil?

Cultivation can sometimes have a negative impact on soil by causing soil compaction and reducing pore space for water and air to flow through the soil.

(b) Explain how cultivating in a sustainable way has a positive impact on soil.

Cultivating, when done sustainably, can positively impact the soil by clearing space to plant the crop. This ensures the crop has space to grow and extend its root network throught the ground.

Direct drilling (sowing new crops into an existing crop or pasture) can improve soil sustainability.

Name one other management practice used to reduce the negative impacts of cultivation.

Management practice: Ploughing.

(c) Comparing your chosen management practice with direct drilling, which method is more effective at ensuring soils remain sustainable?

In your answer consider:

- how each method reduces the negative impacts of cultivation on soil
- short- and long-term sustainability of soils.

Ploughing in comparison to direct drilling can both have positive impacts on soils sustainability but direct drilling is most likely best. Direct drilling is a simple way to plant crop effectively when done well. It can be done very effectively while still maintaining soil health. Direct drilling can also show tiakitanga because you are taking care of the land and specifically choosing what and how you are going to plant your crop.

Achievement

Subject: Agricultural and Horticultural Science

Standard: 91931

Total score: 11

Q	Grade score	Marker commentary
One	A4	The candidate has described how poor management of effluent can result in nutrients and bacteria getting into the water and can cause living organisms to die. They have also described how riparian planting can prevent nutrients running into the water. For merit, it is important to include an explanation of how nutrients and bacteria reduce water quality.
Two	A4	The candidate has described how fertiliser can run off or leach into water. They have also described how soil tests provide information to the grower so they can prevent leaching of nutrients. For merit, an explanation of how fertiliser has a negative impact on the environment, or how soil tests can prevent the negative impacts of fertiliser application, is essential.
Three	A3	The candidate has described in basic detail that cultivation can cause soil compaction and reduction in pore space. For a more solid achievement score they could have described how cultivation causes compaction and reduction in pore space.